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THE EFFECTS OF CONTROLLING LANGUAGE, FEAR, AND DISGUST ON RESPONSES TO COVID-19 VACCINATION PROMOTION MESSAGES

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THE EFFECTS OF CONTROLLING LANGUAGE, FEAR, AND DISGUST ON RESPONSES TO COVID-19 VACCINATION PROMOTION MESSAGES

A DISSERTATION APPROVED FOR THE
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DEDICATION

This project is dedicated to:

My parents, who taught me discipline from an early age,

and

My advisors, who were guiding lights every step of the way as I wrote this dissertation.

Acknowledgments

Sitting at my desk with the music on on a rainy Friday night, looking back on my four-year journey, my eyes become moist. For the efforts I have devoted to adding the two letters (Dr) in front of my family name. For all difficulties I conquered. For all help I have received.

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clearly one day after a discussion with her about a project I wanted to do, she said, “Haijing, you’ve progressed this much” (I paraphrase) while she stretched her arms, showing me how much. With her help, I made it. Thank you so much, Dr. Cionea!

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Abstract

Using psychological reactance theory (PRT; Brehm, 1966) as an explanatory framework, this dissertation experimentally tested the effects of combining controlling language, fear appeals, and disgust appeals on responses to messages advocating COVID-19 vaccination. Measured responses included psychological reactance, source derogation, message attitudes, and COVID-19 vaccination intentions. Pilot study 1 (N = 240) was conducted to examine individual components (i.e., controlling language, fear appeals, disgust appeals) within the treatment messages and images. Pilot study 2 (N = 497) tested thirty-two treatment messages and selected sixteen to be used in the main study.

A main study was then conducted to examine message responses. Participants (N = 447) were randomly assigned to one of eight conditions, crossing controlling language (high vs. low), fear appeals (high vs. low), and disgust appeals (high vs. low). In each condition, participants were presented with two message variations (counterbalanced) showing the consequences of COVID-19 infection and encouraging them to get vaccinated. After each message, participants were asked to respond to a battery of measures. Individual differences in trait reactance and disgust sensitivity were also measured prior to message exposure.

Results showed when messages contained either high levels of controlling language, high fear, or high disgust appeals, message responses suffered—participants reported more source derogation and fewer favorable message attitudes, compared to messages containing either low levels of controlling language, low fear, or low disgust appeals. No significant 3-way interaction among controlling language, fear, and disgust appeals was found. However, the 2-way interaction between fear and disgust appeals in the low controlling language condition was significant—participants reported significantly less source derogation and more favorable

message attitudes in the low controlling language, low fear, and low disgust appeals condition. Perceptions of freedom threat and reactance mediated the relationships between attribute-based message manipulations and source derogation, message attitudes, and vaccination intentions. Individual differences in trait reactance were positively associated with perceptions of freedom threat and reactance, but were negatively associated with source credibility, favorable message attitudes, and COVID-19 vaccination intentions. Individual differences in disgust sensitivity had no significant influence on message responses.

The ramifications of these findings for enriching fear and disgust literature from a reactance perspective and encouraging COVID-19 vaccination as well as vaccinations against other viruses are noteworthy. Findings, limitations, and implications of the research are discussed.

Keywords: COVID-19 vaccination, freedom threat, psychological reactance, message attitudes, source derogation

Chapter I Introduction

It has been over half a century since the debut of psychological reactance theory (PRT; Brehm, 1966; Brehm & Brehm, 1981). As PRT states, individuals tend to see themselves as self-determined and autonomous, having the freedom to act for themselves and affect their surroundings. Perceived threats to autonomy are motivationally arousing, prompting individuals to make efforts to restore threatened freedoms and/or prevent any potential future freedom loss (Brehm, 1966; Rains & Turner, 2007). Motivational arousal to regain restricted freedoms is defined as psychological reactance; individuals may respond defensively to restore threatened freedoms, such as rejecting the influence attempt, derogating the influence source, negatively evaluating the advocated behavior, or even engaging in the forbidden behavior (Brehm & Brehm, 1981).

Psychological reactance has been used to account for the failure of many communication attempts across diverse contexts, such as consumer behavior (Clee & Wicklund, 1980; Wang et al., 2019), health promotion (Wong et al., 2015; Shorey-Fennell & Magnan, 2019), education and learning (Amini et al., 2019; Bahari, 2019), and clinical communication (Finkelstein et al., 2020). One of the widely studied areas of psychological reactance is health communication. In communicating health issues and influencing personal health choices, effective message design forms an essential basis for successful outcomes (Noar, 2006). The arousal of reactance may potentially sabotage the effectiveness of health messages. Therefore, in the interest of communicating health risks and improving health outcomes, it is particularly important to acquire a comprehensive understanding of reactance-inducing message features and avoid triggering reactance. This dissertation examined psychological reactance relating to controlling

language, fear, and disgust appeals as they influence responses to COVID-19 vaccination messages.

In message design, an extensively investigated area in terms of reactance induction is controlling language, or the use of clear, explicit, demanding words to force or pressure information receivers to take on certain recommended attitudes or actions (Quick & Stephenson, 2007; Clayton et al., 2020). Numerous studies have shown how controlling language tends to be seen as freedom threatening, triggering reactance due to its clear intent to influence, and the pressure it imposes on individuals to adopt behavioral options they might not otherwise freely choose (Miller et al., 2007; Spelt et al., 2019). As a result of reactance arousal, controlling language often leads to unfavorable and counterproductive message responses (Clayton et al., 2020; LaVoil et al., 2017).

However, studies have also shown controlling language benefits persuasion. For instance, high controlling language has been found to enhance persuasion (Burgoon et al., 1975) and produce positive behavioral change (Buller et al., 2000). Directly relevant for this dissertation, Shen (2015) asserted that controlling language is highly desired for public service announcements (PSAs) that are typically communicated in a mass-mediated context, with a need for efficiency and clarity. The unambiguous and directive nature of high controlling language leaves little room for alternative interpretations (Grice, 1975). Ambiguity can be particularly costly, even fatal in such situations. However, a consensus has not been reached regarding the specific conditions under which explicit, high controlling language should be used. Descriptions of dire ramifications of deadly events may provide such a condition to justify using high controlling language (Bessarabova & Massey, 2020).

Fear appeals are an often-used technique in persuading people to reduce unhealthy, risky behaviors. They are messages that aim to elicit fear and scare people by describing potential harms they will suffer if they do not follow what the message recommends (Dillard, 1994; Maddux & Rogers, 1983; Witte, 1992). Fear, from an evolutionary perspective, motivates self-protective actions (Cosmides & Tooby, 2000). Several meta-analyses have demonstrated that fear appeals promote healthy behaviors (Tannenbaum et al., 2015; Witte & Allen, 2000). However, studies have also shown fear appeals may provoke unfavorable consequences, including psychological reactance, which, in turn, decreases persuasion (Peng et al., 2020; Quick et al., 2018; Shen, 2011), although research in this area is scarce.

In addition to frightening content, many health issues involve conditions that are potentially disgust-eliciting. In fact, to reinforce the potency of dread, anxiety, and trepidation, it is not uncommon for fear appeals to include repulsive or even nauseating content that stimulates disgust (Hovland et al., 1953; Leshner et al., 2009; Nabi, 1998). Despite the widespread inclusion of disgust-inducing content in fear appeals, the effect of disgust content on message responses has only recently been studied independently from fear appeals. These studies, however, have revealed inconsistent findings. For instance, Halkjelsvik and Rise (2015) found high vs. moderate levels of disgust content to have no significant influence on negative attitudes toward smoking and motivations to refrain from smoking. However, Morales et al. (2012) showed, advertisements with disgust-eliciting content were more persuasive than those with no disgust-eliciting content in terms of advertisement attitudes and behavioral intentions. Moreover, fear appeals were found to be reactance-arousing (Shen, 2011). Therefore, the inclusion of disgust-inducing content as an essential component in fear appeals suggests the possibility that fear alone may not fully account for the arousal of reactance in fear appeals, and disgust may

also, at times, play a part. So far, only limited research has examined reactance arousal concerning disgust or how it may affect message responses in conjunction with fear (Hall et al., 2018; Yang, 2017).

Numerous psychological reactance studies have evidenced the freedom-threatening and reactance-inducing effects of controlling language (Frey et al., 2021; Miller et al., 2007). However, whether and how fear and disgust appeals might also be reactance-inducing and thus undermine persuasion has not received much inquiry, though they are widely used strategies in communicating health problems. To this end, the current study focuses on understanding reactance arousal and responses to messages using controlling language and including fear and disgust content in the context of advocating for COVID -19 vaccination.

As the present research is underway, the world is experiencing a global pandemic caused by the severe acute respiratory syndrome coronavirus 2 (*SARS-CoV-2*). To date (2021, May 4), the coronavirus disease (COVID-19) has spread to more than 210 countries and territories worldwide since the first reported case on December 31, 2019. Thousands of cases continue to be reported daily throughout the world, with the United States, India, and Brazil suffering the most casualties. According to the Johns Hopkins Coronavirus Resource Center (JHCRC, 2021), since December 31, 2019, there have been more than 153,783,000 confirmed cases and over 3,217,000 reported deaths around the globe (United States: more than 32,497,000 confirmed cases and 578,000 deaths, respectively) by the end of May 4, 2021, with the numbers increasing by thousands daily.

Though not all cases are life-threatening, a recent study found COVID-19 can have long-term influences on heart health such that patients may suffer from coronary damage even after recovery (Puntmann et al., 2020). Even worse, on a House Select Subcommittee hearing, Dr.

Anthony Fauci, White House coronavirus advisor, warned the virus is so contagious that it will likely not ever disappear completely (Lovelace & Kim, 2020). To effectively reduce the transmission of the virus and infection, the Centers for Disease Control and Prevention (CDC) suggests several physical measures to protect oneself from infection, such as avoiding close contact, wearing masks, and vaccination.

However, effective measures may not be applied uniformly, especially as states and businesses reopen, and there is no guarantee the CDC's guidelines will always be followed. For instance, on January 3, 2021, a group of people took over a mall in Los Angeles, protesting against mask-wearing (Gillespie, 2021). In such a situation, everyone has a chance of being infected through close contact with others who may be infected but asymptomatic, unaware, and thus untreated. In fact, as many as 40% of those infected are asymptomatic (Crespo & Azad, 2020; Woodyatt, 2020), which dramatically increases the chances of infection.

To complicate things further, several variants of the virus (e.g., British variants, Brazil variants, and South Africa variants), with greater contagiousness and higher severity, have already been found in the U.S. and many other countries (Doucleff, 2021; McLean & Davey-Attlee, 2021; Roberts, 2021). In light of the situation, getting vaccinated should be the best option for effectively reducing infection, permanent damage, and death, given that the vaccines offer up to 95% protection (Chatelain, 2020; Cohen, 2020). The first COVID-19 vaccine came out on December 12, 2020, and was only available for emergency use with front-line workers and high-risk populations (Johns Hopkins Medicine, 2021). The vaccines are expected to be made widely available to the overwhelming majority of the population by the second quarter of 2021 (Fox, 2020). Once vaccinated, people should be significantly protected from being infected with the virus.

Despite the great benefit of vaccination, the public's willingness to get vaccinated remains low. Polling data indicate a global hesitancy to the COVID-19 vaccination (Reynolds, 2020). In the U.S., several national polls show social resistance to COVID-19 vaccination. According to the Associated Press NORC Center for Public Affairs Research, though many Americans expect vaccines targeting the SARS-CoV-2 virus to be available in 2021, less than 70% reported a willingness to get vaccinated (Stobbe & Fingerhut, 2021). A Pew Research Center poll showed, 21% of U.S. adults said they would not get vaccinated, and 39% claimed they were highly unlikely to seek the vaccine (Funk & Tyson, 2020). According to a new CDC study, in December 2020, only half of the adults in the U.S. claimed they would like to get vaccinated, which is still below the threshold (70%-85%) to effectively contain the virus (Berkeley, 2021). Even worse, many front-line workers have rejected getting the COVID-19 vaccine (Madani, 2020). Should the trend bear out, the pandemic is unlikely to be effectively controlled. Therefore, well-crafted messages to communicate the urgent need for COVID-19 vaccination are needed.

The case for promoting COVID-19 vaccination also provides a great context for examining the effect of controlling language, fear, and disgust appeals on reactance and message responses for the following considerations. First, adding to the challenge of promoting COVID-19 vaccination is the fact that widespread public skepticism toward vaccines casts doubts upon the scientific evidence supporting the safety of vaccination. Because of this, one might expect that clear, directive language should work to nudge people to take action since explicit language leaves no room for alternative interpretations (Grice, 1975) that are favored by anti-vaxxers or those who are hesitant in getting vaccinated. However, as mentioned above, direct, explicit language may be seen as freedom threatening, resulting in reactance and, consequently,

defensive message responses, such as source derogation, negative attitudes toward the message, and decreased intentions toward vaccination. Thus, there is a need to explore the condition under which controlling language is justified and its effectiveness is maximized in promoting COVID-19 vaccination.

Second, though the virus is extremely harmful to some people, causing enduring lung, kidney, heart damage, and even death (Puntmann et al., 2020), it may be utterly harmless for others who can survive the infection without any appreciable symptoms. In such a situation, frightening people who see themselves impervious to the virus while highlighting the dreaded outcomes of infection would seem to be manipulative and make persuasive intentions obvious, thereby leading to the potential for freedom threat and the elicitation of reactance (Brehm, 1966). However, as per the extended parallel process model (EPPM; Witte, 1994), COVID-19 vaccination messages will not motivate vaccination if people do not perceive the threat to be severe for themselves and their likelihood to be infected to be high. Therefore, exploring the appropriate levels of risk to be included in COVID-19 messages and the optimal level of fear arousal ideal for motivating COVID-19 vaccination is vital.

Additionally, attitudes about and decision-making regarding vaccination are associated with revulsion and disgust. On the one hand, disgust toward illness and pathogens encourages vaccination intentions (Curtis, 2011); on the other hand, disagreement with medical experts on the acceptability of vaccination epitomizes “purity” relevant attitudes driven by disgust responses meant to protect individuals from contamination (Clifford & Wendell, 2016). Therefore, it is uncertain whether and how disgust content included or implicated in fear appeals influences responses to COVID-19 vaccination advocacy.

This dissertation seeks to contribute to current literature on psychological reactance as it may apply to vaccination uptake in several ways. Despite numerous studies on fear appeals, few have looked at the effect of fear appeals from a reactance perspective. Only recently scholarship in this area has begun to notice the reactance-inducing effects of fear appeals. The current study explores the role reactance may play in the effectiveness of fear appeals on persuasion. Additionally, though disgust content has been an auxiliary component of fear appeals in communicating health problems, how it may influence message responses independent from, and in conjunction with fear appeals has been understudied. Understanding the role disgust content plays provides practical insights for effective message design to increase persuasion. Therefore, this dissertation also examines the influence of disgust appeals on persuasion, and how reactance may play a role in this process. By doing so, the findings reported here may provide empirical evidence concerning the relationship between fear, disgust, and reactance, along with practical implications for strategically designing persuasive messages to effectively motivate people to seek COVID-19 vaccination, an extremely important area for the sake of lives around the globe. Study findings may have broader impacts on promoting vaccination against other diseases, such as flu and HPV viruses (see Discussion).

In the following sections, Chapter II describes the theoretical framework of this dissertation; Chapter III reviews literature relating to controlling language, fear appeals, disgust appeals, and psychological reactance, and proposes research questions and hypotheses; Chapter IV presents the Method section in which two pilot studies and an experiment are described; and Chapter V summarizes study findings, discusses limitations, and provides implications for future research and practical message design.

Chapter II Psychology Reactance Theory

Built on the notion that individuals value their freedom to choose and make their own decisions while possessing a set of free behaviors they feel they can engage in, Brehm (1966) proposed psychological reactance theory (PRT), positing that when one's freedom is eliminated or threatened with elimination, individuals will be motivated to reestablish their freedom. Brehm (1966) notes, although freedom is not always desired, its loss is motivationally arousing; therefore, psychological reactance is defined as a motivational state that drives individuals to reestablish perceived freedoms that have been threatened and/or eliminated by constraints imposed on them from the social environment. Four elements are fundamental to PRT—perceived freedoms, threats to those freedoms, arousal of reactance, and restoration of threatened freedoms (Brehm & Brehm, 1981).

According to PRT, individuals tend to see themselves as independent and autonomous, having the freedom to decide for themselves. Freedom, in this theory, is not an abstract notion. Instead, it needs to be concrete and individuals must have knowledge of it. In other words, for psychological reactance to be aroused, individuals must perceive that they have the freedom to begin with, and they are able to engage in the freedom at the moment or sometime in the near future (Miron & Brehm, 2006). For instance, if one was told not to eat unhealthy food, they should be motivationally aroused and become reactant since they tend to perceive they have the freedom to decide what to eat; the limit put on their food choice threatens their freedom to choose. However, if one was told not to walk on the moon, as per PRT, they should not become reactant since they are more likely to be aware they cannot walk on the moon. Therefore, they do not have the freedom to walk on the moon in the first place; putting a limit on it thus does not constitute a threat.

A perception of a threat to freedom is the prerequisite of psychological reactance (Dillard & Shen, 2005). Any behavior that threatens established freedom or indicates the possibility of a loss of that freedom can be seen as a threat capable of generating reactance. Of note, even well-intended communication for the sake of the interests of the information receiver may be seen as freedom threatening if the intention to influence is perceived (Miller et al., 2007). As soon as a threat to perceived freedom is posed or indicated, individuals should become reactant, and thus motivationally aroused to reestablish threatened freedoms (Rains & Turner, 2007).

Reactance Responses

To restore freedoms, individuals may move away from the recommended position, which is also called boomerang effects (Worchel & Brehm, 1970; also see Bessarabova et al., 2013). Besides, several other types of defensive responses result from reactance arousal, such as source derogation, unfavorable attitudes, and decreased intentions to perform advocated behaviors. The current research focused on the later three outcomes as a result of reactance arousal.

Source Derogation

Source derogation results when the hostility or aggression is expressed toward a threatening agent that is perceived to be limiting one's choices (Brehm, 1966; Worchel & Brehm, 1970), especially when the source is perceived as deliberately intending to do so. Studies examining the reestablishment of freedom following explicit, controlling, reactance-inducing messages have found derogating the threatening source is a typical response (Burgoon et al., 2002; Grandpre et al., 2003; Miller et al., 2007). For example, LaVoie et al. (2017) investigated the effect of graphic anti-smoking warning labels. They found graphic warning labels led to freedom threat perceptions and reactance, which, in turn, increased perceptions of source domineering that indicated interpersonal control. In another study, Miller and colleagues (2007)

showed high controlling language led to more negative evaluations of message sources due to reactance arousal. More importantly, source derogation may often have long-term effects on ongoing communication, not only harming responses to the original influence attempt but also diminishing the effectiveness of future attempts (Miller et al., 2007).

Unfavorable Attitudes

Reactance arousal can also elicit unfavorable appraisals toward the stimuli. Miller's (1976) study examined the effects of mere exposure on psychological reactance, including attitude and behavior change as dependent measures specifying reactant outcomes, and numerous studies since have focused more specifically on the effects of psychological reactance on attitude change. Examining attitude change in response to freedom-threatening messages, researchers have found reactance to increase unfavorable attitudes towards the source, topic, and positions advocated in persuasive health messages (Grandpre et al., 2003; Miller et al., 2007; Richards et al., 2020). For instance, Cho and Sands (2011) showed negative cognitions following exposure to loss-framed sun safety messages resulted in fewer favorable attitudes toward relevant coping behaviors such as wearing long sleeves and using sunscreen. Relatedly, Dillard and Shen (2005) demonstrated how reactance in response to health messages can lead to significantly fewer favorable attitudes toward advocated behaviors. In a more recent study, Dillard and colleagues (2018) showed exposure to anti-sugar-sweetened-beverage messages produced reactance, leading to more unfavorable message attitudes.

Decreased Behavioral Intentions to Comply

Due to the difficulty of examining behavior change in responses to persuasive messages, many studies have looked at behavioral intentions as a proxy of behavior change, which is also the case of the current study. Psychological reactance has been found to link to lower intentions

to follow recommendations. For instance, Bensley and Hu (1991) examined the effect of dogmatic (high freedom threat) vs. neutral (low freedom threat) alcohol prevention messages on alcohol consumption. They found that dogmatic messages were evaluated more negatively, and participants reported lower intentions to quit drinking than neutral messages. Along similar lines, Kavvouris et al. (2020) showed that pro-environmental normative appeals negatively predicted electronic recycling intentions; the relationship was mediated by psychological reactance indexed by perceived freedom threat and counterarguing. Sittenthaler et al. (2015) demonstrated that freedom-threatening messages produced reactance which, in turn, increased the behavioral intentions to go against those messages.

In general, PRT proposes that when individuals perceive their freedom to choose is eliminated or threatened with elimination or implied to be eliminated, they will be motivationally aroused and promoted to restore the threatened freedom. It is not necessarily the behavior itself that is threatened, but, instead, the choice one has to decide whether they want to engage in it freely. Therefore, when it is threatened, the freedom to make a choice, but not necessarily a chance to engage in a specific behavior, must be reestablished (Miller et al., 2020).

In the case of COVID-19 vaccination, if messages advocating for vaccination are perceived as freedom threatening, people should become reactant. As a result, as reactance increases, as a strategy to reestablish their freedom to decide for themselves to get vaccinated or not, people are more likely to derogate the message source, show more unfavorable attitudes toward the message, and report lower intentions to get a COVID-19 vaccine.

Psychological Reactance Measurement

Initially, Brehm (1966) claimed that reactance, as a psychological state (i.e., state reactance), may not be directly measurable. However, later studies showed it could be measured,

and several scales have been developed to measure psychological reactance. For example, the Questionnaire for Measuring Psychological Reactance (QMPR; Merz, 1983), the Therapeutic Reactance Scale (TRS; Dowd et al., 1991), and the scale developed from the Intertwined Model of Psychological Reactance (Dillard & Shen, 2005) have all been used to assess state reactance. Among them, Dillard and Shen's (2005) conceptualization and measure of reactance has been primarily employed in reactance literature and health communication.

Dillard and Shen's (2005) two experiments examining the nature of reactance in two health contexts (flossing and binge drinking) compared four models of reactance measurement: a single process cognitive model, wherein reactance is assumed to be a purely cognitive phenomenon; a single process affective model, wherein reactance is considered to be equivalent to anger; a dual process cognitive-affective model, wherein reactance is operationalized as thoughts and emotions that can be differentiated; and an intertwined, cognitive-affective process model, wherein thoughts and emotions are closely interwoven and seen as indicators of the underlying phenomenon of reactance. Data from these experiments supported the intertwined process cognitive-affective model, concluding psychological reactance is "best understood as an intermingling of negative cognition and anger" (Dillard & Shen, 2005, p. 160). Later work further validated this conceptualization and measurement of state reactance (e.g., Rains & Turner, 2007; Shen, 2011).

In line with Dillard and Shen's (2005) conceptualization and some recent studies (Miller et al., 2007; Rains & Turner, 2007; Shen, 2011), psychological reactance in this dissertation is operationalized as the affective and cognitive responses individuals have responding to a persuasive or social influence attempt, the source of the attempt, and action that is seen as limiting or threatening their freedom. Of note, the perception of freedom threat is a prerequisite

of reactance, but it is not reactance (Dillard & Shen, 2005). Therefore, in this dissertation, three related constructs are included in measuring psychological reactance: perceptions of freedom threat, anger, and negative cognitions.

Trait Reactance

In the beginning, when the theory was put forth, Brehm described reactance as a psychological state (namely, state reactance) in response to social influence attempts, though Brehm realized people are likely to differ in how they individually respond to freedom-threatening stimuli (Brehm, 1966). In their later refinement of the theory, Brehm and Brehm (1981) proposed psychological reactance could be theorized as an individual difference variable (i.e., trait reactance) since individuals can be expected to vary in the extent to which they desire autonomy (Wicklund, 1974), or in their sensitivity to perceive freedom threats (Miller, 2015; Miller et al., 2020). Later research has provided evidence confirming reactance as a personality trait (Donnell et al., 2001; Hong & Faedda, 1996). Generally, relative to those low on trait reactance, individuals high on trait reactance have a stronger need for autonomy and independence and demonstrate greater resistance to regulations and rules (Seibel & Dowd, 2001). As Quick et al. (2013) put it, individuals high in trait reactance tend to be "autonomous, independent, nonconformist, self-determined, and somewhat rebellious" (p. 173). As such, they are more likely to engage in defiant behaviors and resist persuasive attempts (Dowd et al., 1994).

As it relates to responses to persuasive messages, trait reactance has negatively influenced message responses. For example, compared to low trait-reactant individuals, high trait-reactant ones were found to be more likely to report greater freedom threat perceptions upon exposure to health messages promoting safe sex (Richards & Larsen, 2017), advocate against cigarette smoking, and respond with higher levels of anger and perceived source

domineeringness (LaVoie et al., 2017). Besides, high trait-reactant adolescents and emerging adults were more likely to smoke tobacco and engage in unprotected sex than low trait-reactant ones (Miller & Quick, 2010). Presumably, it is expected that people high on trait reactance are more likely to become reactant upon exposure to messages advocating for COVID-19 vaccination as they put a higher value on their freedom regarding vaccination decision making than those low on trait reactance. As a result, they are more likely to become reactant and defensive to such messages.

To sum up, individuals value their freedom to make choices independently and be motivationally aroused to regain perceived freedom should it be eliminated or threatened with elimination (Brehm, 1966). Individuals can reestablish their limited freedom through any combination of rejecting the message, performing the prohibited behavior, derogating the information source, or showing unfavorable attitudes towards the influence attempts or the focal object, among others (Dillard & Shen, 2005; Ma & Miller, 2020; Miller et al., 2020). As a personality trait, high reactant individuals value their autonomy and perceived freedoms more so than do those who are less reactant. Thus, they tend to be more defensive in responding to freedom-threatening influence attempts.

In the following section, PRT is used as a theoretical framework for examining the influences of several relevant cognitive and emotion-based message features associated with COVID-19 vaccination promotion.

Chapter III Controlling Language, Fear and Disgust Appeals, and Psychological Reactance

Reactance theory is widely used to explain the ineffectiveness of certain kinds of influence attempts, such as the failure of health communication campaigns where health promotion or disease prevention messages are crafted to persuade the public to change their attitudes or behaviors. In this chapter, how controlling language, fear, and disgust appeals may influence message responses is reviewed, along with how psychological reactance may play a role in the process. Hypotheses and research questions are then proposed.

Controlling Language and Psychological Reactance

Reactance-inducing message features have long been a focus in reactance research. A plethora of studies have examined the effect of rhetorical strategies on reactance, including controlling language (Clayton et al., 2020; Miller et al., 2007), gain/loss message frame (Cho & Sands, 2011; Quick & Bates, 2010; Reinhart et al., 2007), and vivid images (Quick & Stephenson, 2008). In keeping with the original proposition that reactance will be elicited in freedom-threatening communication, controlling language has been extensively studied (Clayton et al., 2020; Miller et al., 2007).

Controlling language, also referred to as dogmatic (Quick & Stephenson, 2008), explicit (Grandpre et al., 2003), intense (Buller et al., 1998), forceful (Quick & Considine, 2008), and threat-to-choice language (Quick & Stephenson, 2007), resembles Brehm's (1966) experimental manipulations that elevated perceptions of threats to established freedoms. In this dissertation, the term controlling language will be used throughout. High controlling language is characterized by the use of imperatives to pressure receivers to comply with a message and take recommended actions (Staunton et al., 2020). High controlling language uses forceful words, such as "must," "have to," and "should." In contrast, low controlling language is less forceful

and makes the source's intention less obvious (Miller et al., 2007). Low controlling language often uses qualifiers such as "maybe," "consider," and "perhaps." Also referred to as autonomy-supportive language (Deci & Ryan, 1987; Vansteenkiste et al., 2006), low controlling language stresses self-initiation, free choice, and is open to manifold interpretations.

The intensity of language influences how individuals respond to a message (O'Keefe, 1997). Explicit, controlling language is a direct speech act (Searle, 1975) and indicates a sense of control and dependence (Lanceley, 1985). Though explicit language is appreciated for its plainness, clarity, and straightforwardness at times, it tends to be perceived as freedom-threatening by its nature due to its obvious intention to influence receivers (Miller et al., 2007; Miller, 2015). Moreover, social influence, persuasion, and public health communication often target individuals with whom the source has no close relationship. In these instances, as per politeness theory (Brown & Levinson, 1987), controlling language indicates threats to receivers' negative face (i.e., fundamental personal rights such as personal freedom, freedom of action) by threatening individuals' need for self-determination and autonomy (Jenkins & Dragojevic, 2013). Therefore, messages using direct, explicit, demanding language are likely to induce reactance due to their inherent freedom-threatening nature (Reynolds-Tylus, 2019). As Walster and Festinger (1962) state, when individuals realize an influencing agent's intent to persuade, they are inclined to become defensive and less persuadable, even if an influencing agent offers information that is in the interest of the receivers—which is the case of public service announcements—merely perceiving the attempt at persuasion often threatens receivers' freedom (Miller et al., 2007).

Over the years, communication research has reported reactance-inducing outcomes of using controlling language. Bensley and Wu (1991) conducted a seminal study on controlling

language and reactance, examining participants' responses to anti-drinking messages featuring high vs. low threatening language, and found, messages with high threatening language elicited more reactance than those with low threatening language. In a later study, Dillard et al. (1996) found that language dominance caused anger. Grandpre et al. (2003) revealed that participants exposed to explicit anti-smoking messages reported more negative ratings of the messages and the message source, a lower likelihood to comply, and a higher likelihood to smoke to regain their freedom threatened by the overtly persuasive messages. Along similar lines, Miller et al. (2007) looked at the influences of high and low controlling language on messages encouraging exercise and physical activity among college students. They found high controlling language generated more psychological reactance, more unfavorable assessment of the message topic, and lower evaluations of the source credibility. In a vaccination-related study, Tian (2019) noted that participants exposed to high choice-restriction messages (e.g., participants must get a flu shot) reported significantly greater freedom threat, more anger, and counterarguing than those exposed to low choice-restriction messages (e.g., it was suggested to participants to get a flu shot). In the context of vaccination, even partial compulsory vaccination messages—where the public is encouraged to get vaccinated for certain types of disease, but not all—have been found to induce reactance, and therefore decrease vaccination uptake. Moreover, Kim et al. (2017) suggested that high controlling messages may produce more adverse outcomes than merely rejecting the persuasive messages—individuals may act in a way opposite to what is advocated since taking action offers a more vigorous way to restore threatened freedom. Given its freedom-threatening and reactance-inducing feature, controlling language has been found to negatively influence message responses and persuasiveness across diverse contexts such as condom use (Quick &

Stephenson, 2007), physical activity (Miller et al., 2007; Quick & Considine, 2008), and anti-drugs (Clayton et al., 2020; Rains & Turner, 2007).

The freedom-threatening nature of controlling language can also be explained from the perspective of self-determination theory (SDT; Deci & Ryan, 2000). Studies conducted under the framework of SDT compared autonomy-supportive and controlling contexts in promoting adaptive outcomes (Deci et al., 1994). Autonomy supportive contexts maintain individuals' perspectives, allowing self-initiation and free choice while refraining from using pressure to motivate adaptive behavior, whereas controlling contexts pressure individuals to think and act in particular ways (Vansteenkiste et al., 2006). Overtly controlling language (e.g., using "must," "have to," and "ought") may create a type of controlling context in which individuals may feel pressure to behave in a certain way by regulations. SDT posits that the more autonomy-supportive the context, the more it enhances intrinsic motivation since autonomy-supportive contexts satisfy individuals' basic psychological needs for autonomy and choice, promoting adaptive outcomes, and vice versa for controlling contexts (Vansteenkiste et al., 2006). Moreover, supporting individuals' autonomy is important for encouraging receivers to identify with behavioral regulations and seek adaptive outcomes. In contrast, when forceful tactics such as controlling language are used, individuals become less inclined to internalize adaptive outcomes (Vansteenkiste et al., 2006). For instance, Vansteenkiste et al., 2004; Study 1) compared learning a reading activity under autonomy-supportive instruction and language (e.g., "we suggest that you" and "you can") and controlling instruction and language (e.g., "you should" and "you have to"). They found students in the autonomy-supportive condition showed enhanced deep processing, better test performance, and greater persistence than those in the controlling condition.

In sum, high controlling language ordering or mandating specific attitudes or behaviors should threaten individuals' freedom and trigger psychological reactance. This is especially the case for individualistic cultures such as the United States (U.S.), where independence and freedom are highly valued principles (Hofstede, 2011) and where the participants in this study reside. Therefore, in line with extant studies, it is expected that the more controlling a persuasive message is, the higher the likelihood freedom threat will be perceived and reactance aroused, which then will lead to a series of defensive responses.

Within the context of COVID-19 vaccination, high controlling language demanding people to get vaccinated (e.g., "You REALLY have ONLY ONE alternative: GET VACCINATED!") should be seen as more freedom threatening compared to low controlling language, assuring people's freedom to choose to get vaccinated or not (e.g., "You have an OPTION of CHOOSING TO BE VACCINATED."). As predicted by PRT, individuals should become motivationally aroused and reactant. As a result, reactance arousal should decrease the effectiveness of high controlling language in the form of negative appraisals of the message source, fewer favorable message attitudes, and decreased intentions to get COVID-19 vaccination. This reasoning forms the basis for the following hypotheses:

H1: Relative to messages with low controlling language, messages with high controlling language induce a) more freedom threat perceptions and greater psychological reactance in the form of b) increased anger, and c) more negative cognitions toward the message.

H2: Relative to messages with low controlling language, messages with high controlling language lead to a) more source derogation, b) fewer favorable message attitudes, and c) lower COVID-19 vaccination intentions.

Persuasion often increases by drawing receivers into an emotional state (Joffe, 2008). As the "risk-as-feelings" hypothesis posits, emotional responses are often a strong predictor of in-the-moment decision-making (Loewenstein et al., 2001). Evans et al. (2017) similarly suggest that effective warnings should be those that are emotionally evocative. Noar et al.'s (2020) meta-analysis on health warning labels also provides confirmatory evidence to this end: The influences of health warning labels on facilitating health behavior uptake come from eliciting immediate emotional reactions. Therefore, to increase compliance, many health messages are designed to be emotionally arousing. One such emotion is fear.

Fear is a "negatively-valenced emotion accompanied by a high level of arousal and is elicited by a threat that is perceived to be significant and personally relevant" (Witte, 1992, p. 31). This definition formulates fear and threat as two separate constructs but that are linked. Specifically, a threat represents an external, environmental feature warning individuals of negative consequences, whereas fear represents an internal state, namely, a negative emotion intervening between threatening messages and message responses (Hovland et al., 1953; Mongeau, 2013). In promoting behavior change, many health messages describe threats, intending to induce fear; such messages are named fear appeals (Witte, 1992; Mongeau, 2013). In other words, fear appeals are messages describing the potential harms people will suffer from not following what the messages recommend, aiming to elicit fear in message recipients (Dillard, 1996; Maddux & Rogers, 1983; Witte, 1992). However, this definition brings confusion.

As O'Keefe (2003) notes, there are two ways to define a message variable: the message's intrinsic features or the observed effects on message receivers. Fear appeals can be defined as messages including certain types of content (e.g., the portrayal of negative consequences of performing risky behaviors) or whatever messages eliciting fear in message receivers. In the first

definition, fear appeals are defined by objective message attributes that are independent of message recipients' perceptions, whereas in the second one, fear appeals are defined by message responses in recipients. These two definitions do not necessarily correspond and the distinction can be consequential (O'Keefe, 2003, 2015; Tao & Bucy, 2007). For instance, a message that includes negative content showing potential health harms may not trigger fear in message receivers. However, a message may elicit fear in message receivers without presenting the harm content. In many fear appeal research studies, fear messages were manipulated by varying certain types of harm content and assuming fear was aroused (Tannenbaum et al., 2015). Therefore, some researchers claim a better way to define classic fear messages may be threat appeals, since these messages may or may not produce fear, and they are more of a message attribute than the effect they aroused in message recipients (Leshner et al., 2009).

O'Keefe (2003) also recommends feature-based definitions for, most importantly, they can provide direct insights on the construction of persuasive messages, as he notes, "when message variables are defined in terms of effects rather than intrinsic properties, researchers forfeit the ability to speak to questions of the relationship between message properties and persuasive outcomes" (p. 268). Therefore, the current study defined fear appeals on their intrinsic message attributes (instead of their effects), but still used the term fear appeal (instead of threat appeal) to align with the literature. In other words, a fear appeal is a fear appeal because it has the content needed to generate the appraisal of fear (e.g., describing dire health consequences) and perceived coping, instead of message recipients' psychological state after seeing it—i.e., feeling fearful. High fear appeals are messages of high levels of fear-arousing stimuli in some form of increased threat, which may or may not generate high subjective fear in recipients. Low fear appeals are messages including low levels of fear-arousing stimuli in the form of relatively

decreased threats, which may or may not necessarily generate low subjective fear in recipients. Moreover, going beyond the effects of message attributes, the current study will also examine how actual self-reported feelings of fear upon message exposure may influence message responses since, as stated above, emotional arousal is a strong driver of action (Loewenstein et al., 2001). In other words, both attributes-based fear appeals and the psychological state reported by participants following fear appeal exposure will be examined as they relate to message effects, thereby providing greater explanatory power than when only one aspect is examined (Tao & Bucy, 2007).

Fear Appeals and Psychological Reactance

Research on fear originally conceptualized it as a drive state, encouraging adaptive actions to alleviate the uncomfortable state (Hovaland et al., 1953). Later work established the parallel processing of fear (Leventhal, 1970; Rogers, 1975; Witte, 1992) and separated motivational from cognitive aspects in fear appeal processing. According to the EPPM (Witte, 1994), one of the most frequently applied theoretical frameworks for examining fear appeals, a fear appeal should contain two components: threat and efficacy. Threat appraisal deals with evaluating threat severity (i.e., seriousness) and individuals' susceptibility to it (i.e., vulnerability), whereas efficacy appraisal includes assessing response efficacy (i.e., whether message recommendations are thought to be effective in reducing the threat) and self-efficacy (i.e., whether individuals perceive themselves as capable of implementing those recommendations). Following this conceptualization, high fear appeals generally emphasize high severity and susceptibility, whereas low fear appeals are created by lowering severity and susceptibility, holding the efficacy component constant (Cho & Salmon, 2006; De Pelsmacker et al., 2011; Dillard & Anderson, 2004; Kim & Shin, 2018; Witte, 1991).

Inquiries on fear appeals have shown inconsistent findings on their effects on persuasion: Although some studies have found a quadratic relationship suggesting an intervened U-shape relationship between the intensity of fear appeals and attitude change with moderate fear appeals bring the most favorable attitude change (Hovland et al., 1953; Shen & Dillard, 2014), others favor a linear relationship between the intensity of fear appeals and message attitudes. Even in the camp favoring the linear relationship, research findings do not converge. For instance, Leventhal and Singer's (1966) work stipulated a linear relationship between fear appeals and message effectiveness such that stronger fear appeals led to perceptions of superior message effectiveness. A meta-analysis of almost 50 years of work on fear appeals found high fear appeals to be more persuasive than low fear appeals on the condition that efficacy is also high (Witte & Allen, 2000). A recent meta-analysis on fear appeals again confirmed high fear appeals featuring high severity and susceptibility (i.e., high threat) are more effective (Tannenbaum et al., 2015). Specifically, they found fear appeals positively influenced attitudes, intentions, and behaviors, and no circumstances were identified where fear appeals backfired and produced undesirable outcomes (Tannenbaum et al., 2015).

However, some other studies showed inconsistent findings. In an early study, Janis and Feshbach (1953) examined the effectiveness of fear appeals on dental hygiene by varying fear appeals at three levels—minimal, moderate, and strong. They found that although strong fear appeals led to more favorable attitudes than moderate and minimal fear appeals, they also produced more complaints of lack of sufficient information on tooth decay prevention relative to the other two appeals, even though sufficient efficacy information was provided in the study. Moreover, it was the minimal fear appeal that produced the greatest amount of conformity and the most resistance to counterpropaganda one week after message exposure. Therefore, the

authors concluded that strong fear appeals may often be less effective than minimal fear appeals. Some later meta-analyses supported Janis and Feshbach's (1953) conclusion. For instance, De Hoog et al.'s (2007) meta-analysis concludes "extremely 'fear-arousing' messages are no more effective than messages that simply state the negative consequences of a certain behavior" (p. 280).

In the context of COVID-19 vaccination, a high fear appeal can focus on severe health consequences due to COVID-19 infection that signals high severity and a high infection rate due to its contagious feature that suggests high susceptibility. In contrast, a low fear appeal can just show the minor to moderate outcomes of COVID-19 infection that imply low severity, such as cough, chest pain, and fatigue, putting no or less emphasis on its contagiousness to indicate relatively lower susceptibility than that of a high fear appeal. In fact, many who are infected recover, and compared to the most dreaded consequences, these minor to moderate outcomes are more common in those infected by the virus (CDC, 2020). Thus, differences regarding COVID-19 infection symptoms and consequences in reality render such a message variation reasonable.

As per the EPPM, when both threat and efficacy are high, messages should increase persuasion (Witte, 1994). However, given the seemingly inconsistent findings on the effects of high vs. low fear appeals on message responses (De Hoog et al., 2007; Tannenbaum et al., 2015), along with a lack of strong a priori reasons to support one possibility over the other, the following research question is offered:

RQ1: How do high vs. low attribute-based fear appeals influence message responses in the form of a) source derogation, b) message attitudes, and c) COVID-19 vaccination intentions?

Though the updated meta-analysis has shown the effectiveness of fear appeals in increasing persuasion (Tannenbaum et al., 2015), some recent research has noted the backfiring effect of fear appeals due to the arousal of reactance upon message exposure (Peng et al., 2020; Shen, 2011, 2017). For instance, Quick et al. (2018) examined the effect of fear appeals advocating against noise-induced hearing loss on reactance, message attitudes, and message minimization. They found that the feeling of fear upon fear appeal exposure positively predicted favorable message attitudes. However, fear also positively predicted freedom threat and reactance, which, in turn, led to message minimization and negatively predicted favorable message attitudes. Along similar lines, Shen and Coles (2015) confirmed, high fear threatened freedom and led to reactance. Specifically, they showed peak fear on fear appeal exposure significantly and positively predicted perceived manipulation and message derogation that was used to index reactance in their study. In a more recent study, Peng et al. (2020) examined the effect of fear-inducing messages on reactance and persuasion. They found that the feeling of fear was a direct, positive predictor of anger and message attitudes. However, anger negatively mediated the relationship between the feeling of fear and message attitudes. In their study, due to the lack of data on negative cognitions, a compromise was made where anger was used as a proxy of reactance under the condition that freedom threat predicted anger. Nevertheless, they did not directly examine the relationship between fear and freedom threat, a prerequisite of reactance arousal, as per PRT.

In another study, Shen (2011) examined the effect of anti-smoking public service announcements (PSAs) that contained fear content on reactance and persuasion. He found, fear arousal after PSA exposure led to freedom threat perceptions and activated reactance, which, in turn, undermined perceived message effectiveness. However, in a later study looking at the

curvilinear/linear relationship between fear and persuasion, inconsistent findings emerged. Shen (2017) found, from a between-subjects approach, peak fear after message exposure significantly predicted perceived message effectiveness but not perceived manipulation and defensive avoidance. From a within-subjects approach, however, the inverted-U shape quadratic trajectory of fear significantly influenced perceived manipulation and defensive avoidance. Ort and Fahr's (2018) study provided partial support for Shen's (2017) finding: They examined the influence of Ebola vaccination advocacy messages and found the feeling of fear after message exposure positively predicted favorable message attitudes, but it had no significant effect on perceived freedom threat.

These studies revealed four interesting findings. First, most of these studies have consistently demonstrated, aroused subjective fear after fear appeal exposure positively predicted freedom threat perceptions and reactance (Peng et al., 2020; Shen & Coles, 2015). Moreover, the effect of fear on message responses was mediated by reactance (and perceptions of freedom threat in some studies; Peng et al., 2020; Quick et al., 2018; Shen, 2011). However, they did not provide a solid rationale or theoretical mechanism about why fear or fear appeal exposure would be seen as freedom threatening and reactance-induing, except for general description (e.g., "It is reasonable to assume that fear-appeal messages can arouse freedom threat perceptions" in Quick et al., 2018, p. 388). Second, fear produced both maladaptive (e.g., perceived freedom threat, reactance, and message minimization) and adaptive responses (e.g., favorable message attitudes and perceived message effectiveness; Peng et al., 2020; Quick et al., 2018; Shen, 2017). The mainstream theorizations of fear appeals characterize fear control and danger control as distinct paths, and either one or the other occurs. However, these more recent studies suggest the possibility of the co-occurrence of both paths.

Third, reactance on fear appeal exposure has been found to undermine persuasion, but not entirely wash out the positive effects of fear appeals (Quick et al., 2018). In the updated meta-analysis on fear appeals that found positive effects of fear appeals on persuasion, nevertheless, Tannenbaum et al. (2015) did not examine the effect of fear appeals on reactance. Therefore, it could be that reactance was triggered, though not strong enough to overwhelmingly erase the positive effects of fear appeals, leaving those positive effects still to be found, somehow undermined. The majority of studies included in this meta-analysis primarily looked at the effect of fear appeals on outcome responses, whereas the more recent studies that found a positive effect of fear appeals on reactance focused on the predictive effect of aroused fear on fear appeal exposure. Nevertheless, Quick et al. (2018) showed both fear appeals (they called them "health threat appeals") and aroused fear positively related to freedom threat and reactance. Therefore, the effect of fear on reactance may remain undetected since the effects of subjective fear stemming from fear appeal exposure do not appear to have been fully examined by or well-understood within much of the past research, and, thus, not satisfactorily analyzed.

Fourth, subjective fear following fear appeal exposure is positively associated with favorable message responses (Peng et al., 2020; Quick et al., 2018). The positive relationship seems understandable because fear is a negative, uncomfortable emotion people strive to avoid or minimize (Witte, 1992). And, as per the EPPM, avoidance (i.e., fear control) is assumed to be an outcome of most fear appeal attempts unless a high efficacy component contained within the message is present to offer an efficacious way to reduce the threat (i.e., danger control), thereby decreasing the fear elicited by the threat, leading to message acceptance and positive outcomes.

In mainstream theorizations of fear appeals such as the parallel process model (Leventhal, 1970), protection motivation theory (Rogers, 1975), and the EPPM (Witte, 1994),

along with most of the research on fear appeals based on these models, measures of subjective fear are strikingly absent. Stated differently, none of these theoretical models and only limited research built on these models have examined the role of subjective fear in their hypothesized models, though they all aim to illustrate the mechanism of fear appeals (Quick et al., 2018) and that "fear appeals capitalize on the motivational tendencies of fear to scare people into compliance" (Bessarabova et al., 2020, p. 109). As a result, these models fail to demonstrate how fear appeals defined in terms of message attributes are associated with fear arousal, which, in turn, relates to maladaptive responses (e.g., psychological reactance, message derogation; Witte, 1991) theorized in these models (especially the EPPM) on fear appeal exposure. Unsurprisingly, the relationship between fear arousal and reactance remains understudied since the role of fear arousal (i.e., subjective fear) has been overlooked in these models (Quick et al., 2018).

Indeed, the lack of studies directly examining the role of fear arousal has been previously noted, as Tannenbaum et al. (2015) in their meta-analysis concluded:

> Although many fear appeal theories discuss fear, empirical studies typically test the impact of fear appeal messages on outcomes and subsequently infer that message effects were mediated by experienced fear even though fear itself is rarely measured (for a discussion, see Popova, 2012, p. 466). Indeed, only 71 of the 248 studies in the current meta-analysis measured fear directly, and such measures were typically treated as manipulation checks rather than independent variables or mediators. (p. 118)

Therefore, penetrating the long-ignored relationship among fear appeals, fear, reactance, and message responses marks a step toward uncovering the effect of fear appeals on message responses. Despite these recent findings on the positive relationship between fear and freedom

threat and reactance, the underlying theoretical mechanism remains unknown. Besides, it stands to reason that fear may not always be freedom threatening and reactance-eliciting, as Ort and Fahr (2018) found in their study, especially in the current situation where not getting vaccinated may lead to COVID-19 infection and potential death, a threat that should be perceived as more pressing than a threat to autonomy (Bessarabova & Massey, 2020). Therefore, the following research question is posed:

RQ2: Are the effects of attribute-based fear appeals on a) source derogation, b) message attitudes, and c) intentions to get COVID-19 vaccination mediated by freedom threat and psychological reactance?

Research on fear appeals is said to be oversimplified in terms of how it addresses the composition of fear appeals (Krusemark & Li, 2011). Many health problems have repulsive, disgust-eliciting conditions (Allred & Amos, 2018). Therefore, fear appeals generally include descriptions of negative consequences of health compromised behavior and repulsive presentations, such as germs, blackened lungs, or dead bodies that are elicitors of disgust (Haidt et al., 1994). In fact, from the beginning of fear appeal research, fear appeals have contained repulsive content (Hovland et al., 1953). The inclusion of disgust content may influence message responses since it may evoke disgust in message recipients that produces emotion appraisals and action tendencies different from fear (Dillard & Nabi, 2006; Dillard & Shen, 2018; Leshner et al., 2011; Nabi, 1998; Van Hooff et al., 2013).

In the case of COVID-19, repulsive presentations due to infection with the virus—dead bodies and infected lungs—are relevant stimuli falling into what Haidt et al. (1994) refer to as the domain of disgust-elicitors, which may occur alongside, or in addition to more specific health threats. According to Haidt et al.'s (1994) categorizations of disgust sources, these visual

presentations are typical elicitors of disgust. Therefore, the current study includes disgust-eliciting content (disgust elicitors, or "disgust appeals" hereafter) within messages describing the consequences of COVID-19 infection, to be examined for their influence on message responses, in addition to reactions to fear appeals.

Disgust Appeals and Psychological Reactance

Disgust is a universal emotion functioning to protect an organism from potential threats (Chapman & Anderson, 2012; Haidt et al., 1994). It features defensive responses to information/objects seen as impure or revolting (Woody & Teachman, 2000). Working as a "behavioral immune system," disgust motivates avoidance of objects, situations, or people that may contaminate an organism (Schaller, 2011). Disgust relates to avoidance and nausea and involves coping through activity suspension (Leshner et al., 2009). Starting from Darwin (1872), who defined disgust as "something offensive to the taste" (p. 269), scientific examinations of disgust regard oral rejection (literally dis-gustatory) as the origin of disgust. For instance, Rozin and Fallon (1987) defined disgust as "a revulsion at the prospect of (oral) incorporation of an offensive substance" (p. 23). Following initial research establishing a firm link between disgust and food contamination, later studies by Haidt et al. (1994) revealed that ingestible food is not the only source of disgust. Instead, they identified seven source categories of disgust: food, animals, body products, sex, body envelope violations, death, and hygiene.

As two distinct emotions, fear and disgust have different action tendencies (Russell et al., 1989; Woody & Teachman, 2000). Fear provokes sensory acquisition, leading to a "stop-look-and-listen" response to minimize threats (Gray, 1987). In contrast, disgust results in sensory rejection to avoid any potential contamination (Rozin & Fallon, 1987). Therefore, the threat minimization goal of fear renders one to acquire information to reduce the threat, whereas the

avoidance tendency of disgust makes distancing oneself from the repulsive object the primary goal. Moreover, empirical studies have demonstrated how the difference between fear and disgust can be detected. For instance, using electroencephalograph (EEG), Krusemark and Li (2011) compared fear and disgust in terms of neural and behavioral responses. Results showed that participants distinguished between carefully controlled fearful and disgusting images as early as 96 milliseconds after exposure to the stimulus. Findings from other studies validated the notion that the early differentiation between fear and disgust even precedes the amygdala discrimination between fearful and non-fearful stimuli (Krolak-Salmon et al., 2004). These findings suggest that if fear and disgust appeals co-occur, disgust elicitors can be sensed distinctively from fear elicitors, and the former may differently influence message responses relative to when only fear elicitors are included.

Indeed, the important role disgust content plays has long been realized. Strohminger (2014) credits disgust as "the center of several critical questions about human culture and cognition" (p. 478). Nabi (1998), in her work on fear appeals, also notes that it may often be disgust, instead of fear, that dominates the emotional experience upon exposure to what is counted as a fear appeal. In conventional fear appeal studies, however, with a few notable exceptions, disgust content has generally been used to strengthen the influences of fear appeals instead of being studied and assessed independently (Berkowitz & Cottingham, 1960; Halkjelsvik & Rise, 2015; Janis & Feshbach, 1953; Leventhal & Watts, 1966; Witte, 1994), leaving the question of whether disgust uniquely contributes to persuasion unanswered (Nabi, 2002).

Some studies have looked at the influence of message attributes associated with high vs. low disgust-eliciting content and shown inconsistent findings. For instance, Halkjelsvik and Rise

(2015) conducted two studies to compare the effect of high vs. moderate disgust content associated with adverse outcomes of smoking on attitudes toward smoking and motivations to refrain from smoking, holding fear content of the negative consequences of smoking at similar levels in both conditions. They found high vs. moderate levels of disgust content were not different in their influence on these outcome variables. However, Morales et al. (2012) found that advertisements with disgust eliciting content were more persuasive than those with no disgust eliciting content in terms of advertisement attitudes and behavioral intentions across four experiments.

A series of studies by Leshner and colleagues (2009, 2011) investigating the effect of high vs. low disgust-eliciting anti-smoking messages on cognitive processing and memory found messages with high disgust-eliciting content led to more cardiac deceleration compared to those with low disgust-eliciting content, indicating high disgust messages increase cognitive resources allocation for message encoding. Moreover, they found high disgust messages to be recognized more accurately than low disgust messages (Leshner et al., 2009). Though Leshner and colleagues' work focused on cognitive processing, recognition, and memory, their findings may provide important implications for persuasion, since cognition and memory presumably mediate the relationship between message exposure and persuasion (Braun-Latour & Zaltman, 2006).

Given the most supportive, though limited evidence on the positive relationship between high disgust-eliciting appeals and positive message responses and cognitive processing leading to increased persuasiveness, along with the avoidance tendency of disgust that causes immediate action to avoid disease contamination, it is proposed that persuasion should increase as the intensity of disgust described in disgust appeals increases. Thus, the following hypothesis is posited:

H3: Compared to low disgust appeals, high disgust appeals lead to a) less source derogation, b) more favorable message attitudes, and c) higher COVID-19 vaccination intentions.

Studies mentioned above examined the effect of attributes-based manipulations of disgust appeals on message responses. As per O'Keefe's (2003) arguments regarding the difference between the effects of attributes designed to elicit emotion and actual subjectively experienced instances of that emotion, disgust appeals may or may not necessarily stimulate or produce subjective disgust experienced at varying levels of intensity. Coincidentally, some other research on disgust has looked at disgust arousal and its influence on message responses. For instance, Hammond et al. (2004) surveyed adult smokers' responses to graphic Canadian cigarette warning labels in a longitudinal survey and found higher disgust experienced after exposure predicted a higher likelihood of quitting smoking, making an attempt to quit, and reducing smoking at follow-up. Jónsdóttir et al. (2014) also found feelings of disgust to predict the perceived effectiveness of anti-smoking advertisements positively. Similarly, Dillard and Shen (2018) showed peak disgust reported after exposure to messages about meningitis positively predicted intentions to ascertain one's vaccine status, which, in turn, positively predicted information-seeking behavior. Morales and colleagues' (2012) experiments also measured felt disgust on disgust appeal exposure. However, their measure was mainly used as a manipulation check rather than to explain the effects of subjective disgust.

There is another line of work looking at the influences of negative emotions as an overall construct that includes disgust and other discrete emotions instead of separating disgust from other discrete emotions. For instance, Hall and colleagues (2018) examined the influence of anti-smoking pictorial labels on motivations to quit smoking and found negative emotions mediated

the effects of pictorial warning labels on quit intentions in a positive direction, which, however, was weakened by reactance. In their study, the overall negative emotions were obtained by averaging several discrete emotions, including disgust. Though they did not specify the influence of disgust on quit intentions and reactance, it is reasonable to expect that disgust may also positively influence quit intentions and reactance because the factor loading of disgust on overall negative cognition was high (.88), indicating a large variance explained by disgust on negative emotions. In later research, Hall et al. (2018) investigated the influences of negative emotions and reactance on message avoidance in two experimental trials. They found, in Trial 1, both self-reported negative emotions and reactance after the intervention messages related to message avoidance, whereas, in Trial 2, only negative emotions were related to message avoidance. In both trials, message avoidance was positively associated with forgoing cigarettes; furthermore, negative emotions were obtained by averaging several discrete emotions, including disgust. Moreover, disgust explained a significant portion of the overall negative emotion measure (the factor loading of disgust on negative emotions was .88 in both trials).

Despite the finding that reactance weakened the effect of negative emotions on quit intentions in Hall and colleagues' (2018) study, it remains unknown from where or how reactance in response to anti-smoking warning labels exposure may have originated, or which discrete emotions from within the overall mix of negative emotions triggered reactance. In other words, it is worth discovering whether disgust—one component representing a large share of the negative emotion index—induced the reactance that undermined the overall positive effect of negative emotions on quit intentions. Findings from another study may provide an answer: Yang (2017) investigated responses to messages advocating human papillomavirus (HPV) vaccination and found self-reported disgust on exposure to HPV messages positively predicted reactance.

Additionally, the indirect influence of self-reported disgust on outcome variables (i.e., perceived message effectiveness, intentions to get the HPV vaccine, and attitudes toward government) through reactance was marginally significant.

The relationship between disgust and reactance is far from being established, given how only one study (i.e., Yang, 2017) has directly examined disgust and reactance. However, the lack of research in this area due to the failure to distinguish disgust appeals from fear appeals—with or without the inclusion of reactance measures—does not rule out the possibility that disgust may also be freedom threatening and reactance-eliciting, and that it may have been aroused in the studies mentioned above. First, other studies have shown that reactance does not necessarily interfere with positive message responses, the presence of which may just represent an indicator of concern, rather than a systematic effort to escape from message engagement (Cho et al., 2016), or it may only weaken positive message effects, instead of canceling them out (Hall et al., 2018; Peng et al., 2020; Shen, 2011).

Moreover, the action tendency following disgust is distancing oneself from disgust-eliciting objects (Lazarus, 1991). This tendency to avoid disgust-eliciting objects should become stronger as disgust increases in intensity within a disgust appeal. As Argo et al. (2006) note, the avoidance reaction following disgust is so powerful that it even presents for non-disgusting objects that happen to relate to disgusting objects. In other words, though the presence of disgust content may be conducive to encourage adaptive actions to reduce any chances of disease contamination, the disgust-eliciting content and/or feelings of disgust may take a shortcut to block out further processing of the message and its good intention (i.e., to help individuals reduce potential contamination). Due to the overwhelmingly unwelcome features associated with disgust elicitors, disgust appeals could well be seen as a threat to one’s freedom not to be

exposed to disgust-related stimuli and, therefore, prone to inducing reactance. Thus, it is reasonable to expect perceptions of freedom threat and reactance should increase as disgust increases, such that message effectiveness should also suffer. In the case of COVID-19 infection, as disgust increases in intensity within disgust appeals, the avoidance tendency should become stronger to the extent the disgust will be "over the top," leading to a threat to the freedom to not to be grossed out, followed by reactance and defensive message responses.

However, given rather limited evidence in support of this possibility, the following research question is proposed:

RQ3: Are the effects of attribute-based disgust appeals and a) source derogation, b) message attitudes, and c) COVID-19 vaccination intentions mediated by perceptions of freedom threat and psychological reactance?

Controlling Language, Fear, and Disgust Appeals Interaction

As reviewed above, controlling language has been extensively examined and found to often trigger reactance due to its freedom-threatening nature (Miller et al., 2007). However, early on, when PRT was first proposed, Brehm (1966) noted that freedom threat may not always trigger reactance. To be precise, reactance arousal is heavily influenced by the importance of the perceived freedom being threatened. In other words, in a situation where freedom is not perceived to be particularly viable, or if the importance of perceived threatened freedom is diminished, the theory posits that relatively less of a threat to freedom should be perceived, which in turn should result in less or no reactance. Stated differently, controlling language, which is typically freedom-threatening in nature, and thus prone to be reactance-eliciting, may not always be so. Considering situations where certain freedoms are less salient or anticipated (e.g., under conditions of severe bodily threat), there may be boundary conditions where the

freedom-threatening nature of controlling language is less aversive, and the use of highly explicit language perceived to be needed and justified, and thus, less problematic, or perhaps even preferred. High levels of fear and disgust might present such a boundary condition. So in the section below, I attempt to speculate on the potential cushioning function that high fear and/or disgust may serve in lowering perceptions of freedom threat and resulting reactance brought on by high controlling language. I begin with a theoretical framework to provide such a perspective and some recent research in support of it.

Terror management theory (TMT; Greenberg et al., 1986) posits that, when mortality is salient, people experience existential anxiety that motivates coping behaviors to counter it. Building on TMT, the terror management health model (TMHM; Goldenberg & Arndt, 2008) was developed, focusing on decision making when confronting health threats. The TMHM predicts that when mortality is salient and within focal awareness, individuals will engage in protective behaviors if they believe they can do so (Boyd & Goldenberg, 2020).

Bessarabova and Massey (2020) integrated the TMHM with PRT and examined the effects of mortality salience on responses to STD prevention messages featuring high vs. low freedom threat. They proposed that, although reactance can motivate defenses in response to freedom-threatening communication, thereby decreasing its effectiveness, combining mortality salience with freedom-threatening, direct, explicit communication should help reduce death thoughts, and thereby mitigate perceived freedom threats and resulting reactance, since death thoughts are uncomfortable, and, therefore, people will try to inhibit them as quickly and easily as possible; death is also “a more pressing concern than threats to autonomy” (Bessarabova & Massey, 2020, p. 28).

Accordingly, death thought awareness (i.e., mortality salience) and its resulting existential anxiety are more pressing relative to threatened freedoms, which results in terror management defenses, reducing potential reactance effects. As expected, Bessarabova and Massey (2020) found mortality salience decreased perceived freedom threat in messages featuring high freedom threat during the proximal defense. Thus, they concluded the dire ramifications of non-compliance in response to threatening, potentially deadly events that require immediate compliance tend to wash out the reactance-causing effects of freedom threat.

Indeed, in the early proposition of PRT, Brehm (1966) made it clear that people do not always become reactant when their freedom is under threat. Instead, the arousal of reactance depends on the importance of the freedom limited or threatened with elimination. When freedoms of low importance are threatened, minimal or no reactance will be aroused, and people will generally give up on their freedom and comply with the advocated behavior (Erceg-Hurn & Steed, 2011). In light of the TMHM and Bessarabova and Massey's (2020) research, the current study assumes that, when lives are under a threat severe enough to generate death thoughts within focal awareness, free choices may become less important since the death threat is more pressing. As a result, people will tolerate more explicit instructions to decrease the likelihood of death and existential anxiety, thereby reducing the reactance effects of explicit controlling language. Consequently, when people are shown demanding messages describing severe health threats and even death, the death threats should mitigate any freedom threat perceptions presented by the advocated behavior, thereby reducing reactance. In other words, people should be less likely to become reactant and more likely to accept explicit information directing them to reduce the death threat in response to high fear appeals relative to low fear appeals. Therefore, the directiveness and explicitness of high controlling, forceful language should be less

problematic when combined with high fear appeals. In contrast, the use of implicit, ambiguous information that leaves room for other interpretations should be less desired and could be particularly costly in a high fear appeal condition, where people may feel overwhelmed and uncertain of what to do.

In the case of COVID-19 infection, in high fear appeals where potential death is emphasized, and mortality is made salient, death thought awareness should help justify using high controlling, explicit language to counter the threat and existential anxiety. Moreover, high-controlling, forceful messages should be preferred or even desired in high fear appeal conditions since, as Bessarabova and Massey (2020) noted, a death threat is more pressing than an autonomy threat. Accordingly, when high controlling language is combined with a high fear appeal, it is predicted that it will lead to less freedom threat perceptions and less reactance than when high controlling language is used with a low fear appeal.

Moreover, high controlling language may be most needed and justified when high disgust content is added to a high fear appeal, because high disgust-eliciting objects indicate potential contamination, disease infection, and death that humans instinctively try to avoid (Haidt et al., 1994; Oaten et al., 2009). Consequently, freedom threat should be least perceived, reactance least aroused, and defensive responses least produced when high controlling language, fear, and disgust appeals are combined. In contrast, freedom threat should be most perceived, reactance most aroused, and defensive responses most produced when high controlling language is used together with low fear and disgust appeals. This reasoning forms the basis for the following hypotheses:

H4: Controlling language interacts with attribute-based fear and disgust appeals such that a) perceptions of freedom threat and psychological reactance in the form of b) anger

and c) negative cognitions are lower when controlling language, fear and disgust appeals are at the high level than when controlling language is at the high level but fear and disgust appeals are at the low level.

H5: Controlling language interacts with attribute-based fear and disgust appeals such that a) source derogation is lower, b) message attitudes is more positive, and c) COVID-19 vaccination intentions is higher when controlling language, fear, and disgust appeals are at the high level than when controlling language is at the high level but fear and disgust appeals are at the low level.

Additionally, this dissertation examines the role of reactance in mediating the relationship between attribute-based message conditions crossing controlling language, fear and disgust appeals, and message responses. Considering the lack of research in this aspect, and its explanatory nature, the following research question is posed:

RQ4: Are the effects of attribute-based message conditions on a) source derogation, b) message attitudes, and c) COVID-19 vaccination intentions mediated by perceptions of freedom threat and psychological reactance?

In addition to message effects, this study also investigates how individual differences in trait reactance and disgust sensitivity may influence freedom threat, psychological reactance, and message responses, as discussed below.

Trait Reactance, Disgust Sensitivity, and COVID-19 Vaccination

Suboptimal vaccination coverage due to vaccine hesitancy poses a sizable health risk, arguably resulting in many potentially avoidable deaths (Kang et al., 2017). Vaccine hesitancy deals with beliefs, attitudes, and behaviors negatively influencing individuals' vaccination decisions (Kang et al., 2017; Peretti-Watel et al., 2015). Ultimately, despite active health

concerns about diseases, people tend to delay, become reluctant, and even refuse to vaccinate. Established research contends lack of knowledge about science leads to misconceptions and misunderstandings concerning vaccines (Rossen et al., 2016). However, studies have shown how more knowledge rarely leads to higher vaccine acceptance, and efforts to educate hesitant individuals do not appear to significantly or effectively influence confidence in vaccination (Jarrett et al., 2015; Sadaf et al., 2013). For instance, Jarrett et al. (2015) argued scientific illiteracy alone does not constitute the underlying reason for vaccine hesitancy and causes other than lacking resources or information are believed to contribute to low vaccine uptake (Amin et al., 2017; Browne, 2018). One potential candidate for a tendency toward vaccine hesitancy is perceived loss of freedom due to vaccination.

Vaccination hesitancy is associated with freedom-related beliefs; for instance, Amin et al. (2017) found that those who refused vaccination had a strong belief in autonomy and liberty. For some well-resourced and well-educated individuals, opposing vaccination expresses personal agency concerning their health (Browne, 2018). These findings suggest an individual's propensity to value agency and autonomy, namely in the form of trait reactance, should exert some influence on vaccination attitudes and uptake; indeed, trait reactance has been found to affect attitudes toward vaccination. For instance, Hornsey et al. (2018) examined the effect of trait reactance on antivaccination attitudes and found antivaccination attitudes tended to be higher among high relative to low reactant individuals. Along similar lines, Finkelstein et al. (2020) found compared to low reactant people, high reactant ones tended to place less priority on being vaccinated.

In the case of COVID-19 vaccination, the sense of using vaccination to keep individuals healthy may be perceived as threatening their autonomy to stay healthy in their way. Therefore,

individuals high in trait reactance who value personal autonomy should be more likely to dislike the notion that they "need to get vaccinated," leading them to generate more defensive responses to messages encouraging vaccination. In light of empirical findings concerning the relationship between trait reactance and vaccination hesitancy, the following hypotheses are posited:

H6: Trait reactance is positively correlated with a) perceived freedom threat and psychological reactance in the form of b) anger and c) negative cognitions, in response to a COVID-19 vaccination message.

H7: Trait reactance is positively correlated with a) source derogation but negatively correlated with b) positive message attitudes and c) COVID-19 vaccination intentions.

Another factor that may influence vaccination attitudes and decision-making concerns individuals' tendency to experience an aversion toward disgust-elicitors. Individuals vary in their propensity to experience disgust on exposure to potential disgust elicitors, the dispositional sense of which is termed disgust sensitivity (Clifford & Wendell, 2016). People high on disgust sensitivity tend to feel more disgust in response to disgust elicitors; they are more afraid of death and are less inclined to experience an adventure that may pose death threats (Haidt et al., 1994). People low on disgust sensitivity are less sensitive to disgust-elicitors; instead, they may often tend to see disgust-relevant information as intriguing or fascinating, with a sense of morbid curiosity. Thus, they are more motivated to explore disgust-eliciting content (Fink et al., 2018).

Disgust sensitivity influences attitudes toward vaccination (Clay, 2017) that is believed to be linked to biological contamination and notions of physical intrusiveness (Browne, 2018). The issue of disagreement with experts on the acceptance of vaccination, as Clifford and Wendell (2016) claim, exemplifies the so-called "purity" attitude driven by the feeling of disgust meant to

protect the individual from contamination. Moreover, greater disgust sensitivity is associated with more emphatic anti-vaccination beliefs (Clifford & Wendell, 2016). Along similar lines, a study by Hornsey and colleagues (2018) showed disgust sensitivity had a positive influence on anti-vaccination attitudes such that anti-vaccination attitudes were higher among individuals high on disgust toward needles and blood than those low in disgust. Relatedly, Luz et al. (2019) found disgust sensitivity had an indirect negative effect on vaccination uptake through attitudes toward vaccination.

However, disgust sensitivity has also been found to lead to positive responses to vaccination. For instance, high disgust sensitivity toward the illness or pathogen has been found to prompt vaccination intentions (Curtis, 2011). In a related study involving the COVID-19 pandemic, Díaz and Cova (2020) examined factors influencing U.S. residents' decisions to comply with official recommendations, such as quarantining and self-distancing, to slow down the spread of the virus during the initial phases of the pandemic. Across two studies, they found disgust towards pathogens positively predicted behavioral intentions to comply with official recommendations to avoid infection.

Given the inconsistent findings regarding the effects of disgust sensitivity on responses to vaccination, the following research question is posed:

RQ5: How does disgust sensitivity influence message responses in the form of a) source derogation, b) message attitudes, and c) COVID-19 vaccination intentions?

To examine the research questions and test the relevant hypotheses, two pilot studies and an experiment were conducted.

Chapter IV Method

Pilot Study 1

Pilot Study 1 was conducted to examine individual manipulations of controlling language (high vs. low), fear appeals (high vs. low), and disgust appeals (high vs. low) and images that were used in the main study (See the following section for the manipulations).

Participants

GPower 3.1 was used to perform a power analysis to determine the appropriate sample size for detecting small to medium effects (η^2_p = .20; Cohen, 1992) for three predictor variables with α set at .05 and power at .80. The minimum number of participants suggested was 199. A total of 388 participants were recruited on Amazon MTurk on February 11, 2021, to account for potential invalid responses.

Amazon MTurk is a platform for recruiting research participants that offer relatively more diversified and representative samples than community or college student samples (Krupnikov & Levine, 2014). The following seven criteria were applied to obtain the data for this pilot test: (1) Participants needed to meet a 99% or higher approval rating from their previous MTurk requesters to ensure high data quality (Peer et al., 2014); (2) participants were only allowed to complete the study on a computer (not a smartphone); and (3) only workers who had completed more than 5,000 MTurk tasks were allowed to participate; (4) six attention verification questions were implemented throughout the study to screen out participants who did not pay enough attention to the study; (5) one thought-listing question was included to detect potential MTurk "farmers" who used scripts, bots, or other automated methods to complete the study; (6) serial responses were deleted where participants answered the same throughout for questions that should not be answered that way (e.g., reversed questions); and (7) duration to

complete the study was examined to screen out participants who took too long or too short a time (based on the average completion time and standard deviation) to complete the study.

Responses from 148 participants (the percentage of attrition: 38%) were discarded for failing to conform to at least one criterion listed above, leaving responses from 240 participants for analysis. Participants were mostly middle-aged (M = 39.25, SD = 13.52, range: 20-73 years), primarily white, and there were slightly more males than females in the sample. Detailed demographics are reported in Table 1.

Table 1

Sample Characteristics for Pilot Study 1 (N = 240)

Measures	*N*	(%)
Sex		
Male	126	(52.5%)
Female	109	(45.4%)
Prefer not to answer	5	(2.1%)
Ethnicity		
American Indian, or Alaska Native	4	(1.7%)
Black or African American	11	(4.6%)
Asian, or Asian American	41	(17.1%)
Hispanic, or Latino	11	(4.6%)
White, or Western European	164	(68.3%)
Native Hawaiian or Pacific Islander	1	(.4%)
Other	0	
Prefer not to answer	8	(3.3%)
Education		
Did not complete high school	2	(.8%)
Graduated from high school	23	(9.6%)
Some college	0	
Associate's degree	19	(7.9%)
Bachelor's degree	112	(46.7%)
Master's degree	41	(17.1%)
Doctoral degree	5	(2.1%)
Prefer not to answer	38	(15.8%)
Employment		
Employed full time	164	(68.3%)
Employed part-time	33	(13.8%)
Unemployed looking for work	12	(5.0%)
Unemployed not looking for work	14	(5.8%)

Retired	8	(3.3%)
Prefer not to answer	9	(3.8%)
COVID-19 Experience		
Know at least 1 with a confirmed case of COVID-19	61	(25.4%)
Know more than 1 with a confirmed case of COVID-19	0	
Not sure	0	
Know none friends, relatives, or acquaintances has a confirmed case of COVID-19	154	(64.2%)
Prefer not to answer	25	(10.4%)

Study Design and Procedures

Participants read a description of the study recruitment information on MTurk. Those interested and qualified were able to accept the human intelligence task (HIT) and access an online questionnaire hosted on Qualtrics to complete the study. They saw consent information as the first page of the survey. Upon consenting, participants were randomly shown one of two messages for all the three pairs of the messages. After each message, they were asked several questions checking the manipulations. Following messages, they were shown 32 images relating to COVID-19 infection, with each image followed by several questions concerning the presence of fear and disgust content. Finally, participants were asked to provide demographic information, after which they were thanked for their participation and provided a code to claim payment (USD 1.50) on MTurk. Participants took an average of 17.26 minutes (*SD* = 6.86) to complete the study. The university's Institutional Review Board approved the study.

Stimuli

Essential information about COVID-19 infection and vaccination was extracted from official websites, such as the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC). All stimuli consisted of core communication informing participants about the threats of COVID-19 infection and the effectiveness of COVID-19

vaccination. The stimuli were created to be comparable in terms of general content, length, and format.

In the high controlling language condition, demanding, controlling language such as "must," "have to," and "no other options" was used to urge people to seek COVID-19 vaccination, for instance, "You REALLY HAVE TO avoid getting infected with this virus: You simply MUST make sure to protect yourself! You REALLY have ONLY ONE alternative: GET VACCINATED!" In the low controlling language condition, autonomy-supportive, noncontrolling language such as "may consider," "can," and "may want to" was used to suggest people seeking COVID-19 vaccination (Miller et al., 2007; Vansteenkiste et al., 2006). For instance, participants were shown, "WOULDN'T YOU LIKE to stay safe and avoid taking any chances with this virus? There is an effective alternative: You have the OPTION of CHOOSING TO BE VACCINATED."

Following previous practices (e.g., Chadwick, 2015; Peng et al., 2020), high vs. low levels of fear appeals were manipulated by varying the severity and susceptibility of COVID-19 infection. In the high-fear appeal condition, COVID-19 infection was described to have severe health influences, with individuals having a high chance of catching the virus. For instance, participants were told,

> When you are infected, you will experience severe illness from COVID-19, such as organ failure, heart disease, hospitalization, admission to the ICU, intubation, mechanical ventilation, and even death… With no immunity and without vaccination, there is a high likelihood of exposure, and it is highly likely that you will get infected!

In the low-fear appeal condition, COVID-19 infection was described as having comparatively less threatening health influences, and individuals were characterized as having a relatively lower chance of catching the virus. Exemplary descriptions contained,

> If infected, people may experience mild to moderate symptoms, such as fever, fatigue, body aches, and mild discomfort, loss of appetite, dry cough, and in many cases, shortness of breath… With no immunity and without vaccination, there is a real chance of exposure, and it is likely that you may get infected.

High vs. low disgust appeals were manipulated by varying the vividness of descriptions referring to at least one of the disgust-eliciting domains specified by Haidt et al. (1994). High-disgust appeals featured a vivid, gross portrayal of COVID-19 infected lungs. For instance,

> Forensic autopsies performed on deceased victims of COVID-19 show their lungs cut open, revealing what appears to be clotted, scarred tissues that are enlarged and completely firm, with a viscid, gummy substance plastered throughout. Much of the lung tissue shows festering inflammation with clotted blood and sticky, oozing pale yellow glutinous fluid, white pus, and red-brown matter.

Low-disgust appeals contained more generic descriptions of COVID-19 infected lungs (e.g., "Many people infected by COVID-19 have been examined by physicians who have found their lungs to look abnormal and unhealthy. For the most part, they are relatively inflamed, irregular, nonuniform, and atypical in form, with an overall discolored appearance throughout.")

In addition to textual descriptions, the study also included visual presentations of the consequences of COVID-19 infection. Thirty-two images showing the negative impacts of COVID-19 infection (e.g., dead body due to COVID-19 infection; COVID-19 infected lungs being examined in a forensic autopsy; illustrations of COVID-19 infected lungs) were selected

from the Internet or CDC website. Instead of defining the images to be high vs. low levels of fear or disgust content, the study left such evaluations to participants.

Measures

Controlling Language Check. Four items adapted from Clayton et al. (2020) were used as the manipulation check for controlling language. Participants were asked to report the extent to which the message they viewed contained freedom-threatening/opinionated/forceful/controlling language on a 7-point Likert scale ranging from 1 = *None* to 7 = *A great deal*.

Fear and Disgust Appeal Checks. Generally, fear was assessed by gauging participants' feelings towards messages at varying threat levels. For instance, Kim and Shin (2018) manipulated fear at high vs. low levels by varying the severity and susceptibility to sexually transmitted diseases. Fear manipulation was checked using three items adapted from Shen (2011) in which participants indicated the extent to which they felt "scared," "afraid," and "fearful" when reviewing the message. Similarly, Dillard and Anderson (2004) induced fear at high vs. low levels by varying threat levels and examined the manipulation of fear arousal with the same items. However, O'Keefe (2003) argued, the measurement of the feeling of fear was not an appropriate measure of message attributes. Therefore, new measures were created as the manipulation checks in the current study.

For the high vs. low fear appeal manipulation check, participants were asked to indicate the extent to which the message they had read described severe health threats of infection on three items on a 7-point Likert scale ranging from 1 = *None* to 7 = *A great deal*. An example was, "To what extent does the message present severe health threats of infection?" For high vs. low disgust appeal manipulation check, the current study also did not use the traditional

manipulation check method, that is, measuring the feeling of disgust. Instead, participants were asked to respond to three items indicating the presence of repulsive descriptions of infection in the message on a continuum ranging from 1 = *None* to 7 = *A great deal*. For instance, participants were asked, "To what extent does the message present vivid descriptions of the appearance of lungs of COVID-19 victims?"

Considering that many health issues have gruesome conditions, images of COVID-19 infection may contain both fear and disgust content. Therefore, each image was evaluated in terms of both fear and disgust content. Four items (two for each component) adapted from message manipulation checks were used to assess fear and disgust images on a 7-point Likert scale ranging from 1 = *None* and 7 = *A great deal*. For instance, participants were asked, "To what extent does the image present severe health threats of infection?" for fear content, and "To what extent does the image show the disturbing consequences of virus infection or fatal bodily corruption (that is, harms caused to the body that violates its usual status)?" for disgust content.

Message Quality. To examine if fear and disgust appeal manipulations changed message quality, three items were developed to assess the perceived quality of the fear and disgust content. Participants reported perceived message clarity, accuracy, and whether the message represented the consequences of infection on well a 7-point Liker scale ranging from 1 = *Extremely unclear/inaccurate/bad* to 7 = *Extremely clear/accurate/well*. Measurement items were adapted from Updegraff et al. (2007). An exemplary item was, "How clear is the message at representing the consequences of infection?". The manipulation of controlling language was not checked on message quality because no substantial change was made in manipulating high vs. low controlling language, except for the language intensity. Thus, the quality of the two messages should be the same (See Tables 2 and 3 for Cronbach's α and Person's r).

Table 2

Cronbach's α for Pilot Study 1 Message Measures

Measures	Cronbach's α	N of items
High fear appeal	.78	3
Low fear appeal	.82	3
Message quality for high fear appeal	.84	3
Message quality for low fear appeal	.85	3
High disgust appeal	.69	3
Low disgust appeal	.72	3
Message quality for high disgust appeal	.84	3
Message quality for low disgust appeal	.79	3
High controlling language	.71	4
Low controlling language	.90	4

Table 3

Person's r between Two Items for Each Measure for Pilot Study 1 Images

Photos	Person's *r* for fear	Person's *r* for disgust
Photo 1	.78	.70
Photo 2	.65	.62
Photo 3	.85	.80
Photo 4	.84	.69
Photo 5	.75	.68
Photo 6	.82	.69
Photo 7	.78	.60
Photo 8	.85	.75
Photo 9	.79	.70
Photo 10	.87	.89
Photo 11	.88	.80
Photo 12	.86	.81
Photo 13	.81	.75
Photo 14	.88	.87
Photo 15	.88	.85
Photo 16	.89	.87
Photo 17	.86	.87
Photo 18	.80	.81
Photo 19	.82	.80
Photo 20	.90	.88
Photo 21	.88	.91
Photo 22	.91	.90
Photo 23	.92	.88
Photo 24	.87	.86
Photo 25	.89	.84
Photo 26	.89	.84
Photo 27	.88	.88
Photo 28	.91	.88
Photo 29	.86	.91
Photo 30	.90	.87
Photo 31	.90	.89
Photo 32	.89	.89

Results

Several independent *t*-tests were performed to check the manipulations of controlling language, fear, and disgust content, as well as message quality. For each independent *t*-test, the independent variable was the message manipulation condition and the dependent variable was

manipulation check for that condition. Results showed that manipulations succeeded. Specifically, the high controlling language message (M = 5.23, SD = 1.22) was significantly higher on the extent to which it contained forceful language than the low controlling language message (M = 3.49, SD = 1.74), $t(220) = -9.02$, $p < .001$, Cohen's d = 1.16, indicating a very large effect size. In this dissertation, Cohen's d was computed using the means, standard deviations, and sample sizes of the two conditions. Participants in the high fear appeal condition (M = 5.64, SD = 1.06) reported the message contained a higher level of fearful content than those in the low fear appeal condition (M = 5.12, SD = 1.26), $t(238) = -3.50$, $p < .05$, Cohen's d = 0.45. Moreover, message quality evaluation was not significantly different between the high fear appeal condition (M = 5.72, SD = 1.01) and the low fear appeal condition (M = 5.59, SD = 1.00), $t(238) = -1.03$, p = .31, Cohen's d = 0.13. Participants in the high disgust appeal condition (M = 6.19, SD = .81) reported the message contained more repulsive content than those in the low disgust appeal condition (M = 5.31, SD = 1.05), $t(216) = -7.20$, $p < .001$, Cohen's d = 0.95, indicating a fairly large effect size. Again, the message quality evaluation was not significantly different between the high disgust appeal condition (M = 5.87, SD = .93) and the low disgust appeal condition (M = 5.67, SD = .87), $t(238) = -1.71$, p = .09, Cohen's d = 0.22.

For each image, both fear and disgust mean scores were obtained. Following Shen's (2011) practice, multiple images were utilized for each condition: two images that scored the highest on fear content but not on disgust content were selected as high fear images, and two images that scored the highest on disgust content but not on fear content were selected as high disgust images. Similarly, two images that scored the lowest on fear content but not on disgust content were selected as low fear images, and two images that scored the lowest on disgust content but not on fear content were selected as low disgust images. The two high fear images

described death (i.e., a dead body with a COVID-19 tag, and four people fully dressed in protective gear carrying a coffin); two high disgust images showed the repulsive presence of lungs of COVID-19 victims in forensic autopsies; two low fear images presented illustrations of a pair of lungs surrounded by COVID-19 virus, and the two low disgust images were illustrations of the symptoms of COVID-19 infection (Images available for viewing upon request).

Based on these results, 32 messages in total were created by differentially combining textual descriptions and images of COVID-19 infection for the eight conditions crossing controlling language, fear appeal, and disgust appeal (four messages for each condition). Each message contained three components: textual descriptions of COVID-19 infection, images depicting consequences of COVID-19 infection, and texts describing the effectiveness and accessibility of COVID-19 vaccination. Across all 32 messages, the information about the effectiveness and accessibility of COVID-19 vaccination was held constant, with the textual descriptions and images of infection varied for manipulations.

In each condition, the essential content about COVID-19 infection across all four messages was the same, with the order of paragraphs shuffled to create four different messages. Based on the results of Pilot Study 1, there were two images for each level of fear and disgust, leaving four different combinations of images crossing fear and disgust levels (high vs. low). Therefore, for each message, two images of COVID-19 infection that were consistent with the level of fear and disgust appeals were added to the textual descriptions. For instance, for high controlling, high fear, and high disgust appeal, one out of two images selected as the high fear image and one out of two images selected as the high disgust image were added to the textual description of COVID-19 infection using high controlling language, high fear and disgust content.

Pilot Study 2

In Pilot Study 2, the 32 messages created in Pilot Study 1, as described above, were tested in their manipulations.

Participants

A total of 582 participants were recruited on Amazon Mturk on February 22, 2021 to detect a small effect (η^2_p = .15; Cohen, 1992) with α set at .05 and power of .80. The same recruitment criteria used in Pilot study 1 were applied for Pilot Study 2, with two changes. First, participants who had participated in Pilot Study 1 were excluded from participating in Pilot Study 2. Second, workers needed to have completed more than 1,000 tasks on MTurk instead of 5,000. The reason for this change was that a criterion of having completed more than 5,000 tasks might result in a very specific, advanced MTurk worker pool, as Peer et al. (2014) used 500 tasks as a threshold for high vs. low productivity levels. Responses from 85 participants were discarded (the percentage of attrition: 15%) because they failed to complete the study as required (e.g., did not pass attention verification checks). The final sample consisted of 497 participants, who were primarily middle-aged (*M* = 40.8, *SD* = 12.97, range: 20-83 years), and there were slightly more males than females. Detailed demographic information is reported in Table 4.

Table 4

Sample Characteristics for Pilot Study 2 (N = 497)

Measures	*N*	(%)
Sex		
Male	279	(56.1%)
Female	216	(43.5%)
Prefer not to answer	2	(0.4%)
Ethnicity		
American Indian, or Alaska Native	14	(2.8%)
Black or African American	31	(6.2%)
Asian, or Asian American	57	(11.5%)
Hispanic, or Latino	31	(6.2%)
White, or Western European	354	(71.2%)
Native Hawaiian or Pacific Islander	0	
Other	6	(1.2%)
Prefer not to answer	4	(0.8%)
Education		
Did not complete high school	2	(.4%)
Graduated from high school	40	(8.0%)
Some college	92	(18.5%)
Associate's degree	43	(8.7%)
Bachelor's degree	247	(49.7%)
Master's degree	57	(11.5%)
Doctoral degree	11	(2.2%)
Prefer not to answer	5	(1.0%)
Employment		
Employed full time	318	(64.0%)
Employed part-time	83	(16.7%)
Unemployed looking for work	22	(4.4%)
Unemployed not looking for work	27	(5.4%)
Retired	35	(7.0%)
Prefer not to answer	12	(2.4%)
COVID-19 Experience		
Know at least 1 with a confirmed case of COVID-19	147	(29.6%)
Know more than 1 with a confirmed case of COVID-19	175	(35.2%)
Not sure	36	(7.2%)
Know no friends, relatives, or acquaintances has a confirmed case of COVID-19	134	(27.0%)
Prefer not to answer	5	(1.0%)

Study Design and Procedures

In Pilot Study 1, the manipulation of controlling language was more potent than that of fear and disgust content, given the larger mean difference between high vs. low controlling language relative to the mean difference between high vs. low fear content and between high vs. low disgust content in Pilot Study 1, though all manipulations succeeded. Therefore, to increase the power of distinguishing fear and disgust content at high vs. low levels in Pilot Study 2, fear and disgust content were presented and tested as within-subjects variables, whereas controlling language was tested as a between-subject variable. In other words, participants were randomly assigned to either the high or low controlling language condition in which they read messages crossing fear and disgust appeals (high vs. low levels).

Participants read a description of the study recruitment information on MTurk. Those interested and qualified were able to accept the human intelligence task (HIT) and access an online questionnaire hosted on Qualtrics to complete the study. They saw consent information as the first page of the survey. After consenting, participants were randomly assigned to either the high or low controlling language condition. Participants were randomly presented four messages crossing fear appeals (high vs. low) and disgust appeals (high vs. low) addressing COVID-19 infection in each condition. Each message was randomly selected from the four messages in that condition, and after each message, participants were asked to fill out a battery of scales assessing message manipulations. Finally, participants reported demographic information, after which they were thanked and provided a code to claim payment (USD 1.50) from Mturk. Participants took an average of 14.25 minutes (SD = 6.83) to complete the study. The university's Institutional Review Board approved data collection.

Stimuli

Stimuli were the 32 messages created in Pilot Study 1 (See the *Results* section in Pilot Study 1 above).

Measurements

Controlling language, fear and disgust appeal assessments, and message quality evaluation were examined. The same scales used in Pilot Study 1 were employed. Cronbach's α for the measures are reported in Table 5.

Table 5

Cronbach's α for Pilot Study 2 Measures

Measures	Fear appeals	Disgust appeals	Controlling language	Message quality
$H_{control}H_{fear}H_{disgust}1$	.77	.85	.83	.86
$H_{control}H_{fear}H_{disgust}2$	.76	.64	.88	.83
$H_{control}H_{fear}H_{disgust}3$	.66	.70	.75	.82
$H_{control}H_{fear}H_{disgust}4$	.64	.74	.79	.89
$H_{control}H_{fear}L_{disgust}1$	.68	.61	.77	.85
$H_{control}H_{fear}L_{disgust}2$	.67	.72	.89	.84
$H_{control}H_{fear}L_{disgust}3$	.58	.80	.79	.82
$H_{control}H_{fear}L_{disgust}4$	.74	.79	.82	.78
$H_{control}L_{fear}H_{disgust}1$	.56	.77	.78	.88
$H_{control}L_{fear}H_{disgust}2$	.67	.82	.87	.85
$H_{control}L_{fear}H_{disgust}3$	.53	.75	.83	.77
$H_{control}L_{fear}H_{disgust}4$	.64	.81	.80	.87
$H_{control}L_{fear}L_{disgust}1$	.81	.82	.88	.83
$H_{control}L_{fear}L_{disgust}2$	.79	.76	.84	.74
$H_{control}L_{fear}L_{disgust}3$	.83	.80	.88	.75
$H_{control}L_{fear}L_{disgust}4$	.82	.79	.82	.82
$L_{control}H_{fear}H_{disgust}1$	.49	.80	.85	.80
$L_{control}H_{fear}H_{disgust}2$	.62	.84	.78	.82
$L_{control}H_{fear}H_{disgust}3$	.54	.70	.86	.81
$L_{control}H_{fear}H_{disgust}4$	.63	.67	.84	.89
$L_{control}H_{fear}L_{disgust}1$	.71	.81	.92	.70
$L_{control}H_{fear}L_{disgust}2$	.73	.64	.86	.83
$L_{control}H_{fear}L_{disgust}3$	.76	.71	.82	.82
$L_{control}H_{fear}L_{disgust}4$	.66	.77	.90	.73
$L_{control}L_{fear}H_{disgust}1$	.75	.54	.88	.80
$L_{control}L_{fear}H_{disgust}2$	.64	.58	.86	.82
$L_{control}L_{fear}H_{disgust}3$	.43	.60	.84	.86
$L_{control}L_{fear}H_{disgust}4$	.70	.83	.80	.89
$L_{control}L_{fear}L_{disgust}1$	.71	.80	.93	.89
$L_{control}L_{fear}L_{disgust}2$	.76	.79	.94	.89
$L_{control}L_{fear}L_{disgust}3$	.83	.70	.89	.83
$L_{control}L_{fear}L_{disgust}4$	.73	.75	.87	.83

Note. $H_{control}$ = High controlling language $L_{control}$ = Low controlling language

H_{fear} = High fear appeal L_{fear} = Low fear appeal

$H_{disgust}$ = High disgust appeal $L_{disgust}$ = Low disgust appeal

1 = Message 1; 2 = Message 2; 3 = Message 3; 4 = Message 4

Results

Several independent *t*-tests showed manipulations succeeded. For each independent *t*-test, the independent variable was the message manipulation condition and the dependent variable was manipulation check for that condition. Participants in the high controlling language condition (M = 4.40, SD = 1.26) reported higher scores on the extent to which the message contained forceful language than those in the low controlling language condition (M = 3.11, SD = 1.34), $t(495) = -11.05$, $p < .001$, Cohen's $d = 0.99$. Participants in the high fear appeal condition (M = 5.63, SD = 0 .84) reported the message contained more fearful content than those in the low fear appeal condition (M = 5.33, SD = 0.90), $t(992) = -5.36$, $p < .001$, Cohen's d = 0.34. As in Pilot Study 1, message quality was not significantly different between the high fear appeal condition (M = 5.75, SD = .79) and the low fear appeal condition (M = 5.71, SD = 0.77), $t(992) = -.90$, $p = .37$. Participants in the high disgust appeal condition (M = 6.07, SD = 0.77) reported the message contained a significantly higher level of repulsive content than those in the low disgust appeal condition (M = 4.42, SD = 1.13), $t(872) = -27.01$, $p < .001$, Cohen's $d = 1.71$. However, message quality in the high disgust appeal condition (M = 5.84, SD = 083) was reported to be higher than that in the low disgust appeal condition (M = 5.62, SD = 0.77), $t(992) = -4.31$, $p < .001$, Cohen's $d = 0.27$.

Among these 32 messages in eight conditions crossing controlling language (high/ low), fear appeals (high/low), and disgust appeals (high/low), 16 messages (two messages in each condition) were selected to be used in the main study.

The following procedure was followed to select the two messages high on both fear and disgust appeal. Scores of four messages on the level of fear and disgust content (eight scores in total with four scores for fear content and four for disgust content) in high controlling language,

high fear, and high disgust appeal condition were matched and added together with those in low controlling language, high fear, and high disgust appeal cognition. Eight averaged scores (four averaged scores for fear appeal and four for disgust appeal) were obtained from these eight pairs of scores. Then, the four averaged scores on fear content were compared with each other and the four averaged scores on disgust content were compared with each other. The two messages with the two highest scores on both fear and disgust content measure were selected.

Adding high or low controlling language to the high fear and disgust appeal produced two messages high on controlling language, fear, and disgust appeal, and two messages low on controlling language, but high on fear and disgust appeal. In addition, the two messages in each condition varied in terms of the images and the order of paragraphs describing the fear and disgust content of COVID-19 infection. The two messages within the pair were then compared and found not to be significantly different from each other. This exact procedure was repeated for all other conditions to obtain the 16 messages used in the main study.

Main Experimental Study

Participants

For this experiment, a total of 564 participants were recruited on Amazon MTurk on March 2, 2021, and the same recruitment criteria used in Pilot Study 2 were applied, except that participants who had participated in Pilot Study 1 or Pilot Study 2 were not eligible to participate in the main study. To detect a small effect, with $\eta^2_p = .15$ (Cohen, 1992), α set at .05, and power set at .80, GPower suggested a sample of 351 participants; thus, in anticipation of a number of responses being excluded due to failure to meet the required screening criteria, an additional 213 MTurk participants beyond what GPower suggested were recruited. Responses from 117 participants were discarded (the percentage of attrition: 21%) due to failure to complete the study

as instructed, reducing the sample size to 447 responses. Participants were mostly middle-aged (M = 41.68, SD = 12.87, range: 18-75 years), white (N = 315, 70.5%) and there were slightly more females than males. Detailed demographic information is included in Table 6.

Table 6

Sample Characteristics for the Main Study (N = 447)

Measures	N	(%)
Sex		
Male	211	(47.2%)
Female	228	(51.0%)
Intersex	3	(0.7%)
Prefer not to answer	5	(1.1%)
Ethnicity		
American Indian, or Alaska Native	3	(.7%)
Black or African American	25	(5.6%)
Asian, or Asian American	62	(13.9%)
Hispanic, or Latino	31	(6.9%)
White, or Western European	315	(70.5%)
Native Hawaiian or Pacific Islander	0	(0.0%)
Other	6	(1.3%)
Prefer not to answer	5	(1.1%)
Education		
Did not complete high school	2	(.4%)
Graduated from high school	31	(6.9%)
Some college	76	(17.0%)
Associate's degree	54	(12.1%)
Bachelor's degree	191	(42.7%)
Master's degree	74	(16.6%)
Doctoral degree	15	(3.4%)
Prefer not to answer	4	(.9%)
Employment		
Employed full time	273	(61.1%)
Employed part-time	65	(14.5%)
Unemployed looking for work	31	(6.9%)
Unemployed not looking for work	37	(8.3%)
Retired	31	(6.9%)
Prefer not to answer	10	(2.2%)
Income		
Less than $19,999	51	(11.4%)
$20,000-$39,999	87	(19.5%)
$40,000-$59,999	89	(19.9%)
$60,000-$79,999	85	(19.0%)
$80,000-$99,999	61	(13.6%)
More than &100,000	74	(16.6%)
Political Orientation		
Republican	107	(23.9%)
Independent	125	(28.0%)
Democrat	185	(41.4%)

Libertarian	25 (5.6%)
Green Party	5 (1.1%)
COVID-19 Experience	
Know at least 1 with a confirmed case of COVID-19	129 (28.9%)
Know more than 1 with a confirmed case of COVID-19	165 (36.9%)
Not sure	32 (7.2%)
Know no friends, relatives, or acquaintances has a confirmed case of COVID-19	116 (26.0%)
Prefer not to answer	5 (1.1%)

Study Design and Procedures

A 2 (controlling language: high/low) by 2 (fear appeal: high/low) by 2 (disgust appeal: high/low) within 2 (message variations) mixed experimental study was conducted, with controlling language, fear, and disgust appeals as between-subjects factors, and the two message variations assessed as a within-subjects factor.

Participants read a description of the study recruitment information on MTurk. Those interested and qualified were able to accept the human intelligence task (HIT) and access an online questionnaire hosted on Qualtrics to complete the study. They saw consent information as the first page of the survey. Upon consenting, participants were asked to answer questions measuring trait reactance and disgust sensitivity, after which they were randomly assigned to one of eight conditions crossing controlling language (high/low), fear appeals (high/low), and disgust appeals (high/low). In each condition, participants were shown two messages designed for that condition in random order. After each message in the pair was viewed, participants were directed to fill out a battery of scales assessing feelings of fear and disgust, freedom threat perceptions, psychological reactance (anger and negative cognitions), source derogation, message quality, message attitudes, and COVID-19 vaccination intentions. Items for each scale were randomized. Feelings of fear, disgust, perceptions of freedom threat, and vaccination intentions were presented in random order within the first block, given that freedom threat perceptions are the

prerequisite of reactance arousal, feelings of fear and disgust are the key constructs leading to reactance, and increasing vaccination intentions is the ultimate goal of the study. Following the first block, all other scales (i.e., reactance, source derogation, message attitudes, and message quality) were similarly randomized and presented within a second block. Participants reported demographic information after all measures, after which they were thanked and provided a code to claim payment (USD 1.75) from MTurk. Participants took an average of 17.65 minutes (*SD* = 7.26) to complete the study. The university's Institutional Review Board approved data collection.

Stimuli

Sixteen messages selected based on Pilot Study 2, as described above, were used in the main study with two messages in each of the eight conditions. Each message contained information about the consequences of COVID-19 infection described in both textual and graphic format, as well as information about the efficacy of COVID-19 vaccination (Treatment messages are available for viewing only upon request).

Measures

Freedom Threat. Freedom threat perceptions were measured with four items on a 7-point Likert-type scale, with 1 = *Strongly disagree* and 7 = *Strongly agree* (Dillard & Shen, 2005). An exemplary item was, "The message tries to manipulate me."

Perceptions and Psychological Reactance. Following Dillard and Shen (2005), psychological reactance was assessed by measuring anger and negative cognitions. Anger was measured with four items on a 7-point Likert-type scale anchored by 1 = *None of this feeling* and 7 = *A great deal of this feeling* (Dillard & Shen, 2005). An exemplary item was, "Please indicate the extent to which you felt anger while reading the message." Three items were used to measure

negative cognitions (Silvia, 2006). Items were likewise evaluated on a 7-point Likert-type scale, ranging from 1 = *Not at all* to 7 = *Very much*. An exemplary item was, "While reviewing the message, how much were you critical of what was being said?" For the convenience of mediation analyses, following Shen (2011), a composite score for psychological reactance was obtained by summing the standardized scores for anger and negative cognitions.

The Feeling of Fear. Three items were used to measure the feeling of fear on fear appeal exposure (Dillard & Anderson, 2004). Participants were asked to report their feeling of fear on a 7-point Likert-type scale with 1 = *None of this feeling* and 7 = *A great deal of this feeling*. An exemplary item was, "The message made me feel scared."

The Feeling of Disgust. Three items were used to measure the feeling of disgust on disgust appeal exposure (Nabi, 2002). Participants were asked to report their feeling of disgust on a 7-point Likert-type scale with 1 = *None of this feeling* and 7 = *A great deal of this feeling*. An exemplary item was, "The message made me feel gross."

Source Derogation. Reactance was also assessed through source derogation that was measured by twelve items adapted from a source credibility scale (McCroskey & Teven, 1999). Participants were asked to indicate their attitudes toward the source of the message they had just viewed on a 7-point semantic differential scale. Exemplary items included, "Doesn't care about me/Cares about me and Unintelligent/Intelligent".

Trait Reactance. The Refined Hong Psychological Reactance Scale (Hong & Faedda, 1996), with eleven items, was used to measure trait reactance as an individual disposition variable. Items were assessed on a 7-point Likert-type scale, with 1 = *Strongly disagree* and 7 = *Strong agree*. Exemplary items were, "I resist the attempt of others to influence me" and "Advice and recommendations induce me to do just the opposite."

Disgust Sensitivity. Three items from Haidt et al.'s (1994) Disgust Scale and seven items from Tybur et al.'s (2009) Three Functional Domains of Disgust scale were used to measure disgust sensitivity. Participants were asked to respond to ten concepts on a 7-point Likert-type scale with 1 = *Not at all disgusting* and 7 = *Extremely disgusting*. Exemplary items were, "Seeing a cockroach run across the floor," and "Having to touch a dead body."

Message Attitudes. Seven items from Dillard and Shen (2005) were used to measure attitudes toward the messages. Participants were asked to indicate on a 7-point semantic differential scale the extent to which they felt the message was *desirable/undesirable, beneficial/unbeneficial, necessary/unnecessary, positive/negative, unfavorable/favorable, foolish/wise,* and *bad/good*.

COVID-19 Vaccination Intentions. Three items adapted from Nan (2012) were used to measure intentions to get vaccinated on a 7-point Likert-type scale with 1 = *Extremely unlikely/Do not intend to at all*, and 7 = *Extremely likely/Fully intend to*. An example item was, "How likely would you be to get the COVID-19 vaccination in the near future?" (See Table 7 for Cronbach's α for measures and Table 8 for correlations between measures).

Table 7

Cronbach's α for Measures for the Main Study

Measures	F	D	FT	A	NC	SC	AT	BI
$H_{control}H_{fear}H_{disgust}1$	.95	.93	.90	.95	.93	.98	.97	.96
$H_{control}H_{fear}H_{disgust}2$	.97	.91	.91	.96	.92	.98	.97	.93
$L_{control}H_{fear}H_{disgust}1$	.97	.95	.85	.95	.91	.98	.96	.95
$L_{control}H_{fear}H_{disgust}2$	.97	.93	.89	.96	.87	.98	.95	.96
$H_{control}H_{fear}L_{disgust}1$	.99	.87	.85	.96	.89	.98	.98	.98
$H_{control}H_{fear}L_{disgust}2$	.98	.91	.89	.95	.95	.98	.98	.98
$L_{control}H_{fear}L_{disgust}1$	.99	.89	.92	.95	.97	.98	.97	.99
$L_{control}H_{fear}L_{disgust}2$	.98	.86	.91	.93	.96	.97	.98	.99
$H_{control}L_{fear}H_{disgust}1$	.96	.93	.89	.96	.88	.98	.97	.97
$H_{control}L_{fear}H_{disgust}2$	.98	.94	.91	.95	.94	.98	.98	.97
$L_{control}L_{fear}H_{disgust}1$	.95	.92	.85	.95	.94	.98	.97	.99
$L_{control}L_{fear}H_{disgust}2$	.96	.93	.89	.95	.94	.98	.97	.99
$H_{control}L_{fear}L_{disgust}1$	.94	.85	.91	.96	.93	.98	.98	.97
$H_{control}L_{fear}L_{disgust}2$	.95	.96	.91	.95	.95	.98	.98	.97
$L_{control}L_{fear}L_{disgust}1$	.98	.84	.84	.97	.93	.97	.98	.97
$L_{control}L_{fear}L_{disgust}2$	.96	.89	.85	.96	.93	.97	.98	.96

Note. F = Fear; D = Disgust; FT = Freedom Threat; A = Anger; NC = Negative Cognitions; SC = Source Credibility; AT = Message Attitudes; BI = Behavioral Intentions.

1 = Message 1; 2 = Message 2

$H_{control}$ = High controlling language $L_{control}$ = Low controlling language

H_{fear} = High fear appeal L_{fear} = Low fear appeal

$H_{disgust}$ = High disgust appeal $L_{disgust}$ = Low disgust appeal

Table 8

Descriptive Statistics and Correlations among Measured Variables for the Main Study

ME	M	SD	F	D	FT	A	NC	SC	AT	BI
F	3.69	1.88	1	.487**	.086	.066	-.067	.245**	.210**	.308**
D	2.70	1.72		1	.311**	.398**	.300**	-.212**	-.245**	-.022
FT	3.74	1.74			1	.610**	.607**	-.575**	-.603**	-.375**
A	2.43	1.68				1	.744**	-.638**	-.664**	-.422**
NC	2.69	1.68					1	-.704**	-.706**	-.472**
SC	5.31	1.42						1	.893**	.574**
AT	4.98	1.66							1	.593**
BI	5.57	2.03								1

Note. * $p < .05$; ** $p < .01$.

ME = Measures F = Fear; D = Disgust; FT = Freedom Threat; A = Anger; NC = Negative Cognitions; SC = Source Credibility; AT = Message Attitudes; BI = Behavioral Intentions.

Covariates. Participants' political party affiliation and age were included as covariates since they may influence message responses (Hart et al., 2020; Levin et al., 2020). Given message quality evaluations differed between the high disgust and low disgust appeals in Pilot Study 2, message quality was measured as a covariate in the main study, with the same measure used in Pilot Study 1 and 2. Considering that general attitude toward vaccination has been found to correlate with attitude toward a specific vaccine (Peretti-Watel et al., 2014), the general attitude was measured as a covariate using Martin and Petrie's (2017) Vaccination Attitudes Examination scale. Participants were asked to indicate the extent to which they agreed with 12 statements on a 7-point Likert-type scale with 1 = *Strongly disagree* and 7 = *Strongly agree*. An exemplary item was, "I feel safe after being vaccinated." (See Table 9 for Cronbach's α).

Table 9

Cronbach's α for Trait Reactance, Disgust Sensitivity, and Attitudes toward Vaccination in General for the Main Study

Measures	Cronbach's α
Trait Reactance	.89
Disgust Sensitivity	.84
General Attitudes toward Vaccination	.80

Analytic Strategies

Given that message variation was a within-subject factor and that the study included several covariates, repeated measures analyses of covariates (ANCOVAs) were performed to examine the effect of controlling language, fear appeals, and disgust appeals on message responses. The two messages presented as a within-subjects factor, and the experimental conditions as between-subjects factors, with general attitudes toward vaccination, political party affiliation, age, and message quality entered as covariates. In cases where covariates did not significantly influence the dependent variable, they were removed from analyses, and analyses were rerun. Only parameters for significant covariates were reported. Hayes's (2017) PROCESS MACRO Model 6 was used to examine the mediation between attribute-based fear and disgust appeals on message responses. After consulting Hayes (in private communication), a custom model was programmed based on Model 80 (Hayes, 2017) to test the mediation effect of attribute-based message interaction on message responses.

Results

According to O'Keefe (2003), if message conditions are designed based on message attributes, no manipulation check is needed since message attributes are objective and independent of participants' subjective perceptions. Moreover, the emotional content of the messages was assessed based on message attributes within the two pilot studies. Therefore, in the

main study, no manipulation check of the attributes-based message conditions was performed. Though some extant studies have measured the psychological state on message exposure and used it as the manipulation check of message conditions (Shen, 2011), O'Keefe (2003) suggests psychological state due to message exposure is more appropriately analyzed as a mediator rather than a manipulation check. Following O'Keefe (2003), the current study examined feelings of fear and disgust on exposure to the fear and disgust appeals, and entered these psychological states as mediators in analyses.

H1 and H2 examined the effect of controlling language on freedom threat perceptions, psychological reactance (anger and negative cognitions), source derogation, message attitudes, and COVID-19 vaccination intentions. Specifically, H1 proposed that, compared to messages with low controlling language, those with high controlling language induced a) more freedom threat perceptions and more psychological reactance in the form of b) more anger and c) more negative cognitions. H2 predicted that, compared to messages with low controlling language, those with high controlling language led to a) more source derogation, b) fewer favorable message attitudes, and c) lower COVID-19 vaccination intentions.

Repeated measures ANCOVAs were conducted to test the hypotheses. The between-subjects independent variable was controlling language, message variation was a within-subject factor, dependent variables were freedom threat perceptions, reactance in the form of anger and negative cognitions, source credibility, message attitudes, and COVID-19 vaccination intentions, and covariates were general attitudes toward vaccination, quality for two messages, age, and political party affiliation. If covariates did not significantly influence dependent variables, they were removed from the model, and the analysis was rerun. Only significant covariates were

reported here. Results showed controlling language significantly influenced perceptions of freedom threat, source credibility, and message attitudes.

For freedom threat perceptions, $F(1, 444) = 46.23$, $p < .001$, $\eta^2_p = .10$, the covariate of message 2 quality was significant, $F(1, 444) = 82.66$, $p < .001$, $\eta^2_p = .16$. For source credibility, $F(1, 441) = 4.31$, $p = .04$, $\eta^2_p = .01$, significant covariates were, message 1 quality, $F(1, 441) = 66.69$, $p < .001$, $\eta^2_p = .13$; message 2 quality, $F(1, 441) = 15.57$, $p < .001$, $\eta^2_p = .03$; general attitudes toward vaccination, $F(1, 441) = 59.71$, $p < .001$, $\eta^2_p = .12$; and political party affiliation, $F(1, 441) = 7.24$, $p = .01$, $\eta^2_p = .02$. For message attitudes, $F(1, 442) = 4.34$, $p = .04$, $\eta^2_p = .01$, significant covariates were, message 1 quality, $F(1, 442) = 29.45$, $p < .001$, $\eta^2_p = .06$; message 2 quality, $F(1, 442) = 18.25$, $p < .001$, $\eta^2_p = .04$; and general attitudes toward vaccination, $F(1, 442) = 44.38$, $p < .001$, $\eta^2_p = .09$. Participants assigned to the high controlling language condition reported significantly more freedom threat perceptions ($M = 4.22$, $SE = 0.10$), lower source credibility ($M = 5.22$, $SE = 0.062$), and fewer favorable message attitudes ($M = 4.86$, $SE = 0.082$) than those assigned to the low controlling language condition; freedom threat perceptions ($M = 3.24$, $SE = 0.10$), source credibility ($M = 5.40$, $SE = 0.064$), message attitudes ($M = 5.11$, $SE = 0.084$).

There was no significant effect of controlling language on anger, $F(1, 442) = 1.61$, $p = .21$, for which significant covariates were, message 1 quality, $F(1, 442) = 9.82$, $p = .002$, $\eta^2_p = .02$; message 2 quality, $F(1, 442) = 7.99$, $p = .005$, $\eta^2_p = .02$; and general attitudes toward vaccination, $F(1, 442) = 60.14$, $p < .001$, $\eta^2_p = .12$. For negative cognitions, $F(1, 442) = 2.83$, $p = .09$, significant covariates were, message 1 quality, $F(1, 442) = 19.18$, $p < .001$, $\eta^2_p = .04$; message 2 quality, $F(1, 442) = 17.52$, $p < .001$, $\eta^2_p = .04$; and general attitudes toward vaccination, $F(1, 442) = 57.29$, $p < .001$, $\eta^2_p = .12$. For COVID-19 vaccination intentions, $F(1,$

443) = 0.72, $p = .40$, significant covariates were, message 1 quality, $F(1, 443) = 49.26$, $p < .001$, $\eta^2_p = .10$, and general attitudes toward vaccination, $F(1, 443) = 198.10$, $p < .001$, $\eta^2_p = .31$. Therefore, H1a, H2a, and H2b were supported, however, H1b and H1c were no supported, nor was H2c.

RQ1 inquired into the effect of fear appeals on source derogation, message attitudes, and COVID-19 vaccination intentions. Several repeated measures ANCOVAs were performed to examine the question. The between-subject independent variable was fear appeals, message variation was a within-subject factor, dependent variables were source credibility, message attitudes, and COVID-19 vaccination intentions, and covariates were general attitudes toward vaccination, quality for two messages, age, and political party affiliation. If covariates did not significantly influence dependent variables, they were removed from the model, and the analysis was rerun. Only significant covariates were reported here. Results showed that fear appeals significantly influenced source credibility and message attitudes.

For source credibility, $F(1, 441) = 10.48$, $p < .001$, $\eta^2_p = .02$, significant covariates were, message 1 quality, $F(1, 441) = 69.31$, $p < .001$, $\eta^2_p = .14$; message 2 quality, $F(1, 441) = 16.96$, $p < .001$, $\eta^2_p = .04$; political party affiliation, $F(1, 441) = 6.77$, $p = .01$, $\eta^2_p = .02$; and general attitudes toward vaccination, $F(1, 441) = 56.75$, $p < .001$, $\eta^2_p = .11$. For message attitudes, $F(1, 442) = 13.69$, $p < .001$, $\eta^2_p = .03$, significant covariates were, message 1 quality, $F(1, 442) = 31.14$, $p < .001$, $\eta^2_p = .07$; message 2 quality, $F(1, 442) = 20.02$, $p < .001$, $\eta^2_p = .04$; and general attitudes toward vaccination, $F(1, 442) = 41.57$, $p < .001$, $\eta^2_p = .09$.

Participants assigned to the high fear appeal condition indicated significantly lower source credibility evaluations ($M = 5.16$, $SE = 0.063$) and fewer favorable message attitudes ($M = 4.77$, $SE = 0.082$) than those assigned to the low fear appeal condition, source credibility

evaluations (M = 5.45, SE = 0.062), message attitudes (M = 5.20, SE = 0.081). The influence of fear appeals on COVID-19 vaccination intentions was not significant, $F(1, 443) = 0.02$, $p = .89$, for which significant covariates were, message 1 quality, $F(1, 443) = 48.35$, $p < .001$, $\eta^2_p = .10$, and general attitudes toward vaccination, $F(1, 443) = 198.47$, $p < .001$, $\eta^2_p = .31$. Thus, high fear appeals did appear to have a negative influence on source evaluations and message attitudes, but not COVID-19 vaccination intentions.

RQ2 asked whether the effects of fear appeals on a) source derogation, b) message attitudes, and c) COVID-19 vaccination intentions were mediated by perceptions of freedom threat and reactance. To perform mediation analyses in PROCESS, two messages were aggregated to form an overall index for each measure. Therefore, two message in each condition were examined for message effect first. For each analysis, the independent variable was the two messages entered as a within-subjects factor and the dependent variable was the factor relevant to the mediation model. Results showed no message effect for the feeling of fear, Wilk's Λ = 1.00, $F(1, 443) = 0.24$, $p = .63$, the feeling of disgust, Wilk's $\Lambda = 1.00$, $F(1, 443) = 0.15$, $p = .70$, freedom threat perceptions, Wilk's $\Lambda = 1.00$, $F(1, 443) = 0.25$, $p = .62$, psychological reactance, Wilk's $\Lambda = 1.00$, $F(1, 443) = 2.40$, $p = .12$, source derogation, Wilk's $\Lambda = 1.00$, $F(1, 443) = 0.49$, $p = .48$, message attitudes, Wilk's $\Lambda = 1.00$, $F(1, 443) = 0.05$, $p = .82$, or COVID-19 vaccination intentions, Wilk's $\Lambda = 1.00$, $F(1, 443) = 0.06$, $p = .81$, indicating scores for each measure were not significantly different between the two within-pair messages. Thus, using aggregate scores was warranted.

Several mediation analyses were performed with 5,000 bootstraps using the PROCESS MACRO Model 6 (Hayes, 2017). Mediation analyses showed the indirect effect of fear appeals on source credibility through freedom threat and reactance was significant, b = -.04, SE = .02,

95% bootstrap confidence interval: -.080, -.007 (See Model b in Figure 1). There also was a significant indirect effect of fear appeals on source credibility through the feeling of fear, freedom threat, and reactance, *b* = -.01, *SE* = 01, 95% bootstrap confidence interval: -.018, -.001 (See Model c in Figure 1). Table 10 and Model a in Figure 1 (for easier reading, model b and Model c were singled out from Model a throughout the dissertation for significant mediation effects) show the overall model parameters. Of note, *b* was the unstandardized coefficient for all mediation analyses reported in this dissertation.

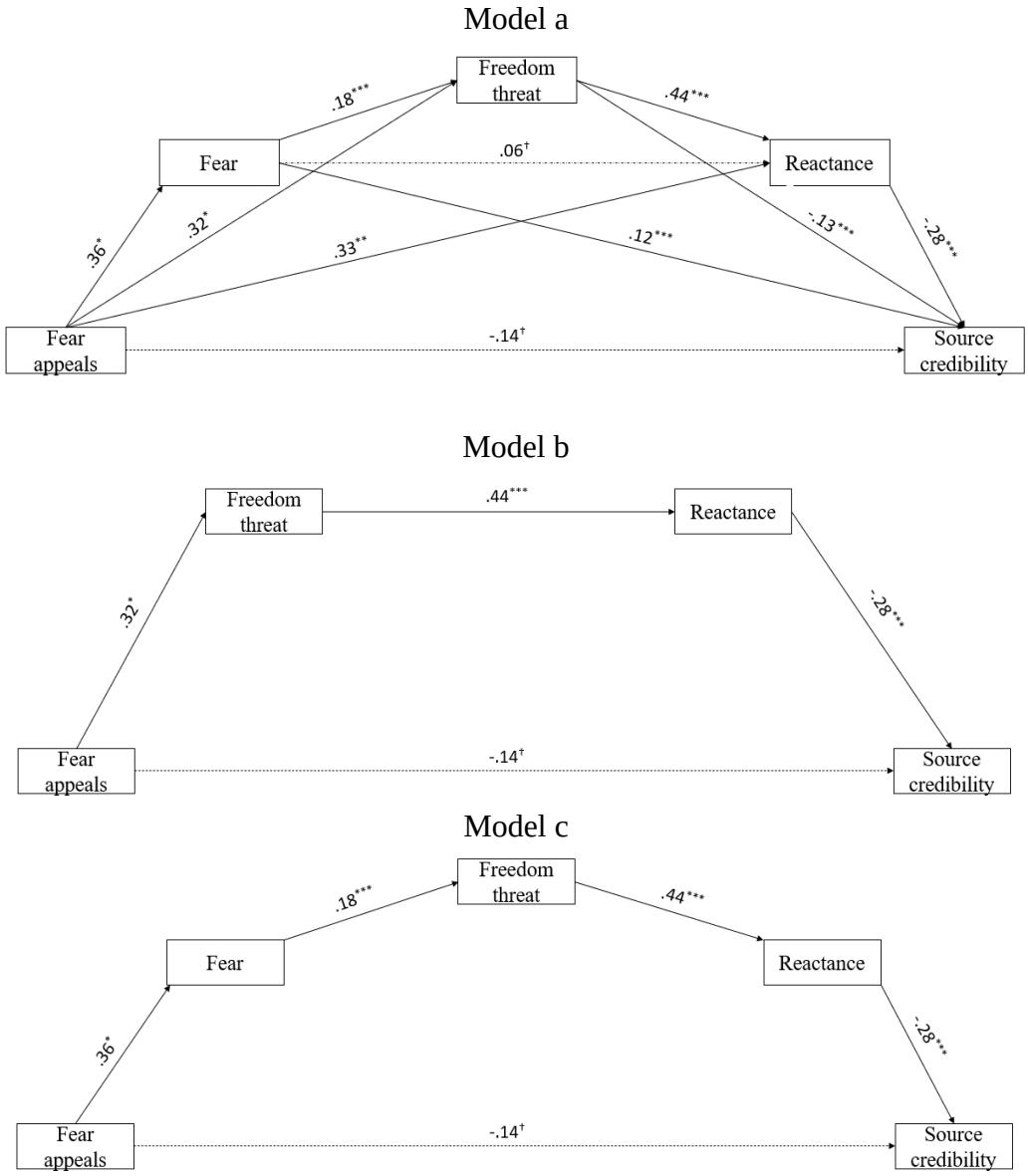
Table 10

Unstandardized Coefficients, SEs, and Model Summary for the Effect of Fear Appeals on Source Credibility

	Fear			Freedom threat			Reactance			Source credibility		
	b	SE	*p*	*b*	SE	*p*	*b*	SE	*p*	*b*	SE	*p*
Fear appeal	.36	.17	.03	.32	.14	.02	.33	.12	.005	-.14	.08	.07
Fear				.18	.04	< .001	.06	.03	.09	.12	.02	< .001
Freedom threat							.44	.04	< .001	-.13	.03	< .001
Reactance										-.28	.03	< .001
Constant	1.14	.51	.03	3.73	.53	< .001	-.04	.48	.93	3.45	.31	< .001
	R^2 = .08			R^2 = .33			R^2 = .55			R^2 = .69		
	$F(4, 442) = 9.48$			$F(5, 441) = 43.00$			$F(6, 440) = 105.09$			$F(7, 439) = 142.79$		
	$p < .001$			$p < .001$			$p < .001$			$p < .001$		

Figure 1

Unstandardized Coefficients and SEs for the Effect of Fear Appeals on Source Credibility



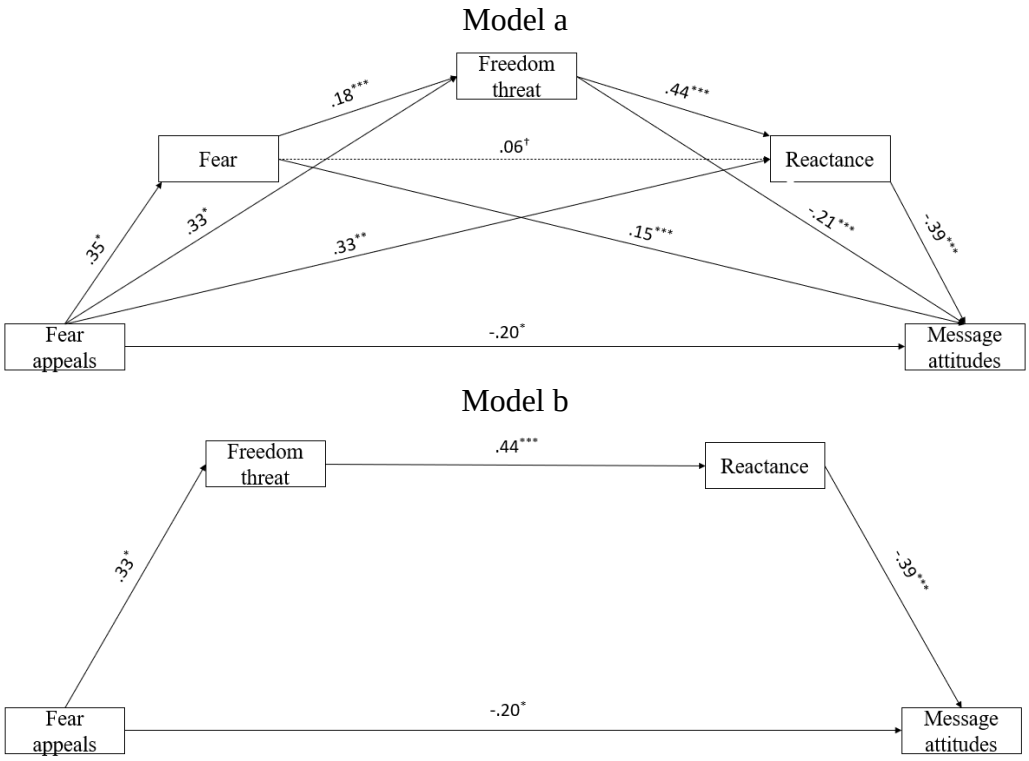
Note. * $p < .05$; ** $p < .01$, *** $p < .001$, † $p < .10$.

The solid line means a statistically significant effect; the dashed line means a statistically insignificant or marginally significant ($p < .10$) effect.

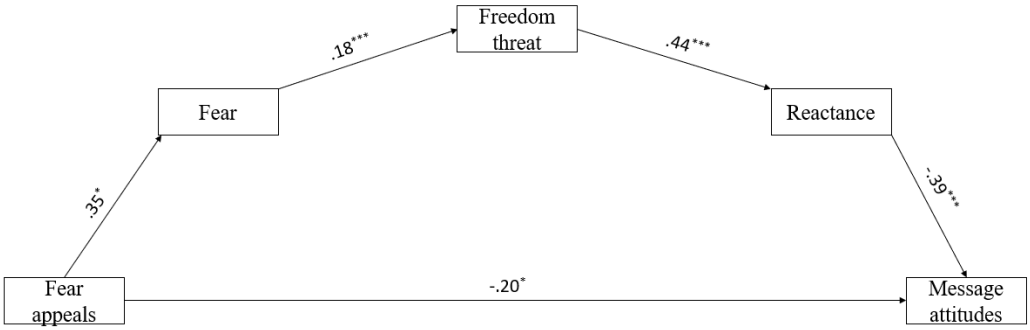
The indirect effect of fear appeals on message attitudes through freedom threat and reactance was significant, *b* = -.06, *SE* = .03, 95% bootstrap confidence interval: -.112, -.010 (See Model b in Figure 2). There also was a significant indirect effect of fear appeals on message attitudes through the feeling of fear, freedom threat, and reactance, *b* = -.01, *SE* = 01, 95% bootstrap confidence interval: -.024, -.001 (See Model c in Figure 2). Table 11 and Model a in Figure 2 show the overall model parameters.

Figure 2

Unstandardized Coefficients and SEs for the Effect of Fear Appeals on Message Attitudes



Model c



Note. * $p < .05$; ** $p < .01$, *** $p < .001$, † $p < .10$.

The solid line means a statistically significant effect; the dashed line means a statistically insignificant or marginally significant effect.

Table 11

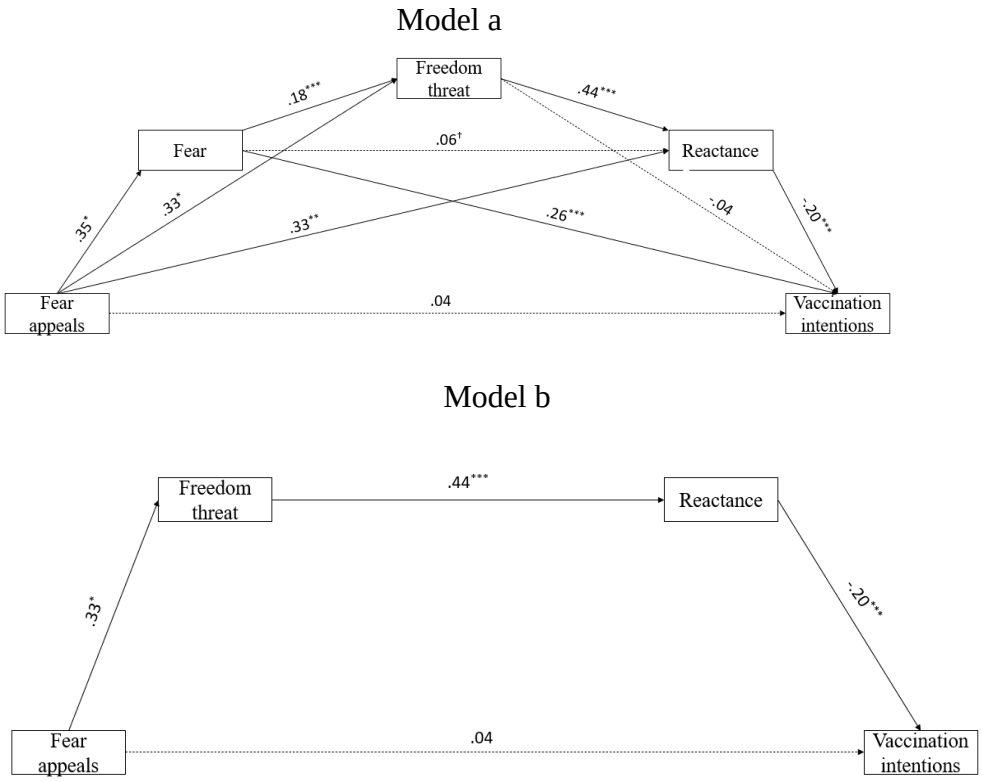
Unstandardized Coefficients, SEs, and Model Summary for the Effect of Fear Appeals on Message Attitudes

	Fear			Freedom threat			Reactance			Message attitudes		
	b	SE	*p*	*b*	SE	*p*	*b*	SE	*p*	*b*	SE	*p*
Fear appeal	.35	.17	.04	.33	.14	.02	.33	.12	.006	-.20	.10	.03
Fear				.18	.04	< .001	.06	.03	.07	.15	.03	< .001
Freedom threat							.44	.04	< .001	-.21	.04	< .001
Reactance										-.39	.04	< .001
Constant	1.17	.66	.08	3.74	.52	< .001	-.08	.48	.87	3.60	.38	< .001
	$R^2 = .07$			$R^2 = .33$			$R^2 = .57$			$R^2 = .66$		
	$F(3, 443) = 10.58$			$F(4, 442) = 53.82$			$F(5, 441) = 116.28$			$F(6, 440) = 139.50$		
	$p < .001$			$p < .001$			$p < .001$			$p < .001$		

The indirect effect of fear appeals on COVID-19 vaccination intentions through freedom threat and reactance was significant, b = -.03, SE = .02, 95% bootstrap confidence interval: -.068, -.003 (See Model b in Figure 3). There was no significant effect of fear appeals on vaccination intentions through the feeling of fear, freedom threat, and reactance, since the 95% bootstrap confidence interval (-.015, 0) includes 0 (b = -.01 SE = .02). Table 12 and Model a in Figure 3 present the overall model parameters.

Figure 3

Unstandardized Coefficients and SEs for the Effect of Fear Appeals on Vaccination Intentions



Note. * $p < .05$; ** $p < .01$, *** $p < .001$, † $p < .10$.

The solid line means a statistically significant effect; the dashed line means a statistically insignificant or marginally significant ($p < .10$) effect.

Table 12

Unstandardized Coefficients, SEs, and Model Summary for the Effect of Fear Appeals on Vaccination Intentions

	Fear			Freedom threat			Reactance			Vaccination intentions		
	b	SE	*p*	*b*	SE	*p*	*b*	SE	*p*	*b*	SE	*p*
Fear appeal	.35	.17	.04	.33	.14	.02	.33	.12	.006	.04	.14	.79
Fear				.18	.04	< .001	.06	.03	.07	.26	.04	< .001
Freedom threat							.44	.04	< .001	-.04	.05	.46
Reactance										-.20	.06	< .001
Constant	1.17	.66	.08	3.74	.52	< .001	-.08	.48	.87	6.69	.56	< .001
	$R^2 = .07$			$R^2 = .33$			$R^2 = .57$			$R^2 = .50$		
	$F(3, 443) = 10.58$			$F(4, 442) = 53.82$			$F(5, 441) = 116.28$			$F(6, 440) = 72.30$		
	$p < .001$			$p < .001$			$p < .001$			$p < .001$		

H3 predicted that, compared to low disgust appeals, high disgust appeals lead to a) less source derogation, b) more favorable message attitudes, and c) higher COVID-19 vaccination intentions. Several repeated measures ANCOVAs were performed. The between-subject independent variable was disgust appeals, message variation was a within-subject factor, dependent variables were source credibility, message attitudes, and COVID-19 vaccination intentions, and covariates were general attitudes toward vaccination, quality for two messages, age, and political party affiliation. If covariates did not significantly influence dependent variables, they were removed from the model, and the analysis was rerun. Only significant covariates were reported here. Results showed that disgust appeals significantly influenced source credibility and message attitudes.

For source credibility, $F(1, 441) = 5.39$, $p = .02$, $\eta^2_p = .01$, significant covariates were, message 1 quality, $F(1, 441) = 68.65$, $p < .001$, $\eta^2_p = .14$; message 2 quality, $F(1, 441) = 16.16$, $p < .001$, $\eta^2_p = .04$; political party affiliation, $F(1, 441) = 8.17$, $p = .01$, $\eta^2_p = .02$; and general attitudes toward vaccination, $F(1, 441) = 60.71$, $p < .001$, $\eta^2_p = .12$. For message attitudes, $F(1, 442) = 11.48$, $p = .001$, $\eta^2_p = .03$, significant covariates were, message 1 quality, $F(1, 442) = 31.03$, $p < .001$, $\eta^2_p = .07$; message 2 quality, $F(1, 442) = 19.40$, $p < .001$, $\eta^2_p = .04$; and general attitudes toward vaccination, $F(1, 442) = 46.99$, $p < .001$, $\eta^2_p = .10$. The influence of disgust appeals on COVID-19 vaccination intentions was not significant, $F(1, 443) = 1.59$, $p = .21$, for which significant covariates were, message 1 quality, $F(1, 443) = 48.99$, $p < .001$, $\eta^2_p = .10$, and general attitudes toward vaccination, $F(1, 443) = 201.02$, $p < .001$, $\eta^2_p = .31$).

Participants assigned to the high disgust appeal condition indicated lower source credibility evaluations ($M = 5.21$, $SE = .062$) and fewer favorable message attitudes ($M = 4.79$, $SE = .081$) than those assigned to the low disgust appeal condition, source credibility evaluations

(M = 5.41, SE = .064), message attitudes (M = 5.19, SE = .083). Therefore, H3 was not supported.

RQ3 was concerned with whether the effect of disgust appeals on a) source derogation, b) message attitudes, and c) COVID-19 vaccination intentions was mediated by freedom threat and psychological reactance. Several mediation analyses were performed using PROCESS MACRO Model 6 with the exact specifications as the previous mediation analyses.

The indirect effect of disgust appeals on source credibility through freedom threat and reactance was not significant, b = .001, SE = .02, 95% bootstrap confidence interval: -.036, .037. However, there was a significant indirect effect of disgust appeals on source credibility through serial mediators—the feeling of disgust, freedom threat, and reactance, b = -.05, SE = .01, 95% bootstrap confidence interval: -.080, -.025 (See Model b in Figure 4). Table 13 and Model a in Figure 4 present the overall model parameters.

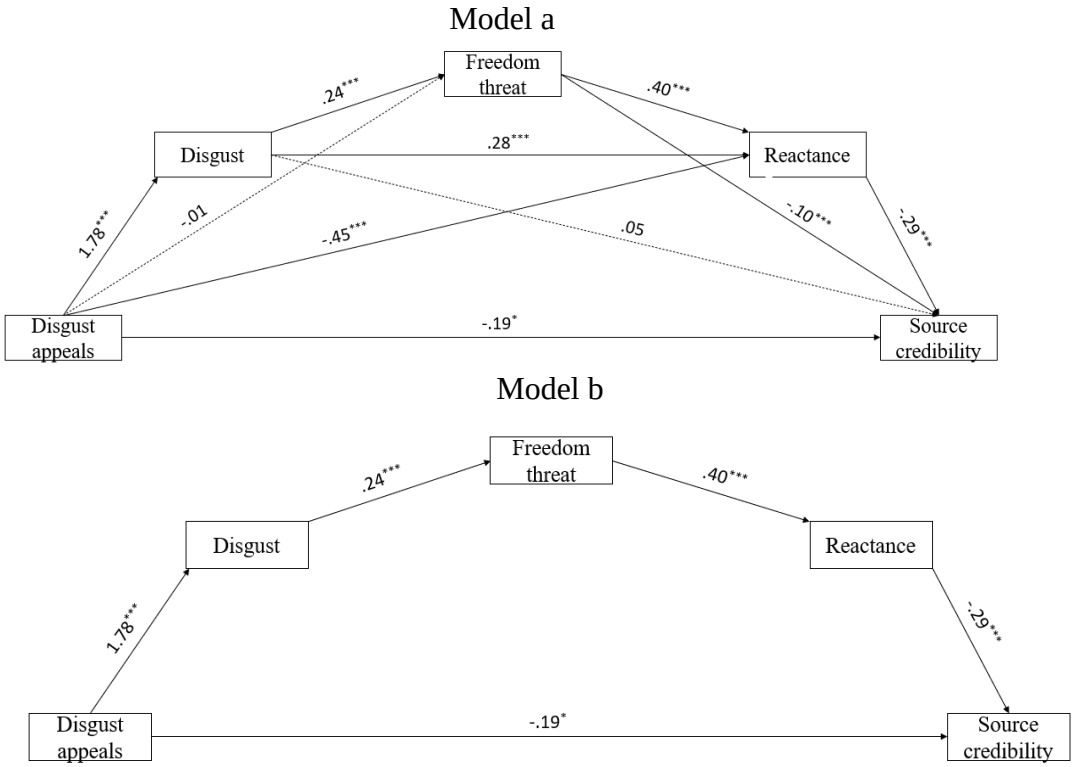
Table 13

Unstandardized Coefficients, SEs, and Model Summary for the Effect of Disgust Appeals on Source Credibility

	Disgust			Freedom threat			Reactance			Source credibility		
	b	SE	*p*	*b*	SE	*p*	*b*	SE	*p*	*b*	SE	*p*
Disgust appeal	1.78	.14	< .001	-.01	.16	.97	-.45	.13	< .001	-.19	.09	.04
Disgust				.24	.05	< .001	.28	.04	< .001	.05	.03	.12
Freedom threat							.40	.04	< .001	-.10	.03	< .001
Reactance										-.29	.03	< .001
Constant	.15	.55	.79	3.75	.54	< .001	.52	.47	.27	3.54	.32	< .001
	$R^2 = .29$			$R^2 = .33$			$R^2 = .60$			$R^2 = .67$		
	$F(4, 442) = 45.23$			$F(5, 441) = 44.30$			$F(6, 440) = 111.45$			$F(7, 439) = 129.94$		
	$p < .001$			$p < .001$			$p < .001$			$p < .001$		

Figure 4

Unstandardized Coefficients and SEs for the Effect of Disgust Appeals on Source Credibility



Note. * $p < .05$; ** $p < .01$, *** $p < .001$.

The solid line means a statistically significant effect; the dashed line means a statistically insignificant effect.

The indirect effect of disgust appeals on message attitudes through freedom threat and reactance was not significant, $b = .001$, $SE = .03$, 95% bootstrap confidence interval: -.048, .052. However, there was a significant indirect effect of disgust appeals on message attitudes through serial mediators—the feeling of disgust, freedom threat, and reactance, $b = -.07$, $SE = .02$, 95% bootstrap confidence interval: -.113, -.035 (See Model b in Figure 5). Table 14 and Model a in Figure 5 include the overall model parameters.

Table 14

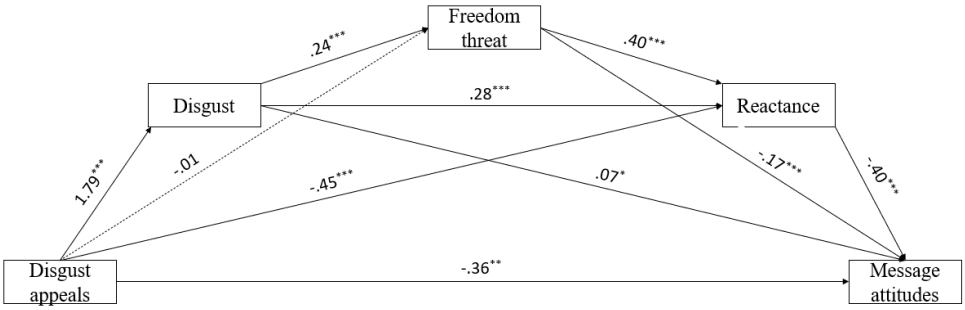
Unstandardized Coefficients, SEs, and Model Summary for the Effect of Disgust Appeals on Message Attitudes

	Disgust			Freedom threat			Reactance			Message attitudes		
	b	SE	*p*	*b*	SE	*p*	*b*	SE	*p*	*b*	SE	*p*
Disgust appeal	1.79	.14	< .001	-.01	.16	.96	-.45	.13	< .001	-.36	.11	.002
Disgust				.24	.05	< .001	.28	.04	< .001	.07	.04	.04
Freedom threat							.40	.04	< .001	-.17	.04	< .001
Reactance										-.40	.04	< .001
Constant	.10	.55	.86	3.77	.53	< .001	.48	.47	.30	3.82	.40	< .001
	$R^2 = .29$			$R^2 = .33$			$R^2 = .60$			$R^2 = .63$		
	$F(3, 443) = 60.10$			$F(4, 442) = 55.45$			$F(5, 441) = 133.65$			$F(6, 440) = 127.45$		
	$p < .001$			$p < .001$			$p < .001$			$p < .001$		

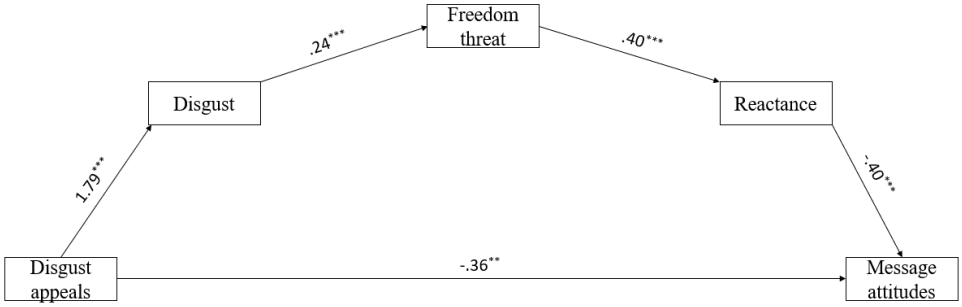
Figure 5

Unstandardized Coefficients and SEs for the Effect of Disgust Appeals on Message Attitudes

Model a



Model b



Note. * $p < .05$; ** $p < .01$, *** $p < .001$.

The solid line means a statistically significant effect; the dashed line means a statistically insignificant effect.

The indirect effect of disgust appeals on COVID-19 vaccination intentions through freedom threat and reactance was not significant, $b = .001$, $SE = .02$, 95% bootstrap confidence interval: -.033, .034. However, there was a significant indirect effect of disgust appeals on vaccination intentions through serial mediators—the feeling of disgust, freedom threat, and reactance, $b = -.04$, $SE = .02$, 95% bootstrap confidence interval: -.083, -.016 (See Model b in Figure 6). Table 15 and Model a in Figure 6 present the overall model parameters.

Table 15

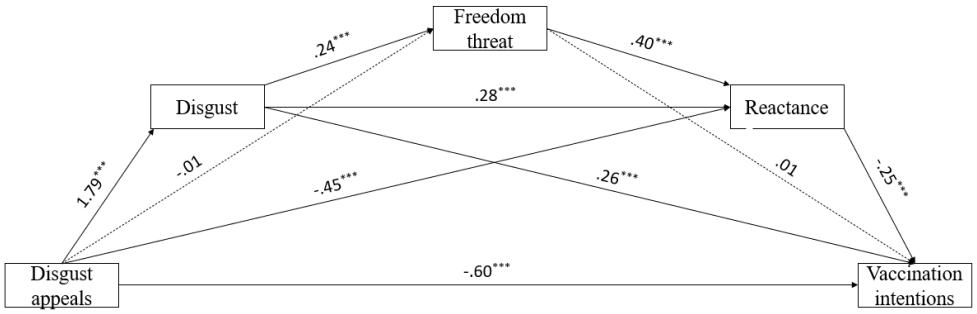
Unstandardized Coefficients, SEs, and Model Summary for the Effect of Disgust Appeals on Vaccination Intentions

	Disgust			Freedom threat			Reactance			Vaccination intentions		
	b	SE	*p*	*b*	SE	*p*	*b*	SE	*p*	*b*	SE	*p*
Disgust appeal	1.79	.14	< .001	-.01	.16	.96	-.45	.13	< .001	-.60	.17	< .001
Disgust				.24	.05	< .001	.28	.04	< .001	.26	.05	< .001
Freedom threat							.40	.04	< .001	.01	.05	.86
Reactance										-.25	.06	< .001
Constant	.10	.55	.86	3.77	.53	< .001	.48	.47	.30	7.26	.59	< .001
	$R^2 = .29$			$R^2 = .33$			$R^2 = .60$			$R^2 = .47$		
	$F(3, 443) = 60.10$			$F(4, 442) = 55.45$			$F(5, 441) = 133.65$			$F(6, 440) = 66.31$		
	$p < .001$			$p < .001$			$p < .001$			$p < .001$		

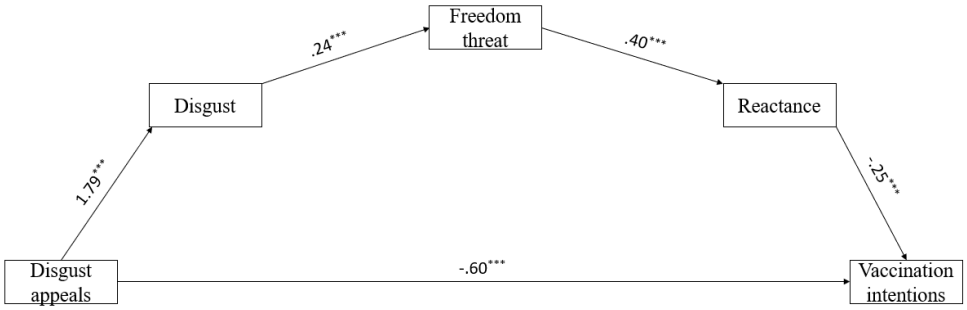
Figure 6

Unstandardized Coefficients and SEs for the Effect of Disgust Appeals on Vaccination Intentions

Model a



Model b



Note. * $p < .05$; ** $p < .01$, *** $p < .001$.

The solid line means a statistically significant effect; the dashed line means a statistically insignificant effect.

H4 and H5 tested the interaction among controlling language, fear, and disgust appeals on freedom threat, psychological reactance, source derogation, message attitudes, and COVID-19 vaccination intentions. H4 predicted controlling language interacted with fear and disgust appeals such that a) perceptions of freedom threat and psychological reactance in the form of b) anger and c) negative cognitions were lower when controlling language, fear and disgust appeals were at the high level than when controlling language was at the high level whereas fear and disgust appeals were at the low level. H5 proposed controlling language interacted with fear and

disgust appeals such that a) source derogation was lower, and b) message attitudes were more positive, and c) COVID-19 vaccination intentions were higher when controlling language, fear, and disgust appeals were at the high level than when controlling language was at the high level but fear and disgust appeals were at the low level.

Several repeated measures ANCOVAs were performed. The between-subject independent variables were controlling language, fear appeals, and disgust appeals, message variation was a within-subject factor, dependent variables were freedom threat perceptions, reactance in the form of anger and negative cognitions, source credibility, message attitudes, and COVID-19 vaccination intentions, and covariates were general attitudes toward vaccination, quality for two messages, age, and political party affiliation. If covariates did not significantly influence dependent variables, they were removed from the model, and the analysis was rerun. Only significant covariates were reported here.

Results revealed no 3-way interaction on freedom threat, $F(1, 437) = .15$, $p = .70$, for which significant covariates were, message 2 quality, $F(1, 437) = 51.67$, $p < .001$, $\eta^2_p = .11$, and general attitudes toward vaccination, $F(1, 437) = 84.20$, $p < .001$, $\eta^2_p = .16$; anger, $F(1, 436) = 1.35$, $p = .25$, for which significant covariates were, message 1 quality, $F(1, 436) = 10.20$, $p = .002$, $\eta^2_p = .02$; message 2 quality, $F(1, 436) = 8.51$, $p = .004$, $\eta^2_p = .02$; and general attitudes toward vaccination, $F(1, 436) = 60.96$, $p < .001$, $\eta^2_p = .12$, or negative cognitions, $F(1, 436) = .32$, $p = .57$, for which significant covariates were, message 1 quality, $F(1, 436) = 19.37$, $p < .001$, $\eta^2_p = .04$; message 2 quality, $F(1, 436) = 18.35$, $p < .001$, $\eta^2_p = .04$; and general attitudes toward vaccination, $F(1, 436) = 56.14$, $p < .001$, $\eta^2_p = .11$.

The 3-way interaction was also not significant on source credibility, $F(1, 435) = .94$, $p = .33$, for which significant covariates were, message 1 quality, $F(1, 435) = 66.87$, $p < .001$, $\eta^2_p =$

.13; message 2 quality, $F(1, 435) = 18.04$, $p < .001$, $\eta^2_p = .04$; general attitudes toward vaccination, $F(1, 435) = 59.90$, $p < .001$, $\eta^2_p = .12$; and political party affiliation, $F(1, 435) = 6.99$, $p = .008$, $\eta^2_p = .02$; message attitudes, $F(1, 436) = .31$, $p = .58$, for which significant covariates were, message 1 quality, $F(1, 436) = 29.59$, $p < .001$, $\eta^2_p = .06$; message 2 quality, $F(1, 436) = 21.43$, $p < .001$, $\eta^2_p = .05$; and general attitudes toward vaccination, $F(1, 436) = 45.95$, $p < .001$, $\eta^2_p = .10$, or COVID-19 vaccination intentions, $F(1, 437) = .04$, $p = .83$, for which significant covariates were, message 1 quality, $F(1, 437) = 47.22$, $p < .001$, $\eta^2_p = .10$, and general attitudes toward vaccination, $F(1, 437) = 197.64$, $p < .001$, $\eta^2_p = .31$.

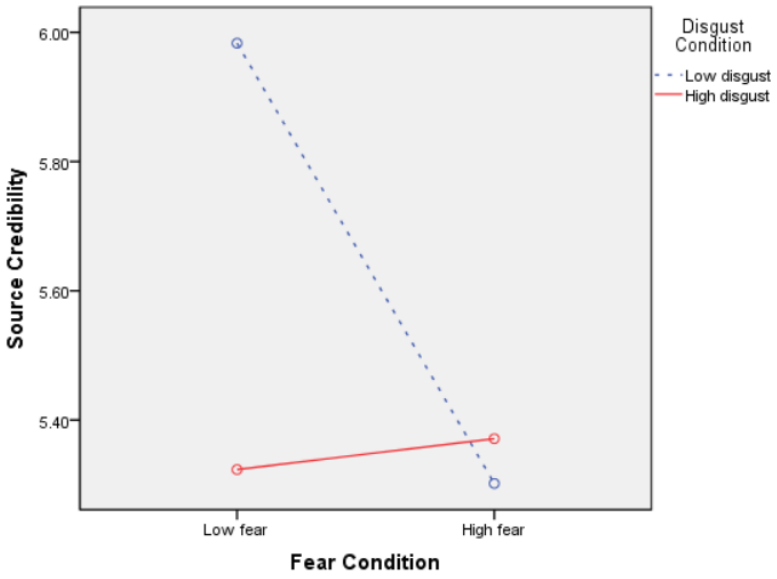
To further examine H4 and H5, the controlling language condition was split into high vs. low conditions. In the high controlling language condition, the interaction between fear and disgust appeals on source credibility was insignificant, $F(1, 221) = 2.12$, $p = .15$, for which significant covariates were, message 1 quality, $F(1, 221) = 42.49$, $p < .001$, $\eta^2_p = .16$; message 2 quality, $F(1, 221) = 8.89$, $p = .003$, $\eta^2_p = .04$; and general attitudes toward vaccination, $F(1, 221) = 23.47$, $p < .001$, $\eta^2_p = .10$. However, the interaction became significant in the low controlling language condition, $F(1, 212) = 8.39$, $p = .004$, $\eta^2_p = .04$ (See Figure 7), for which the significant covariates were, message 1 quality, $F(1, 212) = 22.79$, $p < .001$, $\eta^2_p = .10$; message 2 quality, $F(1, 212) = 9.73$, $p = .002$, $\eta^2_p = .04$; and general attitudes toward vaccination, $F(1, 212) = 39.45$, $p < .001$, $\eta^2_p = .16$.

When the controlling language was at the low level, participants in the low disgust-low fear appeal condition ($M = 5.98$, $SE = .130$) evaluated the message source as significantly more credible than those in the low disgust-high fear appeal condition ($M = 5.30$, $SE = .127$), $F(1, 212) = 13.96$, $p < .001$, $\eta^2_p = .06$, and those in the low fear-high disgust appeal condition ($M = 5.32$, $SE = .121$), $F(1, 212) = 13.88$, $p < .001$, $\eta^2_p = .06$. When the controlling language was at the low

level, there was no significant difference between the high disgust-low fear appeal (M = 5.32, SE = .121) and the high disgust-high fear appeal condition (M = 5.37, SE = .125), $F(1, 212) = .08$, p = .78, and between the high fear-low disgust appeal (M = 5.30, SE = .127) and the high fear-high disgust appeal condition (M = 5.37, SE = .125), $F(1, 212) = .15$, p = .70.

Figure 7

Fear by Disgust Appeal Interaction on Source Credibility in the Low Controlling Language Condition



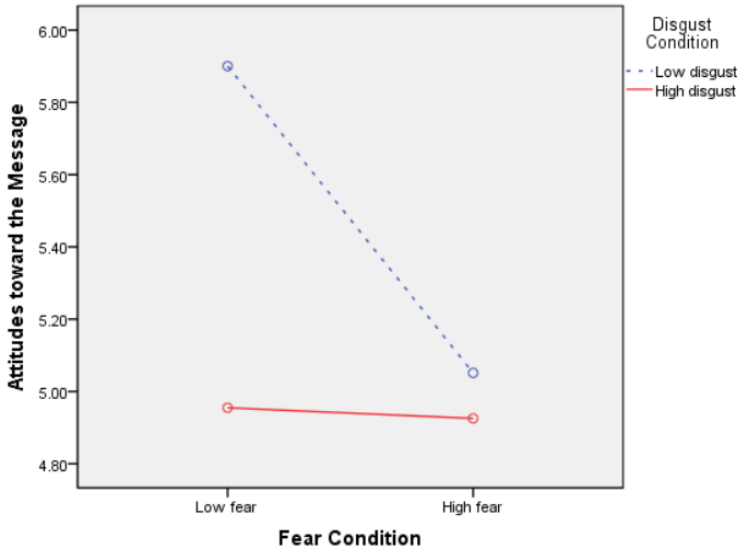
Regarding message attitudes, in the high controlling language condition, there was no interaction between fear and disgust appeals, $F(1, 221) = 2.57$, p = .11, for which significant covariates were, message 1 quality, $F(1, 221) = 18.72$, $p < .001$, $\eta^2_p = .08$; message 2 quality, $F(1, 221) = 12.58$, $p < .001$, $\eta^2_p = .05$; and general attitudes toward vaccination, $F(1, 221) = 10.64$, $p = .001$, $\eta^2_p = .05$. In the low controlling language condition, however, the interaction was significant, $F(1, 212) = 6.92$, $p = .009$, $\eta^2_p = .03$ (See Figure 8), for which significant covariates were: message 1 quality, $F(1, 212) = 10.03$, $p = .001$, $\eta^2_p = .05$; message 2 quality,

$F(1, 212) = 8.78$, $p = .001$, $\eta^2_p = .04$; and general attitudes toward vaccination, $F(1, 212) = 40.71$, $p < .001$, $\eta^2_p = .16$.

When the controlling language was at the low level, participants in the low disgust-low fear appeal condition ($M = 5.90$; $SE = .161$) reported significantly more favorable message attitudes than those in the low disgust-high fear appeal condition ($M = 5.05$, SE = .157), $F(1, 212) = 14.16$, $p < .001$, $\eta^2_p = .06$, and those in the low fear-high disgust appeal condition ($M = 4.96$, $SE = .149$), $F(1, 212) = 18.61$, $p < .001$, $\eta^2_p = .08$. Attitudes toward the message were not significantly different between the high disgust-low fear appeal condition ($M = 4.96$, S$E = .149$) and the high disgust-high fear appeal condition ($M = 4.93$, $SE = .155$), $F(1, 212) = .02$, $p = .89$; and between the high fear-low disgust appeal condition ($M = 5.05$, $SE = .157$) and the high fear-high disgust appeal condition ($M = 4.93$, $SE = .155$), $F(1, 212) = .33$, $p = .57$, when the controlling language was at the low level.

Figure 8

Fear by Disgust Appeal Interaction on Attitudes Toward the Message in the Low Controlling Language Condition



There was no significant interaction between fear and disgust appeals on COVID-19 vaccination intentions in the high controlling language condition, $F(1, 222) = 1.52$, $p = .22$, for which significant covariates were, message 1 quality, $F(1, 222) = 30.84$, $p < .001$, $\eta^2_p = .12$, and general attitudes toward vaccination, $F(1, 222) = 85.18$, $p < .001$, $\eta^2_p = .28$. For the low controlling language condition, $F(1, 213) = 2.29$, $p = .13$, significant covariates were, message 1 quality, $F(1, 213) = 16.39$, $p < .001$, $\eta^2_p = .07$, and general attitudes toward vaccination, $F(1, 213) = 110.84$, $p < .001$, $\eta^2_p = .34$. The interaction between fear and disgust appeals on freedom threat was not significant in the high controlling language condition, $F(1, 222) = .27$, $p = .61$, for which significant covariates were: message 2 quality, $F(1, 222) = 31.58$, $p < .001$, $\eta^2_p = .13$, and general attitudes toward vaccination, $F(1, 222) = 23.28$, $p < .001$, $\eta^2_p = .10$. For the low controlling language condition, $F(1, 213) = 1.61$, $p = .21$, significant covariates were, message 2 quality, $F(1, 213) = 19.28$, $p < .001$, $\eta^2_p = .08$, and general attitudes toward vaccination, $F(1, 213) = 72.07$, $p < .001$, $\eta^2_p = .25$. The interaction between fear and disgust appeals on anger was also not significant in the high controlling language condition, $F(1, 222) = .56$, $p = .45$, for which significant covariates were: message 2 quality, $F(1, 222) = 46.56$, $p < .001$, $\eta^2_p = .17$, and general attitudes toward vaccination, $F(1, 222) = 14.29$, $p < .001$, $\eta^2_p = .06$. For the low controlling language condition, $F(1, 213) = .49$, $p = .48$, the significant covariates were, message 2 quality, $F(1, 213) = 26.27$, $p < .001$, $\eta^2_p = .11$, and general attitudes toward vaccination, $F(1, 213) = 64.84$, $p < .001$, $\eta^2_p = .23$. The interaction between fear and disgust appeals on negative cognitions was not significant in the high controlling language condition, $F(1, 221) = .03$, $p = .87$, for which significant covariates were, message 1 quality, $F(1, 221) = 12.54$, $p < .001$, $\eta^2_p = .05$; message 2 quality, $F(1, 221) = 8.60$, $p = .004$, $\eta^2_p = .04$; and general attitudes toward vaccination, $F(1, 221) = 8.99$, $p = .003$, $\eta^2_p = .04$. For the low controlling language condition,

$F(1, 212) = .41$, $p = .52$, the significant covariates were: message 1 quality, $F(1, 212) = 7.00$, $p = .01$, $\eta^2_p = .03$; message 2 quality, $F(1, 212) = 9.80$, $p = .002$, $\eta^2_p = .04$; and general attitudes toward vaccination, $F(1, 212) = 58.81$, $p < .001$, $\eta^2_p = .22$.

These results further indicated that, in the high controlling language condition, the level of fear and disgust appeals did not influence message responses. However, in the low controlling language condition, message responses were the most positive when both fear and disgust appeals were at the low level. Therefore, H4 and H5 were not supported.

RQ4 examined whether the effects of message condition on a) source derogation, b) message attitudes, and c) COVID-19 vaccination intentions were mediated by perceptions of freedom threat and psychological reactance. Several mediation analyses were performed using an adapted version of Model 80 of the PROCESS MACRO v3.5 (Hayes, 2017). After consulting Hayes (private correspondence), a custom model was created to perform the mediation since the proposed mediation diagram did not fit any of the preprogrammed models in PROCESS.

In the custom model, message condition (i.e., controlling language x fear appeals x disgust appeals) was entered as a single independent variable; feelings of fear and disgust were parallel mediators between message condition and perceived freedom threat; perceived freedom threat and psychological reactance were serial mediators between feelings of fear and disgust and dependent variables; source derogation, message attitudes, and vaccination intentions were each entered as the dependent variables (See Figure 9 for the custom model). The model was performed three times with one dependent variable each time. Of note, the independent variable was multicategory (i.e., the eight groups). Therefore, in running the mediation, the custom model automatically dummy-coded the message condition into seven variables (Hayes, 2017), with the low controlling language-low fear-low disgust appeal condition coded as the reference group.

Each analysis produced seven direct effects on each dependent variable and multiple indirect effects (i.e., relative indirect effects) instead of a single direct or indirect effect produced when the independent variable is continuous or dichotomous.

Considering there were seven paths from the multicategory independent variable (e.g., message condition) to each mediator, reporting the *bs* and *SEs* of all indirect effects for the independent variable using diagrams did not seem optimal. Therefore, the study reported the overall model parameters for each dependent variable, *b* and *SE* for each indirect effect through proposed mediators in tables, and the proposed mediating diagram (See Figure 9).

According to Hayes (2017), the effect of a multicategory independent variable with *g* groups (having *g-1* relative indirect effects) on a dependent variable can be said to be mediated by a third variable "if at least one of the *g-1* relative indirect effects is different from 0" (p. 192). Hayes suggests using a bootstrap confidence interval for inferring the relative indirect effects: The indirect effects are seen as significantly different from zero when the confidence interval does not include zero. These criteria were used to decide the existence of mediation effects.

Figure 9

Proposed Mediation Model

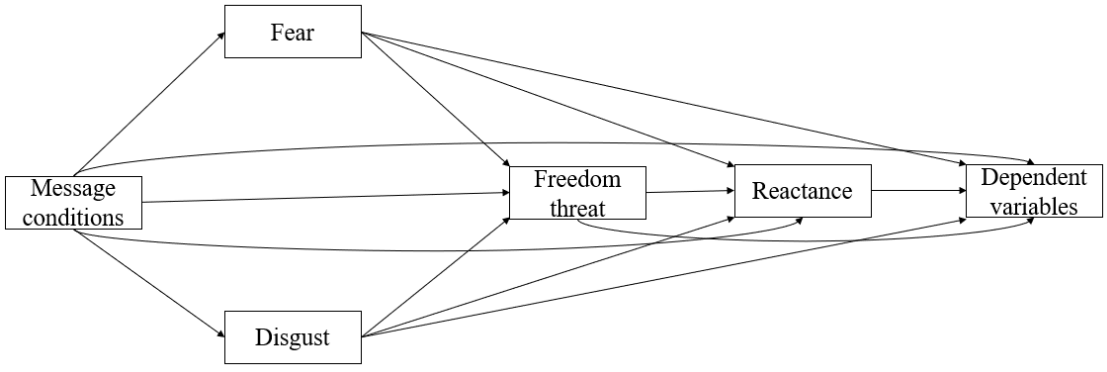


Table 16 reported the model parameters for the effect of message condition on source credibility. The indirect effect of message condition on source credibility through freedom threat

and reactance was significant for six out of seven groups of message condition (See Table 17 for the *b* and *SE* for each significant relative indirect effect). The indirect effect of message condition on source credibility through serial mediators—the feeling of fear, freedom threat, and reactance, was not significant (95% bootstrap confidence intervals included 0; See Table 18). However, the indirect effect of message condition on source credibility through serial mediators—the feeling of disgust, freedom threat, and reactance, was significant for five out of seven groups of message condition (See Table 19 for the *b* and *SE* for each significant relative indirect effect). Based on Hayes's (2017) criterion about the existence of mediation effect for a multicategory variable, as mentioned above, it can be concluded that the indirect effect of message condition on source credibility through freedom threat and reactance was significant.

Table 16

Unstandardized Coefficients, SEs, and Model Summary for Source Credibility

	Fear			Disgust			Freedom threat			Reactance			Source credibility		
	b	SE	*p*	*b*	SE	*p*	*b*	SE	*p*	*b*	SE	*p*	*b*	SE	*p*
$H_{control}H_{fear}L_{disgust}$	.44	.35	.20	.48	.29	.09	1.64	.26	< .001	-.07	.24	.76	-.55	.16	< .001
$H_{control}L_{fear}L_{disgust}$	.29	.33	.39	.10	.28	.71	1.32	.25	< .001	-.49	.23	.04	-.30	.16	.06
$L_{control}H_{fear}L_{disgust}$	.50	.34	.15	.33	.28	.25	.62	.26	.02	-.04	.23	.85	-.61	.15	< .001
$H_{control}L_{fear}H_{disgust}$	1.16	.34	<.001	1.66	.28	< .001	1.33	.27	< .001	-.77	.23	.002	-.53	.16	.001
$L_{control}L_{fear}H_{disgust}$	1.01	.34	.003	2.13	.28	< .001	.34	.27	.21	-.79	.24	.001	-.63	.16	< .001
$L_{control}H_{fear}H_{disgust}$	1.06	.34	.002	1.99	.28	< .001	.69	.27	.01	-.28	.24	.25	-.40	.16	.01
$H_{control}H_{fear}H_{disgust}$	1.82	.33	<.001	2.26	.28	< .001	1.33	.27	< .001	-.54	.25	.03	-.59	.17	< .001
Fear							.07	.04	.11	-.05	.04	.18	.16	.02	< .001
Disgust							.19	.05	< .001	.30	.05	< .001	-.04	.03	.24
Freedom threat										.42	.04	< .001	-.11	.03	< .001
Reactance													-.27	.03	< .001
Constant	.81	.65	.21	1.74	.54	.001	2.64	.50	< .001	.20	.45	.66	3.58	.30	< .001
	R^2 = .14			R^2 = .30			R^2 = .43			R^2 = .62			R^2 = .71		
	$F(9, 437) = 8.18$, $p < .001$			$F(9, 437) = 21.18$ $p < .001$			$F(11, 435) = 30.36$ $p < .001$			$F(12, 434) = 57.91$ $p < .001$			$F(13, 433) = 80.37$ $p < .001$		

Note. $H_{control}$ = High controlling language $L_{control}$ = Low controlling language

H_{fear} = High fear appeal L_{fear} = Low fear appeal

$H_{disgust}$ = High disgust appeal $L_{disgust}$ = Low disgust appeal

Table 17

The Indirect Effect of Message Conditions on Source Credibility through Freedom Threat and Psychological Reactance

Message Condition	*b*	BootSE	LLCI	ULCI
$H_{control}H_{fear}L_{disgust}$	-.19[a]	.04	-.279	-.109
$H_{control}L_{fear}L_{disgust}$	-.15[a]	.04	-.235	-.082
$L_{control}H_{fear}L_{disgust}$	-.07[a]	.03	-.133	-.020
$H_{control}L_{fear}H_{disgust}$	-.15[a]	.04	-.237	-.081
$L_{control}L_{fear}H_{disgust}$	-.04	.03	-.097	.013
$L_{control}H_{fear}H_{disgust}$	-.08[a]	.03	-.147	-.022
$H_{control}H_{fear}H_{disgust}$	-.15[a]	.04	-.239	-.083

Note. [a] indicates the indirect effect is significant because the percentile bootstrap confidence interval did not include 0, based on a bootstrap sample of 5000.

$H_{control}$ = High controlling language $L_{control}$ = Low controlling language

H_{fear} = High fear appeal L_{fear} = Low fear appeal

$H_{disgust}$ = High disgust appeal $L_{disgust}$ = Low disgust appeal

Table 18

The Indirect Effect of Message Conditions on Source Credibility through Fear, Freedom Threat, and Psychological Reactance

Message Condition	*b*	BootSE	LLCI	ULCI
$H_{control}H_{fear}L_{disgust}$	-.003	.01	-.013	.003
$H_{control}L_{fear}L_{disgust}$	-.002	.01	-.012	.003
$L_{control}H_{fear}L_{disgust}$	-.004	.01	-.014	.002
$H_{control}L_{fear}H_{disgust}$	-.009	.01	-.024	.002
$L_{control}L_{fear}H_{disgust}$	-.008	.01	-.021	.002
$L_{control}H_{fear}H_{disgust}$	-.008	.01	-.023	.002
$H_{control}H_{fear}H_{disgust}$	-.014	.01	-.036	.004

Note. $H_{control}$ = High controlling language $L_{control}$ = Low controlling language

H_{fear} = High fear appeal L_{fear} = Low fear appeal

$H_{disgust}$ = High disgust appeal $L_{disgust}$ = Low disgust appeal

Table 19

The Indirect Effect of Message Conditions on Source Credibility through Disgust, Freedom Threat, and Psychological Reactance

Message Condition	*b*	BootSE	LLCI	ULCI
$H_{control}H_{fear}L_{disgust}$	-.011[a]	.01	-.024	-.001
$H_{control}L_{fear}L_{disgust}$	-.002	.01	-.012	.006
$L_{control}H_{fear}L_{disgust}$	-.007	.01	-.018	.001
$H_{control}L_{fear}H_{disgust}$	-.036[a]	.01	-.066	-.014
$L_{control}L_{fear}H_{disgust}$	-.046[a]	.02	-.083	-.018
$L_{control}H_{fear}H_{disgust}$	-.043[a]	.02	-.081	-.017
$H_{control}H_{fear}H_{disgust}$	-.049[a]	.02	-.086	-.019

Note. [a] indicates the indirect effect is significant because the percentile bootstrap confidence interval did not include 0, based on a bootstrap sample of 5000.

$H_{control}$ = High controlling language $L_{control}$ = Low controlling language

H_{fear} = High fear appeal L_{fear} = Low fear appeal

$H_{disgust}$ = High disgust appeal $L_{disgust}$ = Low disgust appeal

Table 20 presents the model parameters for the effect of message condition on message attitudes. The indirect effect of message condition on message attitudes through freedom threat and reactance was significant for six out of seven groups of message condition (See Table 21 for the *b* and *SE* for each significant relative indirect effect). The indirect effect of message condition on message attitudes through the feeling of fear, freedom threat, and reactance was not significant (95% bootstrap confidence intervals included 0; See Table 22). However, the indirect effect of message condition on message attitudes through serial mediators—the feeling of disgust, freedom threat, and reactance, was significant for five out of seven groups of message condition (See Table 23 for the *b* and *SE* for each significant relative indirect effect). Based on Hayes's (2017) criterion about the existence of mediation effect for a multicategory variable, as

mentioned above, the indirect effect of message condition on message attitudes through freedom threat and reactance was significant.

Table 20

Unstandardized Coefficients, SEs, and Model Summary for Message Attitudes

	Fear			Disgust			Freedom threat			Reactance			Message attitudes		
	b	SE	*p*	*b*	SE	*p*	*b*	SE	*p*	*b*	SE	*p*	*b*	SE	*p*
$H_{control}H_{fear}L_{disgust}$	.44	.35	.20	.48	.29	.09	1.64	.26	< .001	-.07	.24	.76	-.66	.20	< .001
$H_{control}L_{fear}L_{disgust}$	.29	.33	.39	.10	.28	.71	1.32	.25	< .001	-.49	.23	.04	-.27	.19	.16
$L_{control}H_{fear}L_{disgust}$	.50	.34	.15	.33	.28	.25	.62	.26	.02	-.04	.23	.85	-.72	.18	< .001
$H_{control}L_{fear}H_{disgust}$	1.16	.34	<.001	1.66	.28	< .001	1.33	.27	< .001	-.77	.23	.002	-.74	.20	< .001
$L_{control}L_{fear}H_{disgust}$	1.01	.34	.003	2.13	.28	< .001	.34	.27	.21	-.79	.24	.001	-.88	.20	< .001
$L_{control}H_{fear}H_{disgust}$	1.06	.34	.002	1.99	.28	< .001	.69	.27	.01	-.28	.24	.25	-.65	.20	.001
$H_{control}H_{fear}H_{disgust}$	1.82	.33	<.001	2.26	.28	< .001	1.33	.27	< .001	-.54	.25	.03	-.79	.20	< .001
Fear							.07	.04	.11	-.05	.04	.18	.19	.03	< .001
Disgust							.19	.05	< .001	.30	.05	< .001	-.03	.04	.40
Freedom threat										.42	.04	< .001	-.18	.04	< .001
Reactance													-.39	.04	< .001
Constant	.81	.65	.21	1.74	.54	.001	2.64	.50	< .001	.20	.45	.66	3.83	.37	< .001
	$R^2 = .14$			$R^2 = .30$			$R^2 = .43$			$R^2 = .62$			$R^2 = .69$		
	$F(9, 437) = 8.18$, $p < .001$			$F(9, 437) = 21.18$ $p < .001$			$F(11, 435) = 30.36$ $p < .001$			$F(12, 434) = 57.91$ $p < .001$			$F(13, 433) = 71.02$ $p < .001$		

Note. $H_{control}$ = High controlling language $L_{control}$ = Low controlling language

H_{fear} = High fear appeal L_{fear} = Low fear appeal

$H_{disgust}$ = High disgust appeal $L_{disgust}$ = Low disgust appeal

Table 21

The Indirect Effect of Message Conditions on Message Attitudes through Freedom Threat and Psychological Reactance

Message Condition	*b*	BootSE	LLCI	ULCI
$H_{control}H_{fear}L_{disgust}$	-.27[a]	.06	-.394	-.161
$H_{control}L_{fear}L_{disgust}$	-.21[a]	.05	-.333	-.121
$L_{control}H_{fear}L_{disgust}$	-.10[a]	.04	-.188	-.031
$H_{control}L_{fear}H_{disgust}$	-.22[a]	.05	-.335	-.119
$L_{control}L_{fear}H_{disgust}$	-.06	.04	-.138	.020
$L_{control}H_{fear}H_{disgust}$	-.11[a]	.04	-.207	-.032
$H_{control}H_{fear}H_{disgust}$	-.22[a]	.06	-.335	-.119

Note. [a] indicates the indirect effect is significant because the percentile bootstrap confidence interval did not include 0, based on a bootstrap sample of 5000.

$H_{control}$ = High controlling language $L_{control}$ = Low controlling language

H_{fear} = High fear appeal L_{fear} = Low fear appeal

$H_{disgust}$ = High disgust appeal $L_{disgust}$ = Low disgust appeal

Table 22

The Indirect Effect of Message Conditions on Message Attitudes through Fear, Freedom Threat, and Psychological Reactance

Message Condition	*b*	BootSE	LLCI	ULCI
$H_{control}H_{fear}L_{disgust}$	-.005	.01	-.018	.003
$H_{control}L_{fear}L_{disgust}$	-.003	.01	-.016	.005
$L_{control}H_{fear}L_{disgust}$	-.005	.01	-.020	.003
$H_{control}L_{fear}H_{disgust}$	-.012	.01	-.035	.003
$L_{control}L_{fear}H_{disgust}$	-.011	.01	-.030	.003
$L_{control}H_{fear}H_{disgust}$	-.011	.01	-.032	.003
$H_{control}H_{fear}H_{disgust}$	-.020	.01	-.049	.005

Note. $H_{control}$ = High controlling language $L_{control}$ = Low controlling language

H_{fear} = High fear appeal L_{fear} = Low fear appeal

$H_{disgust}$ = High disgust appeal $L_{disgust}$ = Low disgust appeal

Table 23

The Indirect Effect of Message Conditions on Message Attitudes through Disgust, Freedom Threat, and Psychological Reactance

Message Condition	*b*	BootSE	LLCI	ULCI
$H_{control}H_{fear}L_{disgust}$	-.015[a]	.01	-.034	-.002
$H_{control}L_{fear}L_{disgust}$	-.003	.01	-.017	.008
$L_{control}H_{fear}L_{disgust}$	-.010	.01	-.025	.001
$H_{control}L_{fear}H_{disgust}$	-.051[a]	.02	-.091	-.021
$L_{control}L_{fear}H_{disgust}$	-.066[a]	.02	-.115	-.027
$L_{control}H_{fear}H_{disgust}$	-.062[a]	.02	-.110	-.025
$H_{control}H_{fear}H_{disgust}$	-.070[a]	.02	-.120	-.029

Note. [a] indicates the indirect effect is significant because the percentile bootstrap confidence interval did not include 0, based on a bootstrap sample of 5000.

$H_{control}$ = High controlling language $L_{control}$ = Low controlling language

H_{fear} = High fear appeal L_{fear} = Low fear appeal

$H_{disgust}$ = High disgust appeal $L_{disgust}$ = Low disgust appeal

Table 24 reports the model parameters for the effect of message condition on COVID-19 vaccination intentions. The indirect effect of message condition on vaccination intentions through freedom threat and reactance was significant for six out of seven groups of message condition (See Table 25 for the *b* and *SE* for each significant relative indirect effect). The indirect effect of message conditions on vaccination intentions through the feeling of fear, freedom threat, and reactance was non-significant (95% bootstrap confidence intervals included 0; See Table 26). However, the indirect effect of message condition on vaccination intentions through serial mediators—the feeling of disgust, freedom threat, and reactance, was significant for five out of seven groups of message condition (See Table 27 for the *b* and *SE* for each

significant relative indirect effect). Therefore, the indirect effect of message condition on vaccination intentions through freedom threat and reactance was significant.

Table 24

Unstandardized Coefficients, SEs, and Model Summary for Vaccination Intentions

	Fear			Disgust			Freedom threat			Reactance			Vaccination intentions		
	b	SE	*p*	*b*	SE	*p*	*b*	SE	*p*	*b*	SE	*p*	*b*	SE	*p*
$H_{control}H_{fear}L_{disgust}$	.44	.35	.20	.48	.29	.09	1.64	.26	< .001	-.07	.24	.76	-.05	.30	.88
$H_{control}L_{fear}L_{disgust}$	.29	.33	.39	.10	.28	.71	1.32	.25	< .001	-.49	.23	.04	.04	.29	.90
$L_{control}H_{fear}L_{disgust}$	.50	.34	.15	.33	.28	.25	.62	.26	.02	-.04	.23	.85	-.45	.28	.11
$H_{control}L_{fear}H_{disgust}$	1.16	.34	<.001	1.66	.28	< .001	1.33	.27	< .001	-.77	.23	.002	-.74	.30	.01
$L_{control}L_{fear}H_{disgust}$	1.01	.34	.003	2.13	.28	< .001	.34	.27	.21	-.79	.24	.001	-.93	.30	.002
$L_{control}H_{fear}H_{disgust}$	1.06	.34	.002	1.99	.28	< .001	.69	.27	.01	-.28	.24	.25	-.48	.30	.11
$H_{control}H_{fear}H_{disgust}$	1.82	.33	<.001	2.26	.28	< .001	1.33	.27	< .001	-.54	.25	.03	-.58	.30	.06
Fear							.07	.04	.11	-.05	.04	.18	.25	.05	< .001
Disgust							.19	.05	< .001	.30	.05	< .001	.12	.06	.04
Freedom threat										.42	.04	< .001	-.04	.06	.49
Reactance													-.24	.06	< .001
Constant	.81	.65	.21	1.74	.54	.001	2.64	.50	< .001	.20	.45	.66	6.91	.55	< .001
	$R^2 = .14$			$R^2 = .30$			$R^2 = .43$			$R^2 = .62$			$R^2 = .52$		
	$F(9, 437) = 8.18$,			$F(9, 437) = 21.18$			$F(11, 435) = 30.36$			$F(12, 434) = 57.91$			$F(13, 433) = 35.80$		
	$p < .001$			$p < .001$			$p < .001$			$p < .001$			$p < .001$		

Note. $H_{control}$ = High controlling language $L_{control}$ = Low controlling language

H_{fear} = High fear appeal L_{fear} = Low fear appeal

$H_{disgust}$ = High disgust appeal $L_{disgust}$ = Low disgust appeal

Table 25

The Indirect Effect of Message Conditions on Vaccination Intentions through Freedom Threat and Psychological Reactance

Message Condition	*b*	BootSE	LLCI	ULCI
$H_{control}H_{fear}L_{disgust}$	-.17[a]	.06	-.291	-.061
$H_{control}L_{fear}L_{disgust}$	-.13[a]	.05	-.239	-.047
$L_{control}H_{fear}L_{disgust}$	-.06[a]	.03	-.132	-.013
$H_{control}L_{fear}H_{disgust}$	-.13[a]	.05	-.244	-.046
$L_{control}L_{fear}H_{disgust}$	-.03	.03	-.097	.013
$L_{control}H_{fear}H_{disgust}$	-.07[a]	.04	-.149	-.013
$H_{control}H_{fear}H_{disgust}$	-.13[a]	.05	-.243	-.047

Note. [a] indicates the indirect effect is significant because the percentile bootstrap confidence interval did not include 0, based on a bootstrap sample of 5000.

$H_{control}$ = High controlling language $L_{control}$ = Low controlling language

H_{fear} = High fear appeal L_{fear} = Low fear appeal

$H_{disgust}$ = High disgust appeal $L_{disgust}$ = Low disgust appeal

Table 26

The Indirect Effect of Message Conditions on Vaccination Intentions through Fear, Freedom Threat, and Psychological Reactance

Message Condition	*b*	BootSE	LLCI	ULCI
$H_{control}H_{fear}L_{disgust}$	-.003	.01	-.012	.002
$H_{control}L_{fear}L_{disgust}$	-.002	.01	-.010	.003
$L_{control}H_{fear}L_{disgust}$	-.003	.01	-.014	.002
$H_{control}L_{fear}H_{disgust}$	-.008	.01	-.024	.002
$L_{control}L_{fear}H_{disgust}$	-.007	.01	-.021	.002
$L_{control}H_{fear}H_{disgust}$	-.007	.01	-.022	.002
$H_{control}H_{fear}H_{disgust}$	-.010	.01	-.035	.003

Note. $H_{control}$ = High controlling language $L_{control}$ = Low controlling language

H_{fear} = High fear appeal L_{fear} = Low fear appeal

$H_{disgust}$ = High disgust appeal $L_{disgust}$ = Low disgust appeal

Table 27

The Indirect Effect of Message Conditions on Vaccination Intentions through Disgust, Freedom Threat, and Psychological Reactance

Message Condition	*b*	BootSE	LLCI	ULCI
$H_{control}H_{fear}L_{disgust}$	-.009[a]	.01	-.023	-.001
$H_{control}L_{fear}L_{disgust}$	-.002	.01	-.012	.005
$L_{control}H_{fear}L_{disgust}$	-.006	.01	-.018	.001
$H_{control}L_{fear}H_{disgust}$	-.032[a]	.02	-.066	-.001
$L_{control}L_{fear}H_{disgust}$	-.041[a]	.02	-.084	-.012
$L_{control}H_{fear}H_{disgust}$	-.038[a]	.02	-.080	-.011
$H_{control}H_{fear}H_{disgust}$	-.043[a]	.02	-.087	-.013

Note. [a] indicates the indirect effect is significant because the percentile bootstrap confidence interval did not include 0, based on a bootstrap sample of 5000.

$H_{control}$ = High controlling language $L_{control}$ = Low controlling language

H_{fear} = High fear appeal L_{fear} = Low fear appeal

$H_{disgust}$ = High disgust appeal $L_{disgust}$ = Low disgust appeal

H6 and H7 examined the effect of trait reactance on reactance and message responses. H6 predicted that trait reactance was positively associated with a) freedom threat and psychological reactance in the form of b) anger and c) negative cognitions. H7 proposed that trait reactance was positively correlated with a) source derogation, b) but negatively correlated with message attitudes, and c) COVID-19 vaccination intentions. Correlation analyses showed that trait reactance was positively associated with freedom threat and psychological reactance but negatively associated with source credibility, favorable message attitudes, and COVID-19 vaccination intentions. Therefore, H6 and H7 were supported (See Table 28).

Table 28

Correlations between Trait Reactance and Freedom Threat, Psychological Reactance, Source Credibility, Message Attitudes, and Vaccination Intentions

Measures	*M*	*SD*	FT	A	NC	SC	AT	BI
Trait Reactance	3.49	1.14	.34**	.39**	.32**	-.28**	-.26*	-.18**

Note. * $p < .05$; ** $p < .01$.

FT = Freedom threat; A = Anger; NC = Negative cognitions; SC = Source credibility; AT = Message attitudes; BI = Behavioral intentions.

RQ4 concerned relationships between disgust sensitivity and a) source derogation, b) message attitudes, and c) COVID-19 vaccination intentions. Correlation analyses showed that disgust sensitivity was not significantly correlated with source derogation, message attitudes, or vaccination intentions (See Table 29).

Table 29

Correlations between Disgust Sensitivity and Source Credibility, Message Attitudes, and Vaccination Intentions

Measures	M	SD	Source Credibility		Message Attitudes		Behavioral Intentions	
Disgust Sensitivity	5.15	1.01	*r* .004	*p* .94	*r* .03	*p* .05	*r* -.02	*p* .64

Summary

Controlling Language. Controlling language (referred to below simply as the controlling condition) significantly influenced perceptions of freedom threat, source derogation, and message attitudes, such that, relative to the high controlling condition, the low controlling condition was associated with lower perceptions of freedom threat, less source derogation, and more favorable attitudes toward the message. Unexpectedly, there were no significant differences between the

high vs. low controlling conditions associated with measures of reactance or COVID-19 vaccination intentions.

Fear Appeals. Repeated measures ANCOVAs revealed beneficial effects for low levels of fear appeals (i.e., the ill effects of high levels of fear appeals) on both source derogation and attitudes toward the message. The effects of fear appeals on message responses were mediated by freedom threat and reactance. Moreover, the indirect effect of fear appeals on source derogation and message attitudes (but not COVID-19 vaccination intentions) were mediated by serial mediators—the feeling of fear, freedom threat, and reactance. These results suggest that the effect of high fear appeals on vaccination message responses was counterproductive from a message design standpoint as high fear appeals induce psychological reactance.

Disgust Appeals. Low levels of disgust appeals (i.e., disgust eliciting message attributes) were more persuasive in terms of lower source derogation and more favorable attitudes toward the message. Mediation analyses showed no indirect effect of disgust appeals on message responses through freedom threat and reactance. However, the indirect effect became significant when the feeling of disgust, freedom threat, and reactance together were entered as serial mediators. In other words, the feeling of disgust, freedom threat, and reactance combined to mediate the effects of disgust appeals on message responses. The finding suggests that the influence of high disgust appeals on message responses was negative since they generated psychological reactance.

Interactions. No significant 3-way interaction among controlling language, fear, and disgust appeals was found. However, there was a significant interaction between fear and disgust appeals in the low controlling language condition (but not in the high controlling language condition). Participants reported the highest source credibility evaluations and most favorable

attitudes toward the message in the low controlling language, low fear, low disgust appeal condition. Mediation analyses showed significant indirect effects of the message condition crossing controlling language, fear and disgust appeals on message responses through freedom threat and reactance.

Trait Reactance and Disgust Sensitivity. As a personality trait, the inclination toward reactance was positively associated with freedom threat perceptions, psychological reactance, and source derogation and negatively associated with favorable message attitudes and COVID-19 vaccination intentions. This finding aligns with previous studies. Individual differences in disgust sensitivity appeared to have no significant effect on message responses.

Chapter V General Discussion

It has been over a year since the first case of COVID-19 infection was detected in the U.S. During this time, the world has witnessed over 100 million people infected and more than 3 million people dead. As COVID-19 vaccines are developed to control the disease, the U.S. holds great hope for containing the virus. However, there is persistent, widespread vaccine hesitancy and even outright rejection among large segments of the public (Berkeley, 2021; Funk & Tyson, 2020). Should this trend continue, the SARS-CoV-2 virus is not likely to be effectively controlled any time soon. In attempting to explore the attributes of more effective persuasive messages to encourage COVID-19 vaccination, this dissertation investigated the effects of controlling language in conjunction with elicitors of fear and disgust within persuasive appeals. This research has sought to extend psychological reactance theory by examining the role reactance may play in influencing message responses within a relatively uncharted territory—to explore how fear and disgust appeals may interact with psychological reactance in influencing message responses.

Overall, the results reported here indicate that when using high levels of controlling language with high fear and high disgust appeals, persuasion may suffer since it led to lower source credibility evaluations and fewer favorable attitudes toward the message. More positive outcomes were found for low controlling, low fear, and low disgust appeals. Freedom threat and reactance mediated the negative relationship between attribute-based fear appeals and message responses (i.e., source derogation, attitudes toward the message, and COVID-19 vaccination intentions). Besides, serial mediators—the feeling of disgust, freedom threat, and reactance, mediated the effect of attribute-based disgust appeals on message responses. Though there were no significant 3-way interactions among controlling language, fear and disgust appeals on

message responses, mediation analyses showed a significant indirect effect of the attribute-based message condition across controlling language, fear and disgust appeals on message responses through freedom threat and reactance. These indirect effects were found using methods recommended by O'Keefe (2003) and Tao and Bucy (2007), advocating the conceptualization of psychological states as mediators when analyzing the effects of experimental message manipulations on message responses. In this view, more variance in message responses can be explained through the mediation of psychological states—in the present case, felt reactance, fear, and disgust—relative to that which can be explained solely by attribute-based message manipulations.

High controlling language led to higher freedom threat perceptions, more source derogation, and fewer favorable message attitudes relative to low controlling language. These findings align with the literature on controlling language (Clayton et al., 2020; Miller et al., 2007; Quick & Stephenson, 2007). However, the insignificant difference between high vs. low controlling language in reactance, despite a significant difference in freedom threat perceptions, was unexpected and inconsistent with the proposition of PRT (Brehm, 1966) and extant research that found when individuals' freedom is threatened, they become reactant. For instance, Miller et al. (2007) revealed that, compared to low controlling language, high controlling language was perceived to impose a greater threat to freedom, leading to more reactance toward messages encouraging physical activity and exercise. Future research is needed to explore why high controlling language did not produce similar effects on reactance within the present context of COVID-19 vaccination advocacy.

A potential reason may be that compared to the benefits of physical activity (Miller et al., 2007) and harms of smoking (Clayton et al., 2020) that show themselves years later, COVID-19

infection has demonstrated its most salient consequences in the short term, leading to a more urgent need of vaccination. Therefore, although participants may have felt freedom threats brought about by highly directive, controlling language, they were more aware of the immediate threat of infection and thus less reactant. This assumption is consistent with Brehm's (1966) proposition that perceptions of freedom threat may not always trigger reactance.

Participants in the high fear appeal condition reported more source derogation and fewer favorable attitudes toward the vaccination message than those in the low fear appeal condition. However, this finding appears to be inconsistent with several meta-analyses (Tannenbaum et al., 2015; Witte & Allen, 2000), showing persuasion increases as the intensity of fear described in fear appeals increases. A potential factor that may account for the inconsistent findings is participants' pre-knowledge about the consequences of COVID-19 infection. Data collection for the main study was conducted in early March 2021, by which time it had been a year since the start of the pandemic in the U.S., and infection was on a downward trend. Therefore, it stands to reason that study participants may have acquired more knowledge leading them to form relatively lesser concerns about the consequences of the infection. Though hundreds of thousands of people have died from the virus, many more infected were either asymptomatic, experienced relatively minor or mild consequences, and/or seem to have fully recovered. Thus, participants in this study may have tempered their responses based on their updated knowledge about the infection. As a result, they may have lowered their perceptions of the virus threat, rendering them more likely to discount the credibility of the high fear appeal emphasizing more dreaded consequences, thereby finding the appeal less convincing. If data were collected in the early stage of the pandemic when participants were still unsure about the situation, responses to high fear appeals would likely be more positive.

Opposite to expectations, compared to their low disgust counterparts, high disgust appeals were demonstrably harmful to positive message responses—they were accompanied by lower assessments of source credibility and fewer favorable attitudes toward the vaccination message. This finding is not in accord with some previous research (Morales et al., 2012; Leshner et al., 2009). For instance, Morales and colleagues (2011) found that, compared to low disgust appeals, high disgust appeals resulted in more positive message attitudes. Despite the limited number of studies on disgust appeals, findings from the present research do not appear to accord with previous research. One potential reason for the defensiveness in response to high disgust appeals is that images used in these appeals (e.g., forensic autopsies operating on lungs) were so repulsive that they were "over the top," rendering them less effective. Given that the primary behavioral tendency of disgust is avoiding potential disease contamination (Haidt et al., 1994), overly gross presentations of disgust content may make message recipients instinctively dislike and reject the message along with the disgusting images.

COVID-19 vaccination intentions were not influenced by either high vs. low controlling language, high vs. low fear appeals, or high vs. low disgust appeals. However, these findings are not inconsistent with some previous research. Clayton and colleagues' (2020) investigated vaper users' responses to dogmatic (i.e., high controlling language) and suggestive (i.e., low controlling language) within anti-vaping PSAs. They found that, though vapers who viewed dogmatic anti-vaping PSAs reported higher perceptions of freedom threat and reactance than those who viewed suggestive (i.e., less dogmatic) anti-vaping PSAs, they did not report significantly higher intentions to vape. In another study, Ma and Miller (2020) revealed that, although messages blaming SARS-CoV-2 for the COVID-19 pandemic were viewed to be more freedom-threatening, triggering more reactance and greater source derogation than messages

blaming human beings for the pandemic, the former did not produce lower intentions to perform protective actions to contain the infection of the virus. This may be in part due to participants receiving only the message manipulations only once, whereas repeated exposure to high reactance-inducing messages could be expected to have a more cumulative negative effect on behavioral intentions. The insignificant differences in vaccination intentions following only a single exposure to the messages suggest that, though participants did not like the tone of the messages and evaluated the message as less favorable, they nevertheless held their stand on vaccination intentions, which appeared to be uninfluenced by the single instance of reactance felt toward the message.

This apparent attitude-behavioral intention inconsistency following a single exposure to the message is also in accord with the proposition that decision-making incorporates various other motivations that may come into play in moderating the influence of message attitudes on behavioral intentions (Vermeir & Verbeke, 2006). In the case of COVID-19 vaccination, factors such as concerns about the side effects of COVID-19 vaccines, conspiracy-theory beliefs about the pandemic (Stein et al., 2021), and general attitudes toward vaccines may moderate the impact of attitudes toward the advocated position on vaccination intentions.

Traditionally, it takes 5-10 years to develop and test a vaccine before making it available for the public (Shipman, 2020). However, due to the urgency of the situation, COVID-19 vaccines were developed and tested in clinical trials in only a matter of months. This unprecedented speed has left many people worrying about the safety of COVID-19 vaccines. In a Pew survey, among those who claimed they would not get vaccinated, 76% mentioned their concern about the vaccine's safety (Tyson et al., 2020). Therefore, it could be that, although people had positive attitudes toward the message, their primary concern when deciding whether

to get vaccinated is the vaccine's safety. Although the messages mentioned that the vaccine has gone through rigorous tests, that information was not emphasized. As a result, people's concern about vaccination safety was not well addressed. Therefore, though they may find the message credible, their vaccination decisions are unaffected. Future studies are needed to explore whether the findings of the current experiment stand when concerns about vaccine safety are more directly addressed within the message.

When fear and disgust appeals (i.e., attribute-based message manipulations) were entered as independent variables, they influenced source derogation and message attitudes but not vaccination intentions. However, when freedom threat and reactance were added to the model as mediators, fear and disgust appeals influenced source derogation, message attitudes, and vaccination intentions. Specifically, as described fear increased in intensity in fear appeals, more freedom threat was perceived and more reactance was aroused, which resulted in more source derogation, fewer positive message attitudes, and lower vaccination intentions. For disgust appeals, as described disgust increased in disgust appeals, more disgust was felt, leading to more freedom threat perceptions and reactance. Consequently, source derogation increased, and fewer positive message attitudes and lower vaccination intentions were reported. Mediation analyses revealed other interesting findings as well.

The feeling of fear mediated the positive effect of fear appeals on message responses. Furthermore, the feeling of fear, freedom threat, and reactance together serially mediated the negative relationship between fear appeals and source derogation and between fear appeals and message attitudes. The finding suggests that adaptative and maladaptive responses, or danger control and danger control in terms of the EPPM, co-occurred, aligning with some previous studies that measured the feeling of fear following fear appeal exposure in their outcome

measures (Peng et al., 2020; Quick et al., 2018). For instance, Peng et al. (2020) also showed the feeling of fear positively predicted favorable message attitudes. The finding that the feeling of fear induced freedom threat perceptions and reactance was also seen in extant research. For example, Shen (2011) showed, reactance (with perceptions of freedom threat as a prerequisite) significantly mediated the relationship between fear and perceived message effectiveness. Along similar lines, Shen and Coles (2015) found, high fear brought perceptions of freedom threat and produced reactance. Quick et al.'s (2018) studies further indicated the negative effect of subjective fear on persuasion through reactance: They found freedom threat and reactance mediated the negative relationship between the feeling of fear and message minimization and message attitudes. Moreover, the present study also found that the negative relationships between attribute-based fear appeals and message responses were mediated by freedom threat and reactance, without the feeling of fear as a mediator between fear appeals and freedom threat. This was a relatively new finding since most previous research that has evidenced the reactance-inducing feature of fear appeals focused on the psychological state of fear following fear appeal exposure and reactance.

There was also an indirect positive effect of disgust appeals on message attitudes and vaccination intentions through the feeling of disgust. Prior studies also have revealed the effect of felt disgust on persuasion. For instance, Hammond and colleagues (2004) found that disgust positively predicted attempts to quit smoking and decreased smoking at follow-up. Along similar lines, Dillard and Shen (2018) demonstrated, peak disgust positively predicted individuals' intentions to check on their vaccination status. However, disgust appeals were also perceived as freedom threatening, which, in turn, triggered reactance that led to negative message responses. Unlike fear appeals, the effect of disgust appeals on freedom threat was mediated by the feeling

of disgust across all message responses, and there was no direct effect of disgust appeals on freedom threat. This finding is in line with what Yang (2017) found: The feeling of disgust on exposure to HPV messages was positively associated with reactance, but disgust negatively influenced HPV vaccination intentions and perceived message effectiveness through reactance, and the mediating effect was marginally significant.

The 3-way interaction between controlling language, fear, and disgust appeals on message responses was not significant; however, when controlling language was spilt into high vs. low condition, there were significant interactions between fear and disgust appeals on source derogation and message attitudes for people in the low controlling language condition (but not in the high controlling language condition), wherein participants in the "matched" low-fear, low-disgust appeal condition reported significantly less source derogation and more favorable message attitudes than those in the "mismatched" high fear-low disgust or low fear-high disgust conditions when low controlling language was used. In other words, message responses were more positive when both fear and disgust appeals were at a low level than when either was at a high level, as long as low controlling language was used. These findings suggest that, when high controlling language is used, the level of fear and disgust appeals does not matter, whereas when low controlling language is used, message responses benefit from the use of low levels of both fear and disgust; when either was at the high level, persuasion deceased.

The current results appear to be inconsistent with Bessarabova and Massey's (2020) finding: Mortality salience (i.e., death thoughts were in focal awareness) mitigated the high level of freedom threat from high controlling language and erased the reactance effect in proximal defenses. Message responses were collected immediately after message exposure in both studies. Thus, there seems to be no substantial difference between these two studies in terms of the study

procedure. The inconsistent findings may stem from message manipulations: The current research focused on fear appeals, whereas Bessarabova and Massey's (2020) study looked at mortality salience. Future research is needed to examine the assumption that mortality salience can decrease freedom threat perceptions, but fear appeals cannot, by comparing freedom threat perceptions resultant from mortality salience and fear appeals.

The most positive message responses produced by the low controlling language, low fear, and low disgust appeal were supported by the mediation analysis regarding the effect of the interaction across message manipulations on responses, as discussed below. Mediation analyses on the effect of attribute-based message condition across controlling language, fear and disgust appeals on message responses showed significant indirect effects of attribute-based message manipulations on message responses via freedom threat and reactance. Specifically, the influence of attribute-based message manipulations on source derogation, message attitudes, and COVID-19 vaccination intentions was mediated by freedom threat and reactance for all message conditions except for the low controlling, low-fear, high-disgust appeal condition. It suggests that compared to the low controlling language, low-fear, and low-disgust appeal condition, all other message conditions were significantly less persuasive due to the arousal of reactance except for the low controlling, low-fear, high-disgust appeal condition.

Furthermore, the feeling of fear, freedom threat, and reactance together did not serially mediate the relationship between message manipulations and responses across any message conditions. However, the feeling of disgust, freedom threat, and reactance did serially mediate the negative relationships between message manipulations and responses across all message conditions except for the high controlling, low-fear, low-disgust appeal and the low controlling, high-fear, low-disgust appeal conditions.

These findings suggest that the feeling of fear is not freedom-threatening, but the feeling of disgust is. For the two message conditions where the influence on message responses was not mediated by the serial mediator of feelings of disgust, freedom threat, and reactance, they were at the low level of disgust appeals and the high level of either controlling language or fear appeals. However, for the other five message conditions where the influence on message responses was mediated by the serial mediators, they were high on any two combinations or all three of message manipulations, which indicates that with any combination of two or three high level manipulations (i.e., controlling language, fear appeal, or disgust appeal) are used, reactance should be aroused, and persuasion should decrease, compared to when all three manipulations are at the low level. The exception was the message condition low in controlling language and fear appeal, but high in disgust appeal—it also significantly influenced message responses through the above-mentioned serial mediators. The exception is reasonable considering the large mean difference between high vs. low disgust appeals. In other words, the reactance effect of the low controlling language, low fear, and high disgust appeal may come from the high disgust appeals, compared to the low controlling language, fear appeal, and disgust appeal.

As expected, trait reactance was positively associated with freedom threat perceptions, psychological reactance, and source derogation, but was negatively related to favorable message attitudes and vaccination intentions, indicating individuals high in trait reactance are more likely to show defensive responses toward messages advocating COVID-19 vaccination relative to those low in trait reactance. This finding is consistent with extant research (Browne, 2018; Finkelstein et al., 2020). To reduce defensiveness, research on self-affirmation suggests that foregrounding and affirming self-integrity before message exposure should be an effective strategy for individuals low on trait reactance (Nan & Zhao, 2012). However, the self-affirmation

strategy may not reduce defensiveness for individuals high on trait reactance, as Nan and Zhao's (2012) study showed self-affirming prior to persuasive message exposure increased defensive responses for individuals high on trait reactance.

Limitations

This dissertation research is subject to several limitations. First, the study sample primarily consisted of low-middle income, middle-aged whites. Therefore, it may not be representative of the general US population, and the findings may not be readily generalizable to other population groups, such as the elderly and minorities for whom the risk of contracting the virus is higher (Gupta, 2020; Iacobucci, 2020; Sandoiu, 2020). Future studies are warranted to examine whether the study findings may apply to other population groups.

The second limitation concerns the length of treatment messages. To comprehensively present the consequences of COVID-19 infection, messages used in the main study were long, approximately 400 words for each message. The length of the message may not be perfect for real-world campaigns advocating COVID-19 vaccination, which are likely to be much shorter.

Third, though the manipulations succeeded, the quality of the images used may have slightly influenced message responses and may explain the difference in message quality perceptions between high vs. low disgust appeals in Pilot Study 2, and the main study, thus possibly influencing other message responses (e.g., source derogation, message attitudes). In fact, message quality was found to be a significant covariate in the analysis; therefore, in future research, efforts should be made to obtain the highest quality visual stimuli or resort to professional editing services.

The fourth limitation concerns reliability. Reliabilities for the attribute-based measures of fear and disgust appeals for some messages used in Pilot Study 2 were low. In contrast,

reliability for the behavioral intention measure in the main study appeared to be excessively high. The low reliabilities may suggest items in the measure may be unrelated or poorly related in terms of who answered them correctly. In contrast, high reliabilities may indicate redundant items, representing only a single attribute of a more complex construct. Thus, the relevant constructs may not have been fully captured. Most communication studies measure the psychological states of fear and disgust rather than attribute-based message manipulations. Therefore, measures for attribute-based messages were explicitly developed for this study. Sound, message attribute-based measures should be established for use in future studies.

Fifth, the difference in felt disgust between high vs. low disgust appeals was much larger than that in felt fear between high vs. low fear appeals, though manipulations for both disgust and fear appeals succeeded. The imbalance between mean differences may have led to better detection of the effects of disgust appeals than the effects of fear appeals and, therefore, skewed the results. Lastly, the present study assumed a linear relationship for fear and disgust appeals on message responses, based on extant meta-analyses (Witte & Allen, 2000; Tannenbaum et al., 2015) and thus manipulated fear and disgust appeals at high vs. low levels. However, their effects may be better described as a curvilinear relationship represented by an inverted U function, as Hovland et al. (1953) found, particularly those of felt disgust, may represent the downward slope of the inverted U-shape. Comparison of linear and curvilinear models of the effect of the feeling of fear on message responses showed that the curvilinear model fit the data set better than the linear model, which is to say more variance was explained by the curvilinear model than the linear model. However, there was no significant difference in variance explained by the linear and curvilinear model for the effect of the feeling of disgust on message responses. Therefore, it seems that low, moderate, and high levels of fear may better capture the effect of

fear appeals than only low and high levels of fear, particularly when the high levels of fear are sufficiently elevated. Future research should explore this possibility by assessing message manipulations with elicitors designed to stimulate low, moderate, and high levels of fear.

Conclusion

Notwithstanding these limitations, the findings reported here provide practical theoretical implications for fear and disgust appeals from a reactance perspective, as well as methodological corollaries for research on emotional appeals, and practical insights for message designs effective at promoting vaccination against COVID-19 and other viruses.

Theoretically, this study provides some empirical support for the reactance-eliciting feature of fear and disgust appeals. Research on fear appeals in which disgust appeals are included to reinforce the potency of fear appeals began decades ago, and has recently seen more application in communication research. However, as a persuasion strategy, fear appeals have rarely been investigated from the reactance perspective, with only a few exceptions (e.g., Quick et al., 2018; Peng et al., 2020), though persuasion attempts are typically perceived as freedom threatening and reactance-eliciting (Brehm, 1966). Moreover, most extant research tends to overly simplify fear appeals, and may overlook the effects of disgust content associated with those fear appeals. It should be noted that fear and disgust have markedly different appraisal and behavioral tendencies that may differently influence message responses (Lazarus, 1991; Morales et al., 2012).

With this in mind, it was the aim of the present study to separately distinguish the effects of fear and disgust appeals from a reactance-inducing perspective, and it was found that both fear and disgust appeals are reactance-eliciting. That is to say, psychological reactance appears to mediate the relationship between fear and disgust appeals and message receivers' emotional and

cognitive responses; thus, providing more empirical support for the unique effects of reactance associated with fear and disgust appeals.

Methodologically, this study echoes the call for defining emotional appeals as attribute-based, while including the effect-based psychological state of emotional appeal exposure as a mediator (O'Keefe; Tannenbaum et al., 2015). Penetrating message processing is of fundamental importance for advancing theory and practice within the health communication field, since it provides explanations for message effects through psychological mechanisms relevant to cognitive operations and emotional responses (Tao & Bucy, 2007). Though the critical role of mediation has been emphasized (O'Keefe, 2003), the application and examination of mediation analysis in experimental studies in the field of communication is somewhat rare with a few notable exceptions (e.g., Bessarabova et al., 2015; Peng et al., 2020; Shen, 2011).

Therefore, in addition to examining the effects of attribute-based manipulations on message responses, the current study has gone a step further to perform several mediation analyses to investigate these mechanisms on message effects. As expected, the indirect effects through mediation analysis explain more variance in message effects, in addition to the direct effects of message manipulations, thereby clarifying the mechanisms involved in the processing of fear and disgust appeals. With this in mind, future research on fear and disgust appeals, as well as other emotional appeals, should examine the effects of attribute-based message manipulations while including mediation analysis to explain the manner of message processing, as well as further insights regarding the construction of persuasive messages.

Practically, findings of this dissertation warn against the use of some commonly applied strategies in creating persuasive health messages. Caution should be taken in language use. As this study found, relative to low controlling language, the use of high controlling, forceful

language harmed the perceived credibility of the message source and reduced favorable attitudes toward the message, even though the topic was one of great urgency. Additionally, persuasive health messages are likely to benefit from avoiding extremely high fear and high disgust content, as they appear to reduce the favorability of message responses—at least concerning the COVID-19 vaccination messages used in the present experiment.

It should also be noted that one's general attitude toward vaccination was a significant covariate in the current study, suggesting it had an important influence on message responses. Therefore, public health programs should also make efforts to effectively educate the public about the benefits of vaccination, as well as cultivate an overall positive attitude toward vaccines, which should help motivate vaccination intentions regarding all virus threats across a range of risk levels.

Although the current study focused on COVID-19 vaccination, the findings reported may also be generalizable to other kinds of vaccinations, such as flu and HPV vaccinations, given their similarities. For instance, COVID-19, flu, and HPV all share a similar social element. COVID-19 infection affects individuals and people nearby due to the high contagiousness of the virus, as do flu and HPV infection. Therefore, messages promoting flu and HPV vaccinations should also use less controlling language and employ less aversive and/or repulsive message attributes to benefit from the effects of decreased reactance arousal.

However, cautions should also be made in generalizing current findings to other vaccination topics due to dissimilarities in the urgency of the situation. Compared to other infections, COVID-19 infection is more contagious and pervasive, and thus it poses a more urgent need for vaccination relative to other diseases. Moreover, vaccination may provide different levels of protection for subpopulation groups. For instance, HPV vaccination offers

fewer benefits for people older than 26 years (CDC, 2020), whereas COVID-19 vaccination is likely more beneficial for older people (CDC, 2021). Thus, compared to the consequences of not getting vaccinated against COVID-19 infection, not getting vaccinated against the HPV virus for people older than 26 years seems less critical. Therefore, in encouraging HPV vaccination, messages should also emphasize the benefits of HPV vaccination, in addition to the costs of not vaccinating.

For public health messaging promoting and advocating COVID-19 vaccination, the findings reported here suggest the importance of avoiding highly fearful and repulsive descriptions of COVID-19 infection when using forceful language. When low controlling language is used, and the message presents low fear and low disgust content, message responses should be substantially more positive.

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