UNINTENDED EFFECTS OF HEALTH AND RISK COMMUNICATION: IDENTIFYING PREDICTORS OF MESSAGE FATIGUE AND INOCULATION AGAINST FATIGUE DURING EXPOSURE TO PERSUASIVE HEALTH RISK MESSAGES

by

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(Under the Direction of Yan Jin)

ABSTRACT

The purpose of this study was to investigate whether and how perceived overcontrol and perceived overdemand in a health message might predict message fatigue and resistance to the message (i.e., message avoidance, inattention, message devaluation, unfavorable attitude to the message, and negative emotions). Two online surveys with different health contexts (i.e., COVID-19 and HPV) were conducted to test the proposed hypotheses and research questions. Based on findings from the online surveys, two online experiments were conducted to test the effects of inoculation and controlling language as communication tactics to mitigate message fatigue during the health communication. In the first experiment (n = 301), a 3 (elaborated inoculation treatment: normative vs. informative vs. control) × 2 (controlling language: high vs. low) between-subjects design was used. The first used elaborated inoculation framed as normative and informative designed to enhance threat of impending message fatigue to a message advocating for COVID-19 vaccination. To test whether the effects of an inoculation message on message fatigue differed by degree of threat detailed in the inoculation message, the second experiment (n = 350), a 2 (limited inoculation treatment: inoculation vs. control) × 2

(controlling language: high vs. low) between-subjects design was used in the context of HPV vaccination.

The findings of the studies were four-fold. First, the findings indicate that when message contains controlling and demanding attitudinal or behavioral task, it led to greater message fatigue. Second, enhanced message fatigue led to greater resistance to the message advocating for vaccination, a finding that is consistent with previous studies. Third, health persuasive message used with less controlling language was effective in reducing message fatigue than using inoculation message. Fourth, the findings showed a possible moderating role of vaccine status, indicating the previous engagement level in vaccination might reduce the adverse effect of message fatigue.

INDEX WORDS: Message fatigue, Message fatigue strategy, Inoculation theory, Controlling language, Health communication.

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DEDICATION

I gratefully dedicate this dissertation to my respectful parents and beloved husband.

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CHAPTER 1

INTRODUCTION

The classical communication model views the transmission of information (Back, 1962) as the sending of messages or information to recipients (Merten, 1999). Krippendorf (1989) metaphorically described this communication model as the "container model," meaning that the information is placed in a shipping container and delivered to another harbor. From this point of view, the sender transfers specifically intended information to recipients without any interference (Hampel, 2006).

However, empirical findings in risk and health communication research indicate that this traditional view of communication is unrealistic. Communication tends to be a complicated social interaction beset with various types of interference (Hampel, 2006). A sender might deliver the same information to various people, but the level of understanding, risk perception, message evaluation, and behavior of different audiences can vary based on prior experience, attitude, emotion, or type of information processing. Audiences do not merely receive messages; they reconstruct and interpret meaning (Rakow et al., 2015). In this way, the intended meaning of the sender might not come across, resulting in outcomes that senders did not intend when designing a message. Communication scholars call this phenomenon the "*unintended effects*" of communication (e.g., Cho & Salmon, 2007).

The term "*unintended effects*" refers to any consequences that are "unforeseen, not expected, or not predicted" (Soanes, 2003). Although the adjective "unintended" can apply to numerous phenomena, in the context of individual health and risk communication, it relates to

the one sending information and to the notion of noise (Shannon & Weaver, 1949), as described in transactional models. Merton's distinction between the manifest and latent functions of social actions helps explain *unintended effects* in health risk communication. Merton distinguishes between two functions of social action: (a) manifest functions and (b) latent functions. Manifest functions are "those objective consequences for a specified unit (person, subgroup, social or cultural system) which contribute to its adjustment or adaption and were so intended"; latent functions are "unintended and unrecognized consequences of the same order" (Merton, 1968, p. 69). As communication is a social action, any unpredicted and unanticipated consequences of purposive communication qualify as unintended effects.

Unintended effects can sometimes lead to desirable outcomes. However, because the primary topic of this dissertation is the adverse effects of communication, I will concentrate on the undesirable consequences of unintended effects. Unintended effects might include the following phenomena: apathy toward the message (i.e., message fatigue), reactance (i.e., psychological reactance), or recipient attitudes and behaviors that are opposite the ones promoted in the message (i.e., boomerang effect). These unintended effects are crucial in health and risk communication because they are likely to influence further message processing.

Although communication scholars largely agree on the necessity of studying unintended effects, research on this topic is nascent. Scholars have addressed a limited number of topics, such as psychological reactance (Brehm, 1966; Dillard & Shen, 2005), boomerang effect, and fear appeals (Witte, 1992), in relation to unintended effects. Scholars need to examine other types of unintended effects to understand the process of responding to health risk message. Fortunately, message fatigue has gained recent attention; although the research on message fatigue is scarce, some communication scholars have begun to investigate what determines

message fatigue and its potential consequences (e.g., So et al., 2017; Kim & So, 2018; So & Alam, 2019; Martinez Gonzalez et al., 2021; Ball & Wozniak, 2021). In a study on the conceptualization and operationalization on message fatigue, So et al. (2017) sheds more light on the dimensions of message fatigue. They defined message fatigue as "an aversive motivational state of being exhausted and bored by overexposure to similar, redundant messages over an extended period of time" (p. 10) and suggested four focal dimensions of message fatigue: (a) perceived overexposure, (b) perceived redundancy, (c) exhaustion, and (d) tedium. Their first two dimensions describe how message dissemination might induce fatigue (i.e., message environment), and the last two describe possible message responses based on the method of dissemination (i.e., audience response). Although the intrinsic features of a message (i.e., the message itself) might also have an impact on message fatigue, little is known about this important possibility in the context of health and risk issues. Health and risk messages, designed to change one's beliefs, attitudes, and even behaviors, naturally involve required or recommended actions in which the message recipient should engage, potentially facilitating fatigue responses during the communication. Therefore, the aim of the current study was to expand the knowledge about message fatigue by shed light on predictors that might exist and how they affect message fatigue and further message processing.

A further aim of the current study was to explore potential communication tactics that might mitigate message fatigue in order to promote more effective health communication campaigns. Given the detrimental consequences of message fatigue found in previous studies about message fatigue, a crucial question is what communication theory or strategy might play a significant role in reducing message fatigue. To fill this gap, I examined the role of predictors in understanding message fatigue during health communication. The goal was to explore how

perceived overcontrol and perceived overdemand in the message might influence message fatigue and further message processing. Another important but understudied practical concern is identifying communication strategies that either facilitate or reduce message fatigue and its effects on attitudinal and behavioral outcomes. To address this concern, I examined the influences of intensity of threat in inoculation and intensity of controlling language on message fatigue and behavioral outcomes and the underlying mechanisms of those relationships by exploring the mediating role of perceived threat and perceived control. Finally, I examined the moderating effect of vaccine status between message fatigue and behavioral intention to receive future vaccines. The specific objectives of the study include the following:

1. To explore the nature of health and risk message fatigue and to identify the predictors of message fatigue.
2. To explore how the intensity of inoculation and controlling language either facilitate or mitigate fatigue and their effects on subsequent behavioral outcomes.
3. To explore the moderating effect of an individual factor in health communication (i.e., vaccine status) in the relationship between message fatigue and behavioral outcomes.

This dissertation includes three main studies. The aim of Study 1 was to identify predictors of message fatigue that exist in the message itself and the mediating role of message fatigue in the relationship between predictors and message processing by conducting two online surveys with different health topics. Study 2 was an experimental study to determine which factors, theories, or concepts might facilitate more message fatigue responses during health communication. I proposed inoculation theory and two message-related factors (i.e., normative/informative inoculation information and intensity of controlling language) that might

increase message fatigue and mitigate the efficacy of target message outcomes. By examining the moderating role of vaccine status, I also investigated how different levels of an individual factor might enhance or attenuate the potential effect of inoculation on message fatigue. Study 3 is a post-experimental study of Study 2 to explore how (a) limited inoculation designed to reduce the threat of impending fatigue to a message advocating vaccination behavior and (b) persuasive messaging with different levels of controlling language influence message fatigue and behavioral intention.

The results of Study 1 yielded new predictors of message fatigue during health and risk communication, which is an understudied area in communication research. Through an examination of two health contexts at varying levels of pre-existing overexposure within health communication, this study provides solid conclusions about the extent to which perceived overcontrol and perceived overdemand in a health message predict message fatigue and how they relate to message processing variables such as inattention, avoidance, devaluation, unfavorable attitude, and negative emotions toward the persuasive health message. Study 1 is a useful starting point for understanding potential causes of message fatigue, especially during a time when a majority of the population is experiencing message fatigue due to COVID-19.

Moreover, the results of Study 2 opened new avenues for health and risk communication research. Previous findings about message fatigue focus primarily on how message fatigue leads to ineffective persuasive outcomes (e.g., inattention, reactance, and unfavorable attitude toward the health issue). The next step was to explore communication strategies that might either facilitate or mitigate message fatigue by examining the underlying mechanisms of mediating variables. The findings confirm the influence of different message tactics (i.e., inoculation and

controlling language) on message fatigue as well as the mediating roles of perceived threat and perceived overcontrol.

Finally, based on the boundary conditions of inoculation theory in health communication (e.g., Richards et al., 2017), the aim of Study 3 was to apply and extend inoculation theory in the context of message fatigue research. Findings from Study 3 confirm the effectiveness of controlling language in increasing pervasive outcomes, shedding light on ways to deliver messages about health issues that target recipients have frequently heard about.

Chapter 1 of this dissertation includes an overview and introduction. Chapter 2 reviews existing literature about message fatigue for Study 1. Chapter 3 includes a review of message fatigue (i.e., identifying predictors and outcomes of message fatigue) and the hypotheses and research questions for Study 1. Chapter 4 reviews existing literature about inoculation theory and message-specific factors (i.e., normative/informative information and intensity of controlling language) and presents the hypotheses and research questions for Studies 2 and 3. Chapter 5 describes the method for Study 1 (i.e., two online surveys), the method for Study 2 (i.e., online experimental study with COVID-19 data), and Study 3 (i.e., online experimental study with HPV data). Chapter 6 reports the results of data analyses for Study 1, Study 2, and Study 3. Chapter 7 provides a summary and discussion of the findings, theoretical and practical implications, and suggestions for future research.

CHAPTER 2

REVIEW OF EXISTING RESEARCH ON MESSAGE FATIGUE

Identifying predictors of message fatigue requires a review of outcome variables and predictors of message fatigue that scholars have already identified. This process helps scholars identify gaps in understanding potential predictors of message fatigue and identifying variables that facilitate message fatigue and how recipients respond to message fatigue.

Previous findings about message fatigue are scarce because the concept is relatively new. Some scholars have examined this effect in various communication settings to identify possible outcomes of message fatigue, including the association between message fatigue and message processing (e.g., So et al., 2017; Kim & So, 2018; So & Alam, 2019). In their conceptualization study, So et al. (2017) identified the association between various outcome variables (i.e., avoidance, annoyance, and information seeking) and message fatigue. They found that message fatigue positively related to message avoidance, desensitization, and counterargument and negatively related to information seeking and attention to both contexts, safe-sex and anti-obesity.

Scholars have investigated several outcome variables induced by message fatigue: psychological reactance, inattention, disengagement, and counterargument. Examining the effect of preexisting fatigue on resistance, Kim and So (2018) found that individuals who perceived higher message fatigue associated with anti-obesity messages had higher reactance and inattention, decreasing adoption of the recommended behavior. So and Alam (2019) tested how preexisting message fatigue gave rise to forms of resistance and found that higher preexisting

message fatigue associated with anti-obesity messages led to fewer message-consistent thoughts or issue-relevant thoughts and higher numbers of counterarguments. Interestingly, they manipulated message fatigue based on thematic frames (i.e., physical health frame vs. mental health frame) to test the effects of framing on unfavorable attitude. The results revealed that anti-obesity messages emphasizing physical health led to greater message fatigue and unfavorable attitude toward message recommendations. In a more recent study, Reynolds-Tylus et al. (2020) confirmed previous findings about the association between message fatigue and psychological reactance; they found that message fatigue influenced psychological reactance through perceived threat to freedom. This finding is a valuable contribution to message fatigue research because they manipulated message fatigue based on level of message frequency (i.e., 1 vs. 3). Although the association between message frequency and message fatigue was not significant, this examination was worthwhile because their empirical study was the first to manipulate the dimension of message fatigue (i.e., overexposure).

In the only study to identify predictors of message fatigue, So and Alam (2019) proposed preexisting message fatigue and individual characteristics. Individuals are likely to have different amounts of accumulated previous exposure to a specific issue, potentially influencing message fatigue response. So and Alam (2019) found that pre-existing message fatigue significantly predicted message fatigue response; the more individuals felt message fatigue prior to message exposure, the more they experienced fatigue during message exposure. They also found that among individual-level factors, subjective perception of targetedness was a potential predictor of message fatigue. Individuals who perceived themselves to be a major target of the message were likely to express greater message fatigue than those who did not have that perception. The results

indicate that women had greater message fatigue than men because they perceived themselves to be the primary target of anti-obesity messages (So & Alam, 2019).

Scholars have rarely discussed the predictors of message fatigue. In relation to the possible predictors of message fatigue, individual differences could limit the persuasive power of messages that elicit fatigue. Because individual levels of message fatigue for certain health and risk issues might have different baselines, examining inherent individuals' characteristics that precede message fatigue is important. For example, fatigue proneness, tendency to engage in sensation seeking via messages, and tolerance of media coverage are possible individual-level predictors of message fatigue. Identifying such individual-level predictors of message fatigue is important because the findings of much communication research suggest that individualized messages produced greater desired persuasive outcomes than non-tailored messages (Hawkins, 2008).

However, individual factors are presumably beyond the control of message designers, limiting the practical implications of message fatigue research. For this reason, message-level predictors of message fatigue during communication might carry more importance. Messages consist of numerous components, including content, tone, and length. At the same time, one particular message characteristic might either facilitate or mitigate fatigue responses that result from overexposure to repetitive messages. Message-level factors are important predictors of message fatigue because they are within the control of communication strategists, while individual factors are inherent and likely exist prior to communication. Accordingly, the aim of the current study was to explore potential predictors of message fatigue within the message itself and how those factors influence various aspects of message processing: message avoidance, perceived message value, information processing depth, and attitude toward the message.

Another area of research worth investigating involves identifying communication strategies that might reduce message fatigue. Scholars can examine the role of communication tactics in reducing message fatigue in two possible ways. First, discovering which factors might cause message fatigue would help designers develop more effective communication tactics. For example, if perceived overcontrol is a cause of message fatigue, messages that address control over the message might help mitigate fatigue. Another possibility is to induce resistance against an upcoming message that might induce fatigue. Inoculation theory explains how individuals create resistance against counter-attitudinal persuasion (McGuire, 1961). McGuire (1961) used the analogy of a viral infection to describe resistance to persuasion. Just as a weakened form of a virus enables a person to build resistance against a future encounter, forewarning people of an impending threat to their beliefs and introducing refutational content can help them develop resistance prior to future persuasive attacks (Richards et al., 2017). Based on this idea, inoculation can generate resistance toward an upcoming persuasive message that might induce message fatigue. Despite the literature pointing to the possibility of applying inoculation theory as a communication tactic in reducing message fatigue, scholars have yet to explore this integration of inoculation and message fatigue.

CHAPTER 3

RESEARCH QUESTIONS AND HYPOTHESES FOR STUDY 1

Guided by prior literature on message fatigue, identifying predictors of message fatigue is necessary. Communication scholars know little about what causes message fatigue or its effect on further message processing. The following sections present discussions of potential predictors of message fatigue—perceived overcontrol and perceived overdemand—and its effects on various message processing variables: message avoidance, inattention, message devaluation, unfavorable attitude toward the message, and negative emotions.

Message Fatigue

Scholars have applied various disciplines in their attempts to explain different kinds of fatigue. Findings about compassion fatigue, message fatigue, psychological fatigue, and cognitive fatigue meaningfully inform the conceptualization of message fatigue. So et al. (2017) proposed four dimensions of message fatigue to shed light on the side effects of prolonged message exposure: perceived overexposure, perceived redundancy, emotional exhaustion, and boredom. They suggested that the first two dimensions were environmental factors and that the latter two were experiential factors.

Two message environment factors include perceived overexposure and perceived redundancy. So et al. (2017) suggested that perceived overexposure and redundancy are key aspects of message fatigue. Perceived overexposure is a perceptual recognition of message exposure beyond one's desired level. Perceived redundancy is a perceptual recognition of superfluous message repetition or overlap. The importance of these two dimensions is also clear

in compassion fatigue research, especially Kinnick et al. (1996). Originally, the term "compassion fatigue" referred to job burnout among service workers: "the stress resulting from helping or wanting to help a traumatized or suffering person" (Figley, 1995, p. 7). Kinnick et al. (1996) applied this concept to the communication field, describing compassion fatigue as the experience of having "grown weary of unrelenting media coverage of human tragedy and ubiquitous fund-raising appeals" (Kinnick et al., 1996, p. 687). Kinnick et al. (1996) identified factors through which the mass media might contribute to compassion fatigue: pervasiveness, sensationalizing social problems, increasing perception of bad news, failure to provide context for an underlying crisis, and failure to provide solutions for problems. The authors highlighted message saturation, which results from pervasive media coverage of social problems, as a primary antecedent of message fatigue that elicits desensitization and lowers interest. Kinnick et al. (1996) defined message saturation as "the flooding of multiple communication channels with redundant messages" (p. 689), suggesting that overexposure and redundancy are key aspects of message fatigue.

Regarding the experiential side of message fatigue, So et al. (2017) identified exhaustion and tedium as dimensions of message fatigue. Exhaustion is a state of mental burnout as a response to exposure to seemingly repetitive messages, while tedium is a failure to find interest in a given message. Historically, burnout is a pattern of emotional exhaustion, detachment, and decreasing personal accomplishment (Burke, 1994; Martinussen et al., 2007), and exhaustion is the core element of burnout according to Maslach et al. (2001). In this regard, Kinnick et al. (1996) described emotional exhaustion (i.e., burnout) as a component of compassion fatigue, "a phenomenon associated with pervasive communication about social problems" (p. 687). So et al. (2017) proposed boredom, in addition to emotional exhaustion, as an experiential dimension of

message fatigue. Although some scholars have differentiated boredom (i.e., tedium) from fatigue, the consensus is that these two concepts share motivational and emotional characteristics (Hockey & Hockey, 2013). Myers (1937) defined boredom as "the outcome of a failure to find interests" (p. 298) and Bartley and Chute (1947) suggested that boredom is a response to monotony. Therefore, boredom (i.e., tedium) is attributable to excessive and monotonous exposure to messages.

Although So et al. (2017), in their original conceptualization of message fatigue, shed light on the key dimensions of message fatigue and how a fatigued audience might react to a message they perceive as repetitive and monotonous, the message itself might carry features that induce fatigue. Especially with regard to health and risk communication, where the persuasive recommendation of target health behaviors is essential, scholars have yet to consider how individuals' subjective perceptions toward health risk message might facilitate or mitigate message fatigue.

Predictors of Message Fatigue

Since the examination of message fatigue by So et al. (2017), numerous communication scholars have added extensive knowledge about the potential consequences of message fatigue. However, scholars have largely neglected to examine variables that might predict message fatigue prior to exposure to unwanted messages. Recognizing the importance of taking message characteristics into account when investigating factors related to message fatigue and further message processing, I examined how two predictors, perceived overcontrol and perceived overdemand, influence message fatigue and unfavorable message outcomes (e.g., unfavorable attitude toward the message, higher message avoidance, and inattention).

The four established dimensions of message fatigue suggest that message fatigue largely depends on message dissemination; however, the message itself might have features that generate fatigue. In this regard, I proposed perceived overdemand and perceived overcontrol as predictors of message fatigue. In his demand-control-support (DCS) model, Karasek (1979) identified perception of high demand, low control, and low support as key aspects of strain, including fatigue. He argued that negative consequences from work came from two dimensions: job demands, which refer to a perceptual evaluation of the amount of pressure and workload, and job controls, which refer to a perceptual evaluation of one's ability to control his or her own task engagement and activity (Karasek et al., 1998). Numerous findings from psychological research support this premise showing a relationship between work and fatigue (Hockey & Hockey, 2013). For example, Le Goff (1980) tested how control of work activities influenced the feeling of tiredness among workers. Specifically, he compared two conditions: work time shaped by others who controlled the clocks and work time shaped by the natural rhythms of daylight. The results indicate that tiredness increased with longer working hours (i.e., high demand) and lower choice and power over work schedules (i.e., low controllability). Similarly, Holding (1983) identified fatigue as any aversive motivation toward further activity that demanded high effort.

This work-fatigue relationship applies to health-related message fatigue as psychological disorder such as burnout or fatigue is supposedly related to perceived demand and control. I expected that subjective perceptions of overcontrol and overdemand in a message would bolster message fatigue. To the best of my knowledge, this is the first work applying DCS into the message fatigue research to investigate psychological disorder from fatigued audience during health and risk communication. Perceived overcontrol, in the current study, is the extent to which a person feels limited in their control over attitudinal and behavioral decisions. The goal of

health and risk communication is to inform publics about the probability of harm and risk (Reynolds & Seeger, 2005). Health risk messages, therefore, contain effort requirements and highlight what actions should be taken to avoid risks. Described actions in the message might lead to people to perceive that the message is trying to limit their freedom and autonomy, involuntarily leading to fatigue. Of course, message recipients might prefer not to follow the instructions in a message, but prolonged exposure to effort requirements can make them perceive the message as limiting their freedom and autonomy, involuntarily leading to fatigue in some individuals. Similarly, perceived overdemand in a health risk message is supposedly related to fatigue experience. Perceived overdemand refers to the number of tasks and degree of pressure a person feels to make attitudinal and behavioral decisions. Perceived overdemand can be distinguished with two aspects of demand in health risk message: number of tasks and degree of pressure. When reading health risk messages, audiences are likely to encounter messages that demand subsequent action. While some health risk messages require a simple action taking (i.e., getting a vaccine), many others do not (i.e., washing hands, social distancing, wearing masks before COVID-19 vaccine development). People might feel fatigue when they encounter quantitative overload and pressure in a message to avoid or prevent danger, regardless of their willingness. This aspect of fatigue appears in the stress overload scale (SOS), which posits that stress overload depends on two factors: (a) event loads and (b) personal vulnerabilities (e.g., perceived external demands, pressures, or responsibilities) (Amirkhan, 2012). Emphasizing demands and effort related to avoiding specific health risks can make people feel emotionally overloaded. Therefore, I proposed the following hypotheses and research question for these predictors:

H1: Perceived overcontrol will positively relate to message fatigue.

H2: Perceived overdemand will positively relate to message fatigue.

RQ1: Is perceived overcontrol or perceived overdemand the stronger predictor of message fatigue?

Message Fatigue as a Mediating Mechanism

Along with identifying potential predictors of message fatigue, the aim of this study was to examine the possible mediating role of message fatigue in the relationship between two predictors (i.e., perceived overcontrol and perceived overdemand) and message processing outcomes. Although no scholars have directly tested the mediating role of message fatigue in the link between predictors and the consequences of message fatigue, a considerable body of message fatigue research provides relevant evidence for this postulation. For example, Lee-Won at al. (2021) found that COVID-19 message fatigue mediated the relationship between future anxiety caused by COVID-19 and willingness to remain vigilant. Specifically, individuals with higher future anxiety were likely to experience higher message fatigue, and this higher level negatively related to willingness to remain vigilant to protect themselves and others from COVID-19. Similarly, So and Alam (2019) found that message fatigue mediated the relationship between message frames and attitude toward message recommendations. According to their findings, a majority of social marketers used a message highlighting weight management purpose (i.e., physical health) rather than life satisfaction (i.e., psychological distress). The anti-obesity messages framed as physical health produced greater message fatigue, enhancing unfavorable attitude toward the recommendations in the weight management message. These findings imply that message fatigue not only generates counterproductive consequences but also performs a mediating role in persuasive health communication. In this study, I predicted that when individuals perceived the message as overly intrusive on one's autonomy and behavior and

placed excessive demands on their feelings and behavior, they would experience an aversive motivational state (i.e., message fatigue) that would generate unfavorable consequences in message processing.

Message Avoidance

Previous findings about message fatigue demonstrate that it relates to a number of undesirable variables associated with message processing outcomes (e.g., So et al., 2017; So & Alam, 2019; Kim & So, 2018; So & Popova, 2018; Reynolds-Tylus et al., 2020). Focusing on message processing variables, I examined the mediation effect of message fatigue on the relationships between the suggested predictors and message avoidance. Message avoidance is an individual's action to mitigate their subjection to message exposure (Speck & Elliott, 1997). Advertising scholars have widely studied message avoidance, especially advertising avoidance. Cho and Cheon (2004) helped explain advertising avoidance in an online context by identifying three distinct types: cognitive, affective, and behavioral. Cognitive message avoidance reflects a negative belief in the message, affective message avoidance reflects a negative emotional response to the message, and behavioral message avoidance includes actions such as scrolling down or hiding or blocking pop-up ads.

Some researchers have found that extensive media coverage of a specific issue can lead individuals to feel fatigue, motivating them to avoid related media content and lowering their motivation to engage in interpersonal discussion or information seeking (Schumann, 2018). For example, So et al. (2017) revealed that more fatigued individuals were likely to avoid exposure to related messages in the context of safe sex and obesity. Similarly, Gurr and Metag (2021) found that high levels of fatigue toward an issue led to greater avoidance of relevant content during media use. When people feel exposed to an issue beyond the limits of their preference,

higher issue fatigue facilitates motivation to avoid news related to the issue. Thus, message fatigue is likely to elevate cognitive and behavioral message avoidance:

H3: Message fatigue will mediate the relationship between (a) perceived overcontrol and (b) perceived overdemand and message avoidance.

Perceived Message Value

Message value is a subjective assessment of the worth or utility of a message (Ducoffe, 1995). Previous findings suggest that the determinants of message value include informativeness, entertainment, and irritation (Ducoffe, 1996). Individuals who experience message fatigue are more likely to perceive a message as interrupting or disrupting their goal pursuit, leading them to perceive the message as boring or annoying. Because message fatigue involves exposure to similar messages over a prolonged time, fatigued individuals are likely to perceive a message as being uninformative, leading them to devalue it. Given that messages often appear on media channels (e.g., mass media or social media), unwanted and displeasing messages are likely to increase message devaluation among fatigued individuals. Therefore, I proposed the following hypothesis:

H4: Message fatigue will mediate the relationship between (a) perceived overcontrol and (b) perceived overdemand and perceived message value.

Attention toward Message

Scholars have treated attention as a prerequisite for effective communication (Blumberg, 2000; McGuire, 1989). Indeed, the persuasion model proposed by McGuire (1989) suggests that exposure and attention are part of a crucial early-stage process for successful outcomes, such as attitudinal and behavioral change. Accordingly, a message fails in the absence of exposure and attention to the message. Because attention to the message is a key mediating factor that

enhances attitudinal change and behavioral engagement, previous scholars in communication have focused on when and how people lose interest and resist attending to a message. More recent findings about message fatigue suggest that it can impede message processing, including attention to the message (e.g., So et al., 2017; So & Alam, 2019; Keating & Galper, 2021). For example, Keating and Galper (2021) found that participants fatigued with regard to e-cigarettes were less likely to pay attention to the message about e-cigarette use. Regarding prevention messaging in health communication, findings show that higher message repetition decreased attention paid while reading the message (e.g., So et al., 2017) and that inattention induced by message fatigue led to a failure to adopt behavioral recommendations (Kim & So, 2018). Relatedly, in their compassion fatigue study, Kinnick et al. (1996) found that more fatigued individuals were less likely to have interest in the target issue than less fatigued individuals across four social issues: violent crime, homelessness, AIDS, and child abuse. Therefore, I proposed the following hypothesis:

H5: Message fatigue will mediate the relationship between (a) perceived overcontrol and (b) perceived overdemand and attention to the message.

Attitude toward Message Recommendations

Although they are scarce, previous findings about message fatigue suggest that it relates to unfavorable attitude toward the message (e.g., So & Alam, 2019). For example, So and Alam (2019) investigated the relationship between anti-obesity message fatigue and unfavorable attitude toward message recommendations and found that the physical health frame of the obesity message led to greater message fatigue among participants, in turn making attitude toward the message about weight management behaviors less favorable. This prediction also emerged in a recent study conducted by So (2021), suggesting that message fatigue induced

greater reactance, which related to unfavorable attitude toward anti-tobacco messages. Therefore, I proposed the following hypothesis:

H6: Message fatigue will mediate the relationship between (a) perceived overcontrol and (b) perceived overdemand and attitude toward message recommendations.

Negative Emotion: Anger and Annoyance

Negative emotions such as anger or annoyance correlate with message fatigue. Scholars have developed various models to show how cognition might influence emotional state and how this relationship might lead to positive or negative outcomes (e.g., Situational Crisis Communication Theory [SCCT], Coombs & Holladay, 2005; Integrated Crisis Mapping [ICM], Jin, 2007). The basis of these models is cognitive appraisal theory (Lazarus, 1991), which posits that personal interpretations of an event determine emotional reactions. According to Lazarus (1991), two stages of appraisal occur: primary and secondary. Primary appraisal refers to whether a situation is relevant to one's wellbeing and whether one perceives the situation as positive or negative. For example, when individuals experience events, they evaluate whether the situation is relevant and favorable to their goals. When the situation is relevant to wellbeing, emotions tend to develop. Specifically, when the situation is favorable (unfavorable) to wellbeing, positive (negative) emotions occur. Secondary appraisal is how an individual evaluates resources needed to cope with a situation, including what is at stake and which actions might minimize negative consequences.

Based on this cognitive theory, a specific negative emotion such as anger or annoyance derives from message fatigue appraisal. Both anger and annoyance result when an individual encounters an obstacle to a goal (Lazarus & Lazarus, 1994; Reiser, 1999). Arguably, individuals might experience fatigue when they perceive that they cannot control their exposure to a specific

risk message on social media. If their direct connections (i.e., friends or followers) keep sharing news and clicking “like” on COVID-related messages, leading to greater exposure on their own feeds, they might evaluate their control over message exposure as low, perceive that they are exhausted, and experience negative feelings such as anger or anxiety. Indeed, So et al. (2017) revealed that annoyance is more likely to surface within fatigued individuals due to undesired message exposure. Although anger did not correlate with message fatigue in So et al. (2017), anger is likely to surface when an individual experiences risk message fatigue. Fatigued individuals might experience displeasure induced by the perception that unwanted messages are blocking their desired goal, inducing anger (Carver & Harmon-Jones, 2009; Frijda, 1986). Therefore, I proposed the following hypothesis:

H7: Message fatigue will mediate the relationship between (a) perceived overcontrol and (b) perceived overdemand and negative emotions (i.e., anger and annoyance).

CHAPTER 4

RESEARCH QUESTIONS AND HYPOTHESES FOR STUDIES 2 AND 3

This chapter is a review of previous research on inoculation theory and three message-specific factors (i.e., normative message, informative message, and intensity of controlling language) that either facilitate or mitigate message fatigue. Guided by previous findings about inoculation, the purpose of Study 2 was two-fold: (a) to explore how an elaborated inoculation message framed as normative and informative and a persuasive message framed as controlling the recipient's choice decrease the efficacy of inoculation intervention and (b) to examine perceived threat and perceived overcontrol as mediators of the relationship between message exposure and behavioral intention. While the aim of Study 2 involved the underlying mediating mechanism of two mediators, the aim of Study 3 was to show how limited inoculation and low level of controlling language might interactively decrease message fatigue with regard to a health communication message. The following sections present discussions about inoculation theory, three message-specific factors, and their integration with message fatigue research.

Inoculation Theory

Along with psychological reactance theory (Brehm, 1966), inoculation theory is one of the dominant theories in communication studies about inducing resistance to persuasion. McGuire (1961) introduced inoculation theory to explain the process of attitudinal inoculation-based resistance. McGuire used a medical analogy derived from human immunization: just as injecting a vaccine into the human body can make people resistant to illness, exposing them to

weak arguments opposing an attitude they already have can help make them resistant to future attack and strengthen their attitude.

Scholars have conducted a substantial number of studies about inoculation theory. McGuire (1961) and subsequent scholars (e.g., McGuire & Papageorgis, 1962) identified two mechanisms behind the inoculation process: threat and refutational preemption. According to McGuire (1961), threat results from exposure to unexpected challenges to an existing position or weakened counterarguments that contain the potential vulnerability of that existing position. McGuire labeled this simple presentation of weakened counterargument "implicit threat" (McGuire, 1964). In his later work, he introduced a new form of threat known as "explicit threat," which a forewarning in a message can generate. Forewarning makes people perceive their attitude as vulnerable to forthcoming challenges. According to McGuire, these two forms of threat are responsible for evoking in message recipients defense mechanisms that are integral to inoculation. Subsequent findings confirm McGuire's argument that threat is crucial to understanding inoculation-based resistance (Compton & Pfau, 2005; Pfau, 1997). According to Ivanov et al. (2009), "the threat element warns the individual about the vulnerability of the attitude currently in place. This realized vulnerability acts as a motivator for the individual to seek out information that would strengthen his or her current attitude" (p. 48).

The second mechanism of inoculation theory is refutational preemption (i.e., counterargument). Based on McGuire's analogy of human immunization, counterargument against counter-attitudinal challenges is analogous to the work of antibodies. As the human body fights a virus by producing antibodies, individuals who encounter a threat activate a defensive process by producing counterarguments that resist persuasive challenges (Compton, 2009). Inoculation theory assumes that when individuals encounter a forewarning of an impending

persuasive attempt and preemptively given refutational information, they become resistant to persuasion (Richards & Banas, 2015). Refutational preemption allows people to prepare for and counterargue against subsequent persuasion attempts, enabling them to prepare to resist messages that they will encounter (Compton & Pfau, 2005).

Traditional outcome variables that inoculation theory scholars have tested include attitude, values, and behavioral intention. Because inoculation theory stems from the motivation to protect established attitudes or beliefs, outcome variables tend to relate to attitudinal and behavioral change. In the context of health and risk communication, numerous scholars have demonstrated that the impact of inoculation relates to attitude in various health topic settings: smoking prevention (e.g., Pfau & Van Bockern, 1994), binge drinking (e.g., Parker et al., 2012), unprotected sex (e.g., Parker et al., 2012), and vaccination (e.g., Wong, 2016). For example, Wong (2016) conducted an experimental study based on inoculation theory, providing evidence that both generalized and specific inoculation messages were effective in preserving anti-HPV vaccine beliefs compared to non-inoculation messages. Richards and Banas (2015) also found that inoculation-based campaigns were effective in encouraging adoption of healthier behaviors via reducing reactance in the context of alcohol consumption.

Some scholars have argued that inoculation messages even promote an umbrella (or blanket) protection; that is, a single inoculation message might offer cross-protection for other related challenges (Compton & Pfau, 2005; Banas & Rains, 2010). For instance, Parker et al. (2012) found that an inoculation message regarding unprotected sex not only made people more resistant to unprotected-sex messages but also protected attitudes against binge drinking. Participants exposed to an inoculation message about unprotected sex showed greater counterarguing and stronger attitude toward anti-binge-drinking than people who did not receive

the inoculation message. Their later work confirmed the phenomenon of umbrella protection. An inoculation message addressing the use of X-rays to detect tuberculosis promoted resistance toward three other potentially beneficial health behaviors: taking penicillin, brushing teeth, and visiting the doctor for routine check-ups (Parker et al., 2016).

Inoculating against Message Fatigue

Fatigue research has much to gain from inoculation theory because it offers a strategy for mitigating fatigue. Inoculation theory proposes that a forewarning of an impending persuasion attempt and preemptively given refutational information bolster resistance by generating perceived vulnerability of an existing attitude (Richards et al., 2017). Inoculation theory scholars have shown that inoculation messages generate threat, which motivates defense preparation (Compton, 2009), and that preemptively given refutational information allows people to prepare for and counterargue against the message that they will encounter (Compton & Pfau, 2005). Such a technique might elicit resistance to the fatigue that can result from persuasive health and risk messages promoting advocate health behaviors. Although inoculation might play a role in reducing fatigue, scholars have not examined this relationship.

Although communication scholars have not discussed the potential link between inoculation and message fatigue, a few have shown that understanding how reactance theory relates to inoculation messaging points to the possible role of inoculation in message fatigue. Recent findings about inoculation theory provide insight into the way inoculation messages reduce involuntary responses such as psychological reactance: (a) reducing reactance after exposure to threatening messages with efforts to restore limited freedom (e.g., Bessarabova et al., 2013) and (b) mitigating reactance before it occurs by forewarning any possibility of its occurrence (e.g., Richards & Banas, 2015). In this regard, Richards and Banas (2015) and

Richards et al. (2017), both examining inoculation against reactance, conceptualized and operationalized inoculation messages based on self-recognized influence. In contrast to traditional inoculation, the authors defined threat as self-generated (i.e., reactance), not a warning about external persuasion. The same principle applies to risk message fatigue because fatigue occurs within an individual, not an external object.

This approach expands the use of inoculation into the domain of fatigue research. Inoculation messages might encourage resistance against the forthcoming urge to react negatively toward a message (Richards & Banas, 2015). An inoculation message can forewarn about attacks designed to change attitudinal positions and offer refutational preemption, allowing people to prepare for counterargument against impending message attacks. In conjunction with traditional inoculation manipulation, fatigue studies should include both forewarning of impending threat and refutational preemption. However, in the context of fatigue, the forewarning of threat needs to indicate that participants will encounter a fatigue-inducing message, emphasizing that fatigue occurs in the recipient, not an external object. By presenting a forewarning message about the threat of fatigue rather than the threat of subsequent persuasive appeal and providing reasons not to feel fatigue rather than information for counterargument against the impending persuasive appeal, inoculation messages can test the effect of inoculation on fatigue. By inoculating against the problem of potential fatigue at the onset of communication, scholars who study fatigue might be able to address more effectively health and risk topics that typically elicit feelings of fatigue.

However, applying inoculation to the message fatigue is not simple as it might appear. Previous scholars studying reactance and inoculation have generated mixed findings and suggested a boundary condition for inoculation theory. Sometimes, an inoculation message was

ineffective in reducing reactance (e.g., Sims, 2008) or even led to an outcome opposite the intended one, actually increasing reactance instead of producing resistance against reactance (e.g., Richards & Banas, 2015). These inconclusive findings suggest the necessity of exploring the influence of different levels of threat in inoculation messages on message fatigue. Study 2 and Study 3 followed the procedures detailed in Richards et al. (2017), who found that enhanced threat in inoculation messages engendered greater reactance and that limited threat in inoculation messages functioned as buffer against reactance.

Study 2

Research Questions and Hypotheses

Given the association between inoculation and indicators of message fatigue, a series of research questions and hypotheses guided the identification of an effective communication strategy for fatigued individuals.

Effects of Inoculation Message on Message Fatigue

McGuire (1961) and other scholars have identified two central mechanisms behind inoculation: threat and refutational preemption. Individuals can develop resistance (i.e., become inoculated against an attempt to persuade them), when they receive a forewarning of forthcoming challenges as well as information that can facilitate counterargument. Inoculation scholars working with inoculation theory have conceptualized threat as an attitudinal vulnerability that results from external attack or counter-attitudinal arguments (e.g., Compton & Pfau, 2005). Initially, scholars believed that threat was pivotal in creating resistance to persuasive communication (McGuire, 1961a; McGuire & Papageorgis, 1961). Although scholars agree that threat is a requisite for inoculation-based resistance (Compton & Pfau, 2005), the optimal level of threat for evoking the inoculation effect is inconclusive (Ivanov, 2017). In line with this

argument, a meta-analysis conducted by Banas and Rains (2010) revealed that the relationship between threat level and inoculation effectiveness (i.e., resistance) was not significant, though the coefficient for threat was in the expected direction.

Despite the controversies surrounding the relationship between threat and inoculation effectiveness, many inoculation theory scholars have argued that enhanced threat evoked by inoculation messages might engender counterproductive consequences in message recipients (e.g., facilitating resistance). For example, Pfau et al. (2010) found that enhanced threat messages containing greater severity, salience, certainty, and immediacy of a potential attack led to greater perceived threat, motivating people to engage in danger control, thereby, increasing resistance. In conclusion, threat seems to predict resistance (Szabo & Pfau, 2002).

On the contrary, previous findings suggest that low levels of perceived threat might be more beneficial for effective reduction of message fatigue. In other words, an inoculation message that attempts to enhance threat against message fatigue might counterproductively cause more message fatigue instead of more resistance to it (see Szabo & Pfau, 2001). Therein lies the problem. Traditionally, the aim of an inoculation message is to confer resistance by enhancing threat. However, such an enhancement led to more anger and perceived threat to freedom instead of engendering resistance against reactance (Miller et al., 2013; Pfau et al., 2009; Richards et al., 2017). Higher perceived threat induced by an inoculation message enhanced anger and perceived threat to freedom, both of which are barriers to resistance against reactance.

Although traditional inoculation scholars argue that inoculation is effective in conferring resistance by enhancing threat, based on the finding that an inoculation treatment designed to enhance threat can actually mitigate the effectiveness of inoculation intervention, I expected that an inoculation message containing a detailed explanation of a threat would actually elicit greater

message fatigue. This postulation is line with Richards et al. (2017), whose findings suggest that perceived threat from an inoculation treatment actually increased perceived threat to freedom. Study 2 used the procedures from previous studies about inoculation and reactance (e.g., Richards & Banas, 2015; Richards et al., 2017) but with an elaborated inoculation treatment featuring two frames (i.e., normative and informative) to convey greater message threat. Given the positive association between inoculation treatment and perceived threat (e.g., Richards & Banas, 2015; Richards et al., 2017), elaborated inoculation messages designed to induce threat should enhance perceived threat and, in turn, reduce the efficacy of the inoculation treatment in reducing message fatigue.

Another practical purpose of this study was to examine the effectiveness of message content in an inoculation message. Despite the amount of research identifying the value of inoculation and its efficacy in various contexts, few scholars have addressed the effectiveness of message variation. One aim of this dissertation was to test two aspects of message content that might influence the efficacy of inoculation: normative and informative.

Contrary to traditional inoculation theory, I expected that a normative inoculation message would not confer resistance against message fatigue but result in more, rather than less, perceived threat. Social norms are "rules and standards that are understood by members of a group, and that guide and/or constrain human behavior without the force of laws" (Cialdini & Trost, 1998, p. 152). Observing the behavior of others can motivate people to engage in similar behaviors and increase pressure to conform (Asch, 1956; Darley & Latane´, 1968; Lewin, 1952; Milgram, Bickman, & Berkowitz, 1969). Previous findings demonstrate that perception of a reference group influences and distorts norm perceptions (e.g., Paek, 2009). The more intensely individuals feel that they are a part of a group and affiliated with a group, the more they are

likely to respond to normative influence (Godbold & Pfau, 2000). A similar concept is peer pressure. For example, Webb et al. (1995) found that 23% of sixth graders said they were willing to drink alcohol in high school due to perceived use by older peers, and 13% said they were willing because their friends approved of alcohol use. The implication is that if a message contains what others think the recipient should do, recipients who feel affiliated with that group of people will be more vulnerable to the message (Godbold & Pfau, 2000).

I also expected that an informative inoculation message would mitigate the efficacy of the inoculation in reducing message fatigue via enhanced perceived threat. Detailed information about health messages includes arguments based on the facts (Godbold & Pfau, 2000). Naturally, these arguments highlight the severity of and personal susceptibility to the risk, both of which are likely to elicit greater threat. Given the evidence that a low level of threat is necessary for successful inoculation treatment, an elaborated inoculation message framed as normative or informative should increase perceived threat, leading to greater message fatigue and lower behavioral intention to receive a vaccine. Finally, given the lack of previous findings about the relative strength of these frames, I explored whether the normative or informative frame would lead to greater perceived threat in an inoculation message. Therefore, I proposed the following hypotheses and research question:

H8: Exposure to elaborated inoculation messages framed as normative or informative will lead to greater perceived inoculation threat than the control message.

H9: Exposure to elaborated inoculation messages will enhance perceived inoculation threat, increasing message fatigue and lowering behavioral intention to receive a vaccine.

RQ2: Will perceived inoculation threat differ between normative-framed and informative-framed inoculation messages?

Effects of Control Language on Message Fatigue

Another message content factor that might generate fatigue during health and risk communication derives from cognitive resource theory (CRT) (Probst & Brubaker, 2001). According to CRT, employees use self-regulatory processes to allocate cognitive resources to either on- or off-task behaviors (Kanfer & Ackerman, 1989). In other words, whether individuals can persist on subsequent tasks depends on self-regulatory capacity; when placed in stressful conditions, they are likely to lose self-regulatory capacity and become unable to continue (Baumeister, 2001). Based on CRT, employees have fewer resources for performance in situations that involve demanding work or when they feel someone else is controlling their behavior or decision making (Tucker et al., 2009).

In conjunction with CRT, perceived control is a key factor in self-regulation that might have an impact on psychological and behavioral responses to a message. Psychology scholars have described perceived control as the degree to which one feels autonomous in their decision making and task completion (Jex, 1998). Therefore, the experience of loss of control over choices might lead to unfavorable responses and outcomes (Paulus & Nagar, 1987). In the context of communication, loss of perceived control over decision making or behavior due to controlling language in the message might lead to frustration. Indeed, numerous scholars have discussed the influence of language intensity in persuasive message responses (Burgoon et al., 1975; O'Keef, 1997). McLaughlin et al. (1980) characterized controlling language as increased use of imperative expressions (e.g., command directives vs. indirect suggestions). Based on previous findings about perceived control and findings from Study 1, coercive pressure language

can evoke perceived loss of control. Thus, greater pressure-inducing language should increase perceived loss of control, generating message fatigue during message processing. Thus, I proposed the following hypotheses:

H10: Exposure to a message featuring high controlling language will lead to greater perceived overcontrol than low controlling language.

H11: Exposure to elaborated inoculation messages will enhance perceived overcontrol, increasing message fatigue and lowering behavioral intention to receive a vaccine.

Moderating Effect of Vaccination Status

The hypothesized effects of inoculation message and controlling language on attitudinal outcomes through message fatigue depend on individual factors that magnify or mitigate the tendency to experience fatigue. One individual-level factor of interest is current vaccination status (i.e., number of doses). Apart from broader message content factors (e.g., how a particular communication tactic might affect message fatigue and further attitudinal outcomes), the effects of individual factors such as current vaccination status have not been the focus of previous study. My investigation called upon the heuristic-systematic model (HSM). According to this model, individuals with well-developed schemas or associated networks related to a particular topic have a tendency to have a better cognitive capacity to handle information related to that topic (Chaiken, 1980; Petty & Cacioppo, 1984; 1990). Individuals with knowledge structures (i.e., schemas) about the benefits and possible side effects of vaccination by engaging vaccine uptake indicated greater approval of vaccines. Consequently, despite potential message fatigue due to inoculation messaging or high controlling language, previous engagement with a vaccine might motivate people to receive needed vaccines in the future. I proposed that the number of

vaccination doses fatigued people had already received would be a factor in their intention to receive a vaccine in the future:

H12: Vaccination history will moderate the indirect effects of elaborated inoculation messages on behavioral intention to receive a vaccine through perceived threat and message fatigue.

H13: Vaccination history will moderate the indirect effects of controlling language on behavioral intention to receive a vaccine through perceived overcontrol and message fatigue.

Interaction Effect of Inoculation and Perceived Control language

Without previous findings to predict how normative/informative information in an inoculation message and coercive pressure-inducing language might affect message fatigue, I posed the following research question:

RQ3: How do inoculation and controlling language manipulations interact to influence message fatigue?

Study 3

Research Questions and Hypotheses

Based on findings from Richards et al. (2017) about the effects of minimized threat in inoculation messages on reactance, the aim of Study 3 was to test whether inoculation designed to minimize the threat of message fatigue might elicit the efficacy of inoculation treatment in conjunction with degree of controlling language.

One aim of this dissertation was to examine how inoculation messages in conjunction with controlling language might mitigate message fatigue, extending the boundary conditions of inoculation to account for resistance to self-recognized influence (i.e., message fatigue).

Traditional inoculation theory suggests the possibility of inoculating against a message that might induce fatigue during communication only when perceived threat is low. Therefore, to obtain favorable inoculation outcomes with regard to message fatigue, low levels of threat in the inoculation message are necessary.

Study 3 featured two central mechanisms through which an inoculation message might create resistance against the urge to react negatively toward a persuasive message. First, the message should forewarn the recipient about the threat of fatigue (i.e., the health risk message that might lead them to feel fatigue). Second, the message should provide information about refutational preemption, indicating reasons to resist fatigue by suggesting the merits of the arguments in the health risk message. However, detailed information about these two components should engender greater threat, followed by opposite effects, as I predicted in Study 2. Moreover, effective inoculation is likely only when controlling language in the subsequent health message is low. Exposure to limited inoculation should confer resistance against message fatigue with regard to the following health message; however, coercive or pressuring language in this health message is likely to mitigate the buffering effect created by inoculation. Therefore, I proposed following hypotheses:

H14: Exposure to the limited inoculation message, compared to the control message, will reduce message fatigue when controlling language is low but increase message fatigue when controlling language is high.

H15: Message fatigue will negatively influence behavioral intention to receive a vaccine.

CHAPTER 5

METHODS

Chapter 5 outlines the two separate studies conducted to address the hypotheses and research questions: (a) online surveys (Study 1) and (b) online experiments (Studies 2 and 3). The aim of study 1 was to identify predictors of message fatigue and the mediating role of message fatigue within two health contexts: COVID-19 and HPV. The main purpose of the two examinations was to replicate findings for the COVID-19 topic with a health message topic that has received less attention among the public (i.e., HPV). Examining multiple contexts helped control for confounding factors and enhanced external validity. Based on the results of Study 1, the aim of the two online experiments in Study 2 and Study 3 was to examine the extent to which an inoculation message and controlling language might reduce message fatigue.

Pretest

To examine whether participants perceived each health topic differently in terms of overexposure, a pretest was conducted among 100 U.S. adults via Prolific panel (M = 31.98, SD = 13.10, 70% female). The pretest featured a within-subjects experimental design. Five health topics perceived to be preventable by engaging in a particular behavior (e.g., getting a vaccine) and relevant to individual health were selected: COVID-19, HPV, Flu, Heart disease, and Diabetes. These five health risk topics were presented in random order, and participants answered five items regarding pre-existing overexposure toward each topic: “I have lost track of the amount of times I have heard that COVID-19 (HPV, Flu, Heart disease, Diabetes) is a serious problem,” “At this point, I’ve heard about problems related to COVID-19 (HPV, Flu, Heart

disease, Diabetes) more than I ever needed to," "I have heard enough about how important it is to follow recommendations to prevent COVID-19 (HPV, Flu, Heart disease, Diabetes)," "There are simply too many health messages about COVID-19 (HPV, Flu, Heart disease, Diabetes) nowadays," and "The importance of not getting COVID-19 (HPV, Flu, Heart disease, Diabetes) is over-taught." One-factor repeated measures analysis of variance revealed a significant difference in the effects of the five health topics on perceived overexposure, Wilks' Lambda = .48, F (4, 96) = 26.20, $p < .001$). Because the profile plot described a significant mean difference between HPV and COVID-19 group, a paired samples t-test was conducted. The results indicated a significant difference between perceived overexposure to HPV (M = 2.94, SD = 1.37) and COVID-19 (M = 4.63, SD = 1.49), t(99) = -9.90, $p < .001$. Thus, COVID-19 and HPV topics were selected as the main topics for the health messages presented in the main study.

Main Study 1

The main Study 1 consisted of two online surveys with two health contexts: COVID-19 and HPV. The main purpose of two examinations was to better understand whether and how propositioned two predictors, perceived overcontrol and perceived overdemand, might influence message fatigue to the different health topics at varying levels of pre-existing overexposure within health communication.

Online survey 1 (COVID-19)

To identify predictors of message fatigue and the mediating role of message fatigue, an online survey was conducted in January 2022. To be eligible, participants had to be at least 18 years old. Recruits from Prolific, an online participant recruitment tool, included 536 U.S. adults. Based on the findings from the pretest, I designed a questionnaire reflecting predictors and outcome variables of message fatigue toward a set of COVID-19 prevention messages.

Online survey 2 (HPV)

The second online survey was conducted through Prolific in February 2022. To be eligible, participants had to be between the ages of 18 and 26 (catch-up population age) and not have participated in the first survey. Participants were screened for prior participation using the Prolific screening function. Recruits from Prolific, an online participant recruitment tool, included 506 U.S. adults. A questionnaire reflecting predictors and outcome variables of message fatigue toward a set of HPV prevention messages was designed.

Participants and Procedure

Online survey 1 (COVID-19)

The sample contained more male participants (56.3%) than female (43.7%), and the average age was 28 years (M = 28.10, SD = 9.27). In terms of ethnicity, a majority of the participants were Caucasian (n = 269, 50.2%), followed by African American (n = 122, 22.8%), Hispanic/Latino (n = 113, 21.1%), Asian (n = 23, 4.3%), Native American (n = 1, 0.2%), and Other (n = 8, 1.5%). A majority of the participants had less than an undergraduate degree (n = 274, 51.1%), followed by undergraduate degree (n = 210, 39.2%), graduate degree (n = 43, 8.0%), and others (n = 9, 1.7%) (see Table 2).

Online survey 2 (HPV)

The sample contained more female participants (75.5%) than male (21.1%), and the average age of the participants was 22 years (M = 22.18, SD = 2.18). In terms of ethnicity, a majority of the participants were Hispanic/Latino (n = 220, 43.5%), followed by Caucasian (n = 184, 36.4%), African American (n = 67, 13.2%), Asian (n = 23, 4.5%), Native American (n = 3, 0.6%), and Other (n = 9, 1.8%). A majority of the participants had less than an undergraduate

degree (*n* = 286, 56.5%), followed by undergraduate degree (*n* = 189, 37.4%), graduate degree (*n* = 28, 5.5%), and others (*n* = 3, 0.6%) (see Table 2).

Instrument

Prior to beginning of the survey questionnaire, participants read an explanation of COVID-19 (HPV) describing what COVID-19 (HPV) is and how it spreads. To assess message fatigue regarding a specific health topic, participants were instructed to focus on messages about COVID-19 (HPV) prevention (e.g., COVID-19 vaccine, social distancing, and washing hands) instead of reading one specific message. Participants then responded to a set of items based on thoughts that the messages about COVID-19 (HPV) brought to their minds.

Measures

Unless otherwise noted, all items were measured using 7-point scales ranging from 1 (strongly disagree) to 7 (strongly agree). Higher scores indicate a higher level of agreement.

Message fatigue. The measure for message fatigue was 17-item scale from So et al. (2017): "I have lost track of the amount of times I have heard that COVID-19 (HPV) is a serious problem," "At this point, I've heard about problems related to COVID-19 (HPV) more than I ever needed to," "I have heard enough about how important it is to prevent COVID-19 (HPV)," "There are simply too many messages about COVID-19 (HPV) nowadays." "The importance of preventing COVID-19 (HPV) is overtaught," "COVID-19 (HPV) messages rarely provide new information," "After hearing them for years, messages about COVID-19 (HPV) seem repetitive," "Messages about COVID-19 (HPV) are all beginning to sound the same to me," "I can predict what a message about COVID-19 (HPV) is going to say," "I am burned out from hearing that people's unpreparedness for COVID-19 (HPV) is a serious problem," "I am sick of hearing about consequences of unprepared risk like COVID-19 (HPV)," "I am tired of hearing about the

importance of preventing COVID-19 (HPV)," "COVID-19 (HPV)-related messages make me want to sigh," "COVID-19 (HPV) messages are boring," "COVID-19 (HPV) messages make me want to yawn," "I find messages about COVID-19 (HPV) to be dull and monotonous," and "COVID-19 (HPV)-related messages are tedious" (COVID-19: Cronbach's α = .95, *M* = 4.80, *SD* = 1.32; HPV: Cronbach's α = .90, *M* = 2.88, *SD* =.96).

Perceived overcontrol. The measure for perceived overcontrol included five items: "I find that messages about COVID-19 (HPV) attempt to determine what I should do," "I find that messages about COVID-19 (HPV) attempt to determine how I should act," "I sometimes feel that COVID-19 (HPV)-related messages attempt to compel my behaviors," "I find that messages about COVID-19 (HPV) attempt to control what actions I should take," and "I find that messages about COVID-19 (HPV) interfere too much in my personal freedom" (COVID-19: Cronbach's α = .89, *M* = 4.86, *SD* = 1.42; HPV: Cronbach's α = .85, *M* = 3.48, *SD* = 1.23).

Perceived overdemand. The measure for perceived overdemand included six items: "Messages about COVID-19 (HPV) make excessive demands on me to take actions," "Messages about COVID-19 (HPV) make intense demands on me to take actions," "Messages about COVID-19 (HPV) pressure me to take actions," "Messages about COVID-19 (HPV) assertively ask me to act," "Messages about COVID-19 (HPV) suppress my spontaneous feelings," and "Messages about COVID-19 (HPV) suppress my spontaneous responses" (COVID-19: Cronbach's α = .91, *M* = 4.16, *SD* = 1.49; HPV: Cronbach's α = .84, *M* = 3.03, *SD* = 1.11).

Message avoidance. The measure for message avoidance included six items adapted from Youn and Kim (2019). Three items addressed cognitive message avoidance: "I ignore COVID-19 (HPV) prevention messages when I am exposed to it," "I do not pay attention to COVID-19 (HPV) prevention messages when I am exposed to it," and "I gloss over COVID-19

(HPV) prevention messages when I am exposed to it." (COVID-19: Cronbach's α = .93, *M* = 3.49, *SD* = 1.74; HPV: Cronbach's α = .91, *M* = 2.71, *SD* = 1.38). Three items addressed behavioral message avoidance: "I try to move my attention away from COVID-19 (HPV) prevention messages," "I try to 'block' COVID-19 (HPV) prevention messages from the media that I am exposed to," and "I try the 'hide' option to block COVID-19 (HPV) prevention messages" (COVID-19: Cronbach's α = .90, *M* = 3.46, *SD* = 1.69; HPV: Cronbach's α = .88, *M* = 2.21, *SD* = 1.13).

Attention to the message. The measure for information processing depth included three items from Nabi et al. (2007): "I was interested in what the messages about COVID-19 (HPV) prevention had to say," "I paid close attention to the argument in the messages about COVID-19 (HPV) prevention," and "I didn't let myself get distracted from focusing on the COVID-19 (HPV) prevention message content" (COVID-19: Cronbach's α = .89, *M* = 4.14, *SD* = 1.54; HPV: Cronbach's α = .84, *M* = 4.85, *SD* = 1.22).

Perceived message value. The measure for perceived message value included seven items adapted from Bevan-Dye (2020): The messages about COVID-19 (HPV) are "helpful," "useful," "valuable," "important," "relevant," "timely," and "contain new information." (COVID-19: Cronbach's α = .94, *M* = 4.81, *SD* = 1.39; HPV: Cronbach's α = .88, *M* = 5.72, *SD* = .88).

Attitude toward the COVID-19 prevention message. The measure for attitude toward COVID-19 (HPV) prevention messages included three bipolar adjective pairs from So and Alam (2019): "bad-good," "negative-positive," and "unfavorable-favorable." (COVID-19: Cronbach's α = .95, *M* = 4.72, *SD* = 1.73; HPV: Cronbach's α = .93, *M* = 5.88, *SD* = 1.13).

Control variables. Age, gender, race/ethnicity, and education were included as controlled sociodemographic variables. Age was a continuous variable measured in years. Gender was collapsed into two categories (0 = Male, 1 = Female). Education was collapsed into six categories: (a) high school graduate, (b) some college, (c) college graduate, (d) Master's degree, (e) Doctoral degree, and (f) other. Race/ethnicity was recoded into two dummy variables (0 = White, 1 = non-White)

Although no scholars have identified direct relationship between involvement and message fatigue, many have found that involvement enhanced not only cognitive processing but also direction of processing (Petty & Cacioppo, 1990). More specifically, personal importance intensified positive or negative feeling about a message. Even though other factors (e.g., attitude or prior experience) might have already determined direction of processing, involvement can intensify that direction (Stephenson & Palmgreen, 2001). Therefore, individuals with lower personal involvement with a message topic might be more likely to experience message fatigue due to a discrepancy between personal importance and overexposure to the message. In addition, previous findings suggest that heightened vaccine confidence related to favorable information processing and a higher likelihood of adopting the health recommendations in a message (e.g., Nowak et al., 2020). Vaccine confidence typically depends on level of trust in the safety and efficacy of a vaccine (Larson et al., 2015). Individuals with low vaccine confidence might delay in receiving or refuse to receive vaccines due to heightened vaccine hesitancy. These individuals might have message fatigue toward repetitive vaccine encouragement messages if they believe that the vaccination options are not safe or trustworthy. Thus, issue involvement and vaccine confidence were included as additional control variables.

Issue involvement was measured as a continuous variable using three items adopted from Leippe & Elkin, 1987. Participants indicated how critical, personally relevant, and involving the issue of COVID-19 (HPV) was to them by rating the following statements: "It is important," "It affects me," and "It concerns me" (COVID-19: Cronbach's α = .91, *M* = 5.31, *SD* = 1.52; HPV: Cronbach's α = .81, *M* = 5.02, *SD* = 1.30). The measure for vaccine confidence included three items adapted from Betsch et al. (2018): "I am completely confident that COVID-19 (HPV) vaccines are safe," "COVID-19 (HPV) vaccines are safe," and "Regarding COVID-19 (HPV) vaccines, I am confident that public authorities decide in the best interest of the community." (COVID-19: Cronbach's α = .93, *M* = 4.56, *SD* = 1.92; HPV: Cronbach's α = .82, *M* = 5.68, *SD* = 1.03) (see Table 4).

Main Study 2

The main purpose of Study 2 was to explore how an elaborated inoculation and a controlling language in a persuasive message decrease the efficacy of inoculation intervention through two mediations, perceived threat and perceived overcontrol respectively. In addition, to demonstrate that how enhanced threat driven from an elaborated inoculation message might engender opposite effects from traditional inoculation intervention by increasing message fatigue. The aim of Study 3 was to examine how limited inoculation and low controlling language in a persuasive message interactively play a significant role in mitigating message fatigue. Based on the distinct purpose of study in 2 and 3, different levels of threat-induced manipulation were created to answer a series of hypotheses and research questions.

Online Experimental Study (COVID-19)

The further aim of Study 2 was to examine one of the predictors of message fatigue, perceived overcontrol, based on the findings of Study 1. The goal was to investigate the

underlying mechanisms that might explain the effects of inoculation and controlling language on behavioral intention through multiple mediators. To identify communication tactics that might mitigate message fatigue, an online experiment with a 3 (inoculation type: normative vs. informative vs. non-inoculation) × 2 (controlling language: high vs. low) between-subjects design was conducted in May 2022.

Once consent form and pre-measures were obtained, participants read either a normative inoculation message, an informational inoculation message, or a neutral non-inoculating message (i.e., short history of Mexican food) prior to reading the health messages. After exposure to the first message, all participants answered the manipulation check items about perceived inoculation threat in the message they read. Then they read a persuasive message about COVID-19 vaccine promotion containing either high or low controlling language. After reading both messages, they responded to questions gauging their post-exposure perceived overcontrol, message fatigue, and behavioral intention, along with demographic information.

Participants and Procedure

An a priori power analysis was performed using G*Power 3 to estimate a sample size adequate for a medium effect size (f = .25) (Faul et al., 2007). With an alpha of .05 and 80 percent power, the sufficient sample size needed for this effect size was 158, suggesting that the sample size of 301 was more than adequate for the current study. To be eligible, participants had to be at least 18 years old. Recruits from a Qualtrics, survey panel, operated by Ugam, included 301 U.S. adults.

The sample contained more female participants (51.8%) than male (46.5%), and five participants reported being non-binary (1.7%). The average age was 47 years (*SD* = 17.60). In terms of ethnicity, a majority of participants were Caucasian (*n* = 174, 57.8%), followed by

Hispanic/Latino (*n* = 56, 18.6%), African American (*n* = 37, 12.3%), Asian (*n* = 13, 4.3%), Other (*n* = 12, 4.0%), and Native American (*n* = 9, 3.0%). A majority of participants had less than an undergraduate degree (*n* = 186, 61.8%), followed by undergraduate degree (*n* = 58, 19.3%), graduate degree (*n* = 38, 12.7%), and others (*n* = 19, 6.3%) (see Table 3).

Experimental Stimuli

Consistent with previous manipulations (i.e., Godbold & Pfau, 2000), the elaborated inoculation message consisted of two components, a forewarning of threat and refutational preemption. However, this message design differed from the traditional inoculation message design, which tends to focus on the forewarning of threat from external persuasive attempts. Similar to Richards and Banas (2015) and Richards et al. (2017), the inoculation message in the current study focused on self-recognized influence rather than external persuasion.

The forewarning of threat described a health message encounter that might lead to fatigue. Refutational preemption consisted of reasons to resist message fatigue by considering the merits of the arguments in the health message (i.e., normative vs. informational). The normative inoculation message described the necessity of fitting in with the reference group. The argument mentioned that many more people in United States had received COVID-19 vaccines than people expected. The informational inoculation message presented detailed information about variants of the coronavirus. The control message referred to an issue that is irrelevant to the COVID-19 vaccine promotion message (i.e., a short history of Mexican food). Previous scholars commonly used the history of sushi as a control message in an inoculation manipulation (e.g., Richards et al., 2017; Banas & Miller, 2013; Banas & Rains, 2010). However, the prominence of anti-Asian bigotry during the coronavirus pandemic might have affected

responses in a certain way; thus, the history of Mexican food in the United States was selected as the control message.

The persuasive health message differed in the intensity of controlling language (i.e., high vs. low). Controlling language includes words that the message recipient perceives to be forceful or pressure-inducing. The high controlling language contained words meant to override the natural decision making of the recipient (e.g., "You must start right now. We're not asking you, we're telling you" or "You have to do it"). The low controlling language presented more polite and suggestive words (e.g., "Why not give it a try?" or "Consider getting a COVID-19 vaccine"). Both messages were nearly identical in length and sentence structure.

Measures

Unless otherwise noted, all items were measured using 7-point scales ranging from 1 (strongly disagree) to 7 (strongly agree). Higher scores indicate a higher level of agreement.

Perceived inoculation threat. The measure for perceived inoculation threat included bi-polar adjective pairs from Burgoon et al. (1987) and Banas and Richards (2017): "safe-dangerous," "nonthreatening-threatening," "calm-anxious," "unintimidating-intimidating," "not harmful-harmful," and "not risky/risky" (Cronbach's $\alpha = .96$, $M = 3.12$, $SD = 1.77$).

Perceived overcontrol. The measure of perceived overcontrol included five items: "I find that messages about COVID-19 attempt to determine what I should do," "I find that messages about COVID-19 attempt to determine how I should act," "I sometimes feel that COVID-19-related messages attempt to compel my behaviors," "I find that messages about COVID-19 attempt to control what actions I should take," and "I find that messages about COVID-19 interfere too much in my personal freedom" (Cronbach's $\alpha = .90$, $M = 4.86$, $SD = 1.45$).

Message fatigue. The measure for message fatigue was the seventeen-item scale from So et al. (2017): "I have lost track of the amount of times I have heard that COVID-19 is a serious problem," "At this point, I've heard about problems related to COVID-19 more than I ever needed to," "I have heard enough about how important it is to prevent COVID-19," "There are simply too many messages about COVID-19 nowadays." "The importance of preventing COVID-19 is overtaught," "COVID-19 messages rarely provide new information," "After hearing them for years, messages about COVID-19 seem repetitive," "Messages about COVID-19 are all beginning to sound the same to me," "I can predict what a message about COVID-19 is going to say," "I am burned out from hearing that people's unpreparedness for COVID-19 is a serious problem," "I am sick of hearing about consequences of unprepared risk like COVID-19," "I am tired of hearing about the importance of preventing COVID-19," "COVID-19-related messages make me want to sigh," "COVID-19 messages are boring," "COVID-19 messages make me want to yawn," "I find messages about COVID-19 to be dull and monotonous," and "COVID-19-related messages are tedious" (Cronbach's $\alpha = .97$, $M = 4.60$, $SD = 1.57$).

Behavioral intention. The measure for intention to obtain the COVID-19 vaccine included three items: "I intend to get a COVID-19 vaccination when available (if needed)," "I will try to get a COVID-19 vaccination when available (if needed)," and "I will actually get a COVID-19 vaccination when available (if needed)." (Cronbach's $\alpha = .99$, $M = 4.36$, $SD = 2.29$).

Vaccination status. The measure for COVID-19 vaccination status was a one-item measure. The item asked "Have you got COVID-19 vaccination in the past?" with responses ranging from 1 (No, not at all), 2 (Yes, I have received both doses), and 3 (Yes. I have received both doses and booster shot as well).

Control variables. An association between age and COVID-19 vaccination rate identified from previous research (e.g., Sherman et al. 2020). Thus, age was included as controlled sociodemographic variable. In addition, previous findings suggest that personal experience related to recognition of risk and motivation to engage in protective behaviors (e.g., Marx et al., 2007). For example, Weinstein (1989) found that individuals who suffered impacts from the risks showed greater health protective behaviors through enhanced susceptibility. To control for these potential influences on intention to get a vaccine, this study considered age and personal history with COVID-19 as covariates. Age was a continuous variable measured in years. Personal experience with COVID-19 was measured as a categorical variable using one item: "Have you ever been diagnosed with COVID-19?" (yes: n = 27.2%; no: n = 72.8%) (see Table 4)

Main Study 3

Online Experimental Study (HPV)

The aim of Study 3 was to determine whether the effects of an inoculation message on message fatigue differed by health topic and the degree of threat detailed in the inoculation message. This further investigation allows an adequate evaluation of inoculation effectiveness at varying levels of threatening in inoculation message. For this purpose, first, HPV was chosen as another infectious disease with prevention measures through vaccination. Second, in order to lower perceived threat induced by the inoculation message, the threat portion in the inoculation manipulation was shortened. Previous scholars have suggested that small mention of threat in an inoculation message reduced not only perceived threat to freedom but also reactance (Miller et al., 2013). Based on previous findings and limitations in Study 2, an online experiment with a 3 (limited threat inoculation treatment: yes vs. no) × 2 (controlling language: high vs. low) between-subjects design was conducted in June 2022.

Once consent form and pre-measures were obtained, participants were randomly assigned to read either a limited threat inoculation message or a non-inoculating message (i.e., a short history of Mexican food) prior to reading the health messages. After exposure to the first manipulation, all participants answered the manipulation check items about perceived inoculation threat in the message they read. Then they read a persuasive message about HPV vaccine promotion containing either high or low controlling language. After reading both messages, they responded to questions gauging their post-exposure perceived overcontrol, message fatigue, and behavioral intention, along with demographic information.

Participants and Procedure

To eligible, participants to be between the ages of 18 and 26. Centers for Disease Control and Prevention (CDC) recommends HPV vaccination for people starting at age 11 or 12. However, young adults who did not receive a vaccination at that age can still benefit from a vaccine if they receive catch-up vaccination through age 26. Recruits from a Prolific survey panel included 350 U.S. adults between the ages of 18 and 26.

The sample contained more female participants (50.6%) than male (43.7%), and twenty participants reported being non-binary (5.7%). The average age was 22.7 years (SD = 3.40). In terms of ethnicity, a majority of participants were Caucasian (n = 196, 56.0%), followed by Asian (n = 54, 15.4%), Hispanic/Latino (n = 41, 11.7%), African American (n = 40, 11.4%), Other (n = 16, 4.6%), and Native American (n = 3, 0.9%). A majority of participants had less than an undergraduate degree (n = 192, 54.9%), followed by undergraduate degree (n = 131, 37.4%), graduate degree (n = 20, 5.7%), and others (n = 7, 2.0%).

Experimental Stimuli

Consistent with previous manipulations for inoculation with different levels of perceived threat in an inoculation message (i.e., Richards et al., 2017), the limited inoculation message consisted of two components, a forewarning of threat and refutational preemption. However, this message design differed from the elaborated inoculation message design, which described an upcoming threat in detail and highlighted susceptibility to message fatigue.

Participants in the limited inoculation condition read an inoculation message consisting of a forewarning of threat, a description of a health message encounter that might lead to fatigue, and a refutational preemption highlighting a benefit of the arguments in the health message. Participants in the non-inoculation condition read a same control message used in the Study 2. Following the inoculation manipulation, participants answered a series of questions designed to determine whether the manipulation was successful. Then, they read one of two messages (i.e., high vs. low controlling language) advocating for HPV vaccination. The manipulation for controlling language featured the same two messages used in Study 2 (see Figure 1).

Measures

Unless otherwise noted, all items were measured using 7-point scales ranging from 1 (strongly disagree) to 7 (strongly agree). Higher scores indicate a higher level of agreement.

Perceived inoculation threat. The measure for perceived inoculation threat included six bi-polar adjectives from Burgoon et al. (1987) and Banas and Richards (2017): "safe-dangerous," "nonthreatening-threatening," "calm-anxious," "unintimidating-intimidating," "not harmful-harmful," and "not risky/risky" (Cronbach's $\alpha = .95$, $M = 2.96$, $SD = 1.40$).

Perceived overcontrol. The measure for perceived overcontrol included five items: "I find that messages about HPV attempt to determine what I should do," "I find that messages about HPV attempt to determine how I should act," "I sometimes feel that HPV-related messages

attempt to compel my behaviors," "I find that messages about HPV attempt to control what actions I should take," and "I find that messages about HPV interfere too much in my personal freedom" (Cronbach's α = .88, *M* = 4.54, *SD* = 1.38).

Message fatigue. The measure for message fatigue was a seventeen-item scale from So et al. (2017): "I have lost track of the amount of times I have heard that HPV is a serious problem," "At this point, I've heard about problems related to HPV more than I ever needed to," "I have heard enough about how important it is to prevent HPV," "There are simply too many messages about HPV nowadays," "The importance of preventing HPV is overtaught," "HPV messages rarely provide new information," "After hearing them for years, messages about HPV seem repetitive," "Messages about HPV are all beginning to sound the same to me," "I can predict what a message about HPV is going to say," "I am burned out from hearing that people's unpreparedness for HPV is a serious problem," "I am sick of hearing about consequences of unprepared risk like HPV," "I am tired of hearing about the importance of preventing HPV," "HPV-related messages make me want to sigh," "HPV messages are boring," "HPV messages make me want to yawn," "I find messages about HPV to be dull and monotonous," and "HPV-related messages are tedious" (Cronbach's α = .96, *M* = 3.09, *SD* = 1.29).

Behavioral intention. The measure for intention to receive the HPV vaccine included three items: "I intend to get a HPV vaccination when available (if needed)," "I will try to get a HPV vaccination when available (if needed)," and "I will actually get a HPV vaccination when available (if we need)." (Cronbach's α = .98, *M* = 5.26, *SD* = 1.67).

Control variables. Age and gender were included as controlled sociodemographic variables. Age was a continuous variable measure in years. Gender collapsed into two categories (0 = Male, 1 = Female) (see Table 4).

CHAPTER 6

RESULTS

First, the data were tested for normality by examining skewness, kurtosis, and normality histograms (Field, 2009). Results indicate that all continuous variables were at an acceptable level because skewness and kurtosis values fell within ±2 (Field, 2009). In order to test the hypotheses and address the research questions, two hierarchical regression analyses were conducted. For each regression analysis, the first block included age, gender, education level, and race/ethnicity, the second block additionally included issue involvement and vaccine confidence, and the third block additionally included the main predictor variables: perceived overcontrol and perceived overdemand. In terms of multicollinearity of the data between the independent variables, variance inflation factors (VIFs) and tolerance statistics revealed acceptable values. VIF values between one and four and tolerance values larger than 0.10 indicate an acceptable amount of collinearity (see Hair et al., 2010; Allen et al., 2009). Furthermore, zero-order correlations were generated to investigate the associations among perceived overcontrol, perceived overdemand, issue involvement, and vaccine confidence (see Tables 5 and 6).

Main Study 1

Online Survey Studies (COVID-19 and HPV)

Hypothesis 1 predicted that perceived overcontrol would be positively associated with the message fatigue toward health messages while hypothesis 2 predicted that perceived overdemand

would be positively associated with message fatigue. Research question 1 sought to examine which one might best predict message fatigue about two health messages (COVID-19 and HPV).

To address both hypotheses and the research question, two hierarchical linear regression analyses were conducted with message fatigue as an outcome variable. For the COVID-19 data, the first block of predictors explained 1.7% of the variance in the COVID-19 message fatigue. Among the demographic control variables, education significantly associated with message fatigue. Individuals with higher education tended to experience message fatigue ($\beta = .11$, $p < .05$). For the HPV data, the first block of predictors explained 2.7% of the variance in the HPV message fatigue. Among the demographic control variables, gender significantly associated with message fatigue. Male participants ($\beta = -.16$, $p < .001$) tended to experience message fatigue.

With the inclusion of issue involvement and vaccine confidence, the second block of predictors explained an additional 29.9% of the variance in COVID-19 message fatigue. Individuals with lower issue involvement toward COVID-19 ($\beta = -.30$, $p < .001$) and who were less confident in the COVID-19 vaccine ($\beta = -.34$, $p < .001$) reported more message fatigue. For HPV data, the second block of predictors explained an additional 0.7% of the variance in HPV message fatigue. Individuals who were less confident in the HPV vaccine reported more message fatigue ($\beta = -.19$, $p < .001$).

With the inclusion of perceived overcontrol and perceived overdemand, the third block of predictors explained an additional 19% of the variance in COVID-19 message fatigue, $F(8, 527) = 67.38$, $p < .001$. After controlling for sociodemographic variables, issue involvement, and vaccine confidence, perceived overcontrol ($\beta = .30$, $p < .001$) and perceived overdemand ($\beta = .25$, $p < .001$) were significantly associated with COVID-19 message fatigue. Perceived overcontrol was the best predictor of COVID-19 message fatigue. In terms of the HPV data,

Model 3 explained an additional 18.3% of the variance in HPV message fatigue, $F(8, 496) = 17.14$, $p < .001$. After controlling for sociodemographic variables, issue involvement, and vaccine confidence, perceived overcontrol ($\beta = .18$, $p < .001$) and perceived overdemand ($\beta = .31$, $p < .001$) were significantly associated with HPV message fatigue. Between the two proposed predictors, perceived overdemand was the strongest predictor of HPV message fatigue (see Tables 7 and 8).

H3a predicted that message fatigue would mediate the relationship between perceived overcontrol and message avoidance while H3b predicted that message fatigue would mediate the relationship between perceived overdemand and message avoidance. H3 was tested via four mediation analyses using Hayes (2013) PROCESS Macro model 4 and 5000 bootstrap estimates to construct a 95% bias-corrected confidence interval effect (Preacher et al., 2007). In the first two mediation analyses, mediation models included perceived overcontrol as an independent variable while controlling for age, gender, education, race/ethnicity, issue involvement, vaccine confidence, and perceived overdemand. In the latter two mediation analyses, perceived overdemand was entered as the independent variable, while age, gender, education, race/ethnicity, issue involvement, vaccine confidence, and perceived overcontrol were covariates. Four analyses were conducted with message fatigue as a mediator and two types of message avoidance (i.e., cognitive and behavioral message avoidance) as outcome variables.

For the COVID-19 data, results indicate an indirect effect of perceived overcontrol on cognitive message avoidance (indirect effect = .18, $SE = .04$, 95% CI [.11, .25]) and behavioral message avoidance (indirect effect = .18, $SE = .03$, 95% CI [.11, .24]) through message fatigue were statistically significant. As perceived overcontrol increased, COVID-19 message fatigue increased ($b = .28$, $SE = .04$, $t = 6.67$, $p < .001$), in turn increasing cognitive message avoidance

(b = .63, SE = .06, t = 10.27, p < .001). The direct effect of perceived overcontrol on cognitive message avoidance was not significant (b = -.08, SE = .06, t = -1.24, p = .22). Similarly, as perceived overcontrol increased, COVID-19 message fatigue increased (b = .28, SE = .04, t = 6.67, p < .001), in turn increasing behavioral message avoidance (b = .63, SE = .06, t = 11.12, p < .001). The direct effect of perceived overcontrol on behavioral message avoidance was not significant (b = -.08, SE = .06, t = -1.38, p = .17).

In the analyses with perceived overdemand as the independent variable, as perceived overdemand increased, COVID-19 message fatigue increased (b = .22, SE = .04, t = 5.59, p < .001), in turn increasing cognitive message avoidance (b = .63, SE = .06, t = 10.27, p < .001). The direct effect of perceived overdemand on cognitive message avoidance was not significant (b = -.01, SE = .06, t = -.13, p = .90). Similarly, as perceived overdemand increased, COVID-19 message fatigue increased (b = .22, SE = .04, t = 5.59, p < .001), in turn increasing behavioral message avoidance (b = .63, SE = .06, t = 11.12, p < .001). The direct effect of perceived overdemand on behavioral message avoidance was significant (b = .18, SE = .05, t = 3.39, p < .001).

Similar to the previous results, the HPV data results indicated an indirect effect of perceived overcontrol on cognitive message avoidance (indirect effect = .07, SE = .02, 95% CI [.03, .12]) and behavioral message avoidance (indirect effect = .07, SE = .02, 95% CI [.03, .12]) through message fatigue were statistically significant. As perceived overcontrol increased, HPV message fatigue increased (b = .14, SE = .04, t = 3.72, p < .001), in turn increasing cognitive message avoidance (b = .47, SE = .06, t = 7.84, p < .001). The direct effect of perceived overcontrol on cognitive message avoidance was not significant (b = .08, SE = .05, t = 1.49, p = .14). Similarly, as perceived overcontrol increased, HPV message fatigue increased (b = .14, SE

= .04, t = 3.72, p < .001), in turn increasing behavioral message avoidance (b = .53, SE = .05, t = 11.20, p < .001). The direct effect of perceived overcontrol on behavioral message avoidance was not significant (b = -.01, SE = .04, t = -.15, p = .89).

In the analyses with perceived overdemand as the independent variable, as perceived overdemand increased, HPV message fatigue increased (b = .27, SE = .04, t = 6.50, p < .001), in turn increasing cognitive message avoidance (b = .47, SE = .06, t = 7.84, p < .001). The direct effect of perceived overdemand on cognitive message avoidance was not significant (b = -.08, SE = .06, t = -1.35, p = .18). Similarly, as perceived overdemand increased, HPV message fatigue increased (b = .27, SE = .04, t = 6.50, p < .001), in turn increasing behavioral message avoidance (b = .52, SE = .05, t = 11.20, p < .001). The direct effect of perceived overdemand on behavioral message avoidance was significant (b = .07, SE = .05, t = 1.45, p < .05).

H4a predicted that message fatigue would mediate the relationship between perceived overcontrol and perceived message value. H4b predicted that message fatigue would mediate the relationship between perceived overdemand and perceived message value. H4 was tested via two mediation analyses using Hayes (2013) PROCESS Macro model 4. In both analyses, the same independent, mediator, and covariate variables used for H3 were entered, along with a new outcome variable: perceived message value.

For the COVID-19 data, mediation analysis revealed a significant indirect effect of perceived overcontrol on perceived message value through message fatigue (indirect effect = -.11, SE = .02, 95% CI [-.16, -.07]). As perceived overcontrol increased, COVID-19 message fatigue increased (b = .28, SE = .04, t = 6.67, p < .001), in turn decreasing perceived message value (b = -.40, SE = .04, t = -9.27, p < .001). The direct effect of perceived overcontrol on cognitive message avoidance was not significant (b = .06, SE = .04, t = 1.32, p = .19).

In the analysis with perceived overdemand as the independent variable, results indicate an indirect effect of perceived overdemand on perceived message value via message fatigue was statistically significant (indirect effect = -.09, *SE* = .02, 95% CI [-.12, -.05]). As perceived overdemand increased, COVID-19 message fatigue increased (*b* =.22, *SE* = .04, *t* = 5.59, *p* < .001), in turn decreasing perceived message value (*b* = -.40, *SE* = .04, *t* = -9.27, *p* < .001). The direct effect of perceived overdemand on perceived message value was not significant (*b* = .06, *SE* = .04, *t* = 1.44, *p* = .15).

For the HPV data, a similar pattern of relationship emerged as expected. Mediation analysis revealed a significant indirect effect of perceived overcontrol on perceived message value through message fatigue (indirect effect = -.04, *SE* = .01, 95% CI [-.07, -.02]). As presented in Figure 8, increased perceived overcontrol positively related to increased HPV message fatigue (*b* = .14, *SE* = .04, *t* = 3.72, *p* < .001), leading to lower perceived message value (*b* = -.29, *SE* = .04, *t* = -7.93, *p* < .001). The direct effect of perceived overcontrol on perceived message value was not significant (*b* = .03, *SE* = .03, *t* = .81, *p* = .42).

In the analysis with perceived overdemand as the independent variable, results indicate an indirect effect of perceived overdemand on perceived message value via message fatigue (indirect effect = -.08, *SE* = .02, 95% CI [-.12, -.05]). As perceived overdemand increased, HPV message fatigue increased (*b* =.27, *SE* = .04, *t* = 6.50, *p* < .001), in turn decreasing perceived message value (*b* = -.29, *SE* = .04, *t* = -7.93, *p* < .001). The direct effect of perceived overdemand on perceived message value was not significant (*b* = .01, *SE* = .04, *t* =.34, *p* = .73).

H5a predicted that perceived overcontrol would indirectly lead to lower attention to the message through an increase in message fatigue, while H5b predicted that perceived overdemand would indirectly lead to lower attention toward the message through an increase in message

fatigue. H5 was tested via two mediation analyses using Hayes (2013) PROCESS Macro model 4 with attention to the message as the dependent variable.

The results for the COVID-19 data show that the overall mediation analysis yielded a significant indirect effect of perceived overcontrol on attention to the COVID-19 message through message fatigue (indirect effect = -.15, *SE* = .03, 95% CI [-.21, -.09]). Increased perceived overcontrol led to greater COVID-19 message fatigue (*b* = .28, *SE* = .04, *t* = 6.67, *p* < .001), leading to decreased attention to the COVID-19 message (*b* = -.53, *SE* = .06, *t* = -9.19, *p* < .001). The direct effect of perceived overcontrol on attention to the COVID-19 message was not significant (*b* =.07, *SE* = .06, *t* =1.14, *p* = .26).

In the analysis with perceived overdemand as the independent variable, results indicate a significant indirect effect of perceived overdemand on attention to the COVID-19 message through message fatigue (indirect effect = -.12, *SE* = .03, 95% CI [-.17, -.07]). As perceived overdemand increased, COVID-19 message fatigue increased (*b* =.22, *SE* = .04, *t* = 5.59, *p* < .001), in turn led to decreasing attention to the COVID-19 message (*b* = -.53, *SE* = .06, *t* = -9.19, *p* < .001). The direct effect of perceived overdemand on attention to the COVID-19 message was significant (*b* =.18, *SE* = .05, *t* = 3.45, *p* < .001).

For the HPV data, as expected, mediation analysis revealed a significant indirect effect of perceived overcontrol on attention to the HPV message through message fatigue (indirect effect = -.06, *SE* = .02, 95% CI [-.09, -.02]). Greater perceived overcontrol resulted in greater HPV message fatigue (*b* = .14, *SE* = .03, *t* = 3.72, *p* < .001), leading to decreased attention to the HPV message (*b* = -.36, *SE* = .05, *t* = -6.66, *p* < .001). The direct effect of perceived overcontrol on attention to the HPV message was not significant (*b* = -.07, *SE* = .05, *t* = -1.46, *p* = .14).

In the analysis with perceived overdemand as the independent variable, the overall mediation was significant (indirect effect = -.10, *SE* = .02, 95% CI [-.15, -.06]). As perceived overdemand increased, HPV message fatigue increased (*b* =.27, *SE* = .04, *t* = 6.50, *p* < .001), in turn decreasing attention to the HPV message (*b* = -.36, *SE* = .05, *t* = -6.66, *p* < .001). The direct effect of perceived overdemand on attention to the HPV message was significant (*b* =.15, *SE* = .05, *t* = 2.79, *p* < .01).

To test the significance of the indirect effects of perceived overcontrol and perceived overdemand on attitude toward the message through message fatigue, two additional mediation analyses were conducted using PROCESS Macro model 4.

H6a predicted that perceived overcontrol would indirectly lead to unfavorable attitude toward the message through an increase in message fatigue, while H6b predicted that perceived overdemand would indirectly lead to unfavorable attitude toward the message through an increase in message fatigue.

For the COVID-19 data, mediation analysis revealed a significant indirect effect of perceived overcontrol on information processing depth through message fatigue (indirect effect = -.12, *SE* = .03, 95% CI [-.17, -.07]). Increased perceived overcontrol led to greater COVID-19 message fatigue (*b* = .28, *SE* = .04, *t* = 6.67, *p* < .001), leading to unfavorable attitude toward the message (*b* = -.42, *SE* = .05, *t* = -7.95, *p* < .001). The direct effect of perceived overcontrol on attitude toward the message was not significant (*b* = -.02, *SE* = .05, *t* = -.33, *p* = .75).

In the analysis with perceived overdemand as the independent variable, results indicate an indirect effect of perceived overdemand on attitude toward the message through message fatigue (indirect effect = -.09, *SE* = .02, 95% CI [-.14, -.06]). As perceived overdemand increased, COVID-19 message fatigue increased (*b* =.22, *SE* = .04, *t* = 5.59, *p* < .001), in turn

leading to unfavorable attitude toward the message (b = -.42, SE = .05, t = -7.95, p < .001). The direct effect of perceived overdemand on attitude toward the message was not significant (b = -.08, SE = .05, t = -1.54, p = .12).

In the analyses of the HPV data, a similar pattern of relationship emerged as expected. Mediation analysis revealed a significant indirect effect of perceived overcontrol on attitude toward the message through message fatigue (indirect effect = -.04, SE = .01, 95% CI [-.07, -.02]). Greater perceived overcontrol resulted in greater HPV message fatigue (b = .14, SE = .04, t = 3.72, p < .001), leading to unfavorable attitude toward the HPV message (b = -.28, SE = .05, t = -5.77, p < .001). The direct effect of perceived overcontrol on attitude toward the message was not significant (b = .02, SE = .04, t = .36, p = .72).

In the analysis with perceived overdemand as the independent variable, the overall mediation was significant (indirect effect = -.08, SE = .02, 95% CI [-.12, -.04]). As perceived overdemand increased, HPV message fatigue increased (b =.27, SE = .04, t = 6.50, p < .001), in turn leading to unfavorable attitude toward the HPV message (b = -.28, SE = .05, t = -5.77, p < .001). The direct effect of perceived overdemand on attitude toward the message was not significant (b = -.07, SE = .05, t = -1.53, p = .13).

Finally, to test the significance of the indirect effects of perceived overcontrol and perceived overdemand on negative emotions (i.e., anger and annoyance) through message fatigue, two additional mediation analyses were conducted using PROCESS Macro model 4.

H7a predicted that perceived overcontrol would indirectly lead to negative emotional responses to the COVID-19 message through an increase in message fatigue, while H7b predicted that perceived overdemand would indirectly lead to negative emotional responses to the COVID-19 message through an increase in message fatigue.

The results for the COVID-19 data show that mediation analysis yielded a significant indirect effect of perceived overcontrol on negative emotional responses to the COVID-19 message through message fatigue (indirect effect = .14, *SE* = .03, 95% CI [.09, .20]). Increased perceived overcontrol led to greater COVID-19 message fatigue (b = .28, *SE* = .04, t = 6.67, p < .001), leading to stronger negative emotional responses to the COVID-19 message (b = .50, *SE* = .06, t = 8.28, p < .001). The direct effect of perceived overcontrol on negative emotional responses to the COVID-19 message was not significant (b = .03, *SE* = .06, t = .50, p = .62).

In the analysis with perceived overdemand as the independent variable, results indicate an indirect effect of perceived overdemand on negative emotional responses to the COVID-19 message through message fatigue (indirect effect = .11, *SE* = .03, 95% CI [.06, .16]). As perceived overdemand increased, COVID-19 message fatigue increased (b =.22, *SE* = .04, t = 5.59, p < .001), leading to stronger negative emotional responses to the COVID-19 message (b = .50, *SE* = .06, t = 8.28, p < .001). The direct effect of perceived overdemand on negative emotional responses to the COVID-19 message was significant (b = .17, *SE* = .06, t = 3.05, p < .01).

In the analyses for HPV data, a similar pattern of relationship emerged. Mediation analysis revealed a significant indirect effect of perceived overcontrol on negative emotional responses to the HPV message through message fatigue (indirect effect = .05, *SE* = .02, 95% CI [.02, .08]). Greater perceived overcontrol resulted in greater HPV message fatigue (b = .14, *SE* = .04, t = 3.72, p < .001), leading to stronger negative emotional responses to the HPV message (b = .34, *SE* = .05, t = 6.37, p < .001). The direct effect of perceived overcontrol on negative emotional responses to the HPV message was not significant (b = -.04, *SE* = .05, t = -.85, p = .40).

In the analysis with perceived overdemand as the independent variable, the overall mediation was significant (indirect effect = .09, *SE* = .02, 95% CI [.05, .14]). As perceived overdemand increased, HPV message fatigue increased (*b* =.27, *SE* = .04, *t* = 6.50, *p* < .001), in turn leading to negative emotional responses to the HPV message (*b* = .34, *SE* = .05, *t* = 6.37, *p* < .001). The direct effect of perceived overdemand on negative emotional responses to the HPV message was significant (*b* = .20, *SE* = .05, *t* = 3.83, *p* < .001).

Main Study 2

Online Experimental Study (COVID-19)

Manipulation Checks

Prior to hypothesis testing and research question examination, analysis of variance (ANOVA) and independent sample t-test were performed to confirm whether the experimental manipulations were successful. Two manipulations were assessed: perceived inoculation threat (normative inoculation vs. informative inoculation vs. non-inoculation) and controlling language (high vs. low). To confirm that participants perceived different levels of inoculation threat from the assigned conditions, an ANOVA test was conducted. The results indicate a significant difference in the inoculation message conditions, *F* (2, 298) = 7.87, p < .001, partial η2 = .05. Participants in the normative inoculation (*M* = 3.17, *SD* = .18) and informative inoculation (*M* = 3.55, *SD* = .16) conditions were more likely to perceive a higher inoculation threat than those in the control condition (*M* = 2.60, *SD* = .18). Thus, inoculation manipulation was successful. An independent t-test was performed to confirm that participants perceived different levels of perceived control according to their assigned conditions. The results revealed that the participants in the high controlling language condition perceived higher control (*M* = 5.15, *SD* =

1.66) than low controlling language (M = 3.65, SD = 1.70), $t(299) = -7.69$, $p < .001$. Thus, controlling language manipulation was successful.

Hypothesis Testing and Research Question Examination

Hypotheses and research questions were tested via two moderated mediation analyses using Hayes (2018) PROCESS Macro model 87 and ANCOVA. In the first moderated mediation analysis, inoculation message type was the independent variable and perceived inoculation threat and message fatigue were mediators. Because inoculation message type was a categorical variable with three levels (0 = non-inoculation vs. 1 = normative inoculation vs. 2 = informative inoculation), two dummy coded variables (i.e., D_1 and D_2) were created for the moderated mediation analysis. In this study, non-inoculation was the reference group, D_1 was the comparison between normative frame and the reference group while D_2 was the comparison between the informative frame and the reference group. Age, personal history with COVID-19, and controlling language were covariates. In the second moderated mediation analysis, controlling language was the independent variable (0 = low controlling language vs. 1 = high controlling language) and perceived overcontrol and message fatigue were mediators. Age, personal history with COVID-19, and inoculation message type were covariates. Both analyses were conducted with COVID-19 vaccine history as the moderator and behavioral intention to receive a vaccine as the dependent variable. Sample bootstrapping at 5,000 estimates for the construction of 95% bias-corrected confidence intervals was applied (Hayes, 2013).

H8 predicted that exposure to inoculation messages framed as normative and informative would lead to a greater perceived threat than the control message. In support of this proposition, results of the moderated mediation analysis show that the normative frame (D_1: b = .52, SE = .25, t = 2.02, $p < .05$) and informative frame (D_2: b = .92, SE = .24, t = 3.83, $p < .001$) positively and

significantly influenced perceived threat compared to control message, suggesting that perceived threat was significantly greater among participants in the normative frame inoculation message and informative frame inoculation message conditions than those in the control message condition (see Table 9). Therefore, H8 was supported.

H9 predicted a multiple mediation of the effects of inoculation message type on behavioral intention to receive a vaccine through perceived threat and message fatigue. The index of the moderated mediation shows that inoculation message type only indirectly related to behavioral intention through the double mediation of perceived threat and message fatigue (D_1:effect = .02, SE = .01, 95% Confidence Interval [CI] [.00, .05]; D_2:effect = .03, SE = .02, 95% Confidence Interval [CI] [.01, .08]). As expected, participants in the normative or informative inoculation message condition reported greater perceived threat (normative: $b = .51$, $SE = .25$, $t = 2.02$, $p < .05$; informative: $b = .92$, $SE = .24$, $t = 3.83$, $p < .001$), leading to greater message fatigue ($b = .15$, $SE = .05$, $t = 2.87$, $p < .01$), and, in turn, weaker behavioral intention ($b = -1.22$, $SE = .10$, $t = -11.82$, $p < .001$). The indirect effect of inoculation message type on behavioral intention to receive a vaccine through perceived threat only was not significant (normative: effect = .00, SE = .02, 95% Confidence Interval [CI] [−.04, .06]; informative: effect = .01, SE = .04, 95% Confidence Interval [CI] [−.07, .09]); nor was the indirect effect through message fatigue only was not significant in D_2 (informative: effect = -.10, SE = .06, 95% Confidence Interval [CI] [−.22, .01]). However, an indirect effect of inoculation message type on behavioral intention to receive a vaccine through message fatigue only was significant in D_1 (informative: effect = -.12, SE = .06, 95% Confidence Interval [CI] [−.24, -.01]) (see Figure 22).

In order to compare normative inoculation with informative inoculation condition, inoculation message type was recoded (0 = normative vs. 1 = informative vs. 2 = non-

inoculation). The non-inoculation condition was the reference group, D_1 was the comparison between normative frame and the reference group while D_2 was the comparison between the normative and the reference group. Age, personal history with COVID-19, and controlling language were covariates. Results of the moderated mediation analysis show that although the informative frame influenced perceived threat compared to normative frame, it was not statistically significant, (D_1: b = .41, SE = .25, t = 1.67, p = .10) (see Figure 22).

H10 predicted that exposure to high controlling language in the health promotion message would lead to greater perceived overcontrol compared to low controlling language. As presented in Table 10, level of controlling language positively and significantly related to perceived overcontrol (b = .50, SE = .17, t = 3.02, p < .01), supporting H10 (see Table 10).

Moreover, H11 predicted a multiple mediation of the effects of controlling language on behavioral intention to receive a vaccine through perceived control and message fatigue. Similarly, the index of the moderated mediation revealed that controlling language was only indirectly related to behavioral intention through the double mediation of perceived overcontrol and message fatigue (effect = .09, SE = .03, 95% Confidence Interval [CI] [.03, .16]). As expected, participants in the high controlling language condition reported greater perceived overcontrol (b = .50, SE = .17, t = 3.02, p < .01), leading to greater message fatigue (b = .71, SE = .05, t = 14.56, p < .001), and, in turn, weaker behavioral intention (b = -1.19, SE = .12, t = -10.35, p < .001). The indirect effect of controlling language on behavioral intention through perceived overcontrol only was not significant (effect = −.02, SE = .04, 95% Confidence Interval [CI] [−.11, .05]); nor was the indirect effect through message fatigue only was not significant (effect = −.06, SE = .04, 95% Confidence Interval [CI] [−.13, .01]) (see Figure 23).

H12 predicted that vaccination history would moderate the indirect effects of inoculation message type on behavioral intention to receive a vaccine through perceived threat and message fatigue. In the analysis with D_1, the indirect effect was estimated using three different COVID-19 vaccination statuses: unvaccinated, both standard vaccination doses, and booster dose. The indirect effect of inoculation treatment (normative vs. reference) on behavioral intention via perceived threat and message fatigue increased as the number of COVID-19 vaccination doses decreased: unvaccinated (indirect effect = -.08, SE = .05, 95% CI [-.20, -.00]), both standard vaccination doses (indirect effect = -.04, SE = .03, 95% CI [-.10, -.00]), and booster dose (indirect effect = -.02, SE = .02, 95% CI [-.05, -.00]). The direct effect of inoculation message type (normative vs. reference) on behavioral intention was not significant, *b* = .09, SE = .19, 95% CI (-.28, .46). In the analysis with D_2, the indirect effect was also estimated using the three different COVID-19 vaccination statuses. The indirect effect of inoculation message (informative vs. reference) on behavioral intention via perceived threat and message fatigue increased as number of COVID-19 vaccination doses decreased: unvaccinated (indirect effect = -.13, SE = .07, 95% CI [-.29, -.03]), both standard vaccination doses (indirect effect = -.07, SE = .04, 95% CI [-.15, -.01]), and booster dose (indirect effect = -.02, SE = .02, 95% CI [-.08, -.00]). The direct effect of inoculation message type (informative vs. reference) on behavioral intention was not significant, *b* = -.06, SE = .18, 95% CI (-.42, .30) (see Figure 22).

H13 predicted that vaccination history would moderate the indirect effects of controlling language on behavioral intention to receive a vaccine through perceived overcontrol and message fatigue. Moderated mediation was significant (effect = .09, SE = .03, 95% Confidence Interval [CI] [.03, .16]). The indirect effect was estimated using three different COVID-19 vaccination statuses: unvaccinated, both standard vaccination doses, and booster dose. The indirect effect of

controlling language on behavioral intention via perceived overcontrol and message fatigue increased as the number of COVID-19 vaccination doses decreased: unvaccinated (indirect effect = -.34, SE = .12, 95% CI [-.60, -.11]), both standard vaccination doses (indirect effect = -.16, SE = .06, 95% CI [-.30, -.06]), and booster dose (indirect effect = -.08, SE = .04, 95% CI [-.17, -.01]). The direct effect of inoculation message type (informative vs. reference) on behavioral intention was not significant, b = .16, SE = .15, 95% CI (-.14, .45) (see Figure 23).

RQ3 addressed how the two treatments might interact to influence the degree of COVID-19 message fatigue. To answer to this research question, a two-way analysis of covariance (ANCOVA) was performed. As in the previous analysis, age and personal history with COVID-19 were covariates. The results show that the effect of history of COVID-19, as a covariate, was significant ($p < .05$). No significant interaction effect of inoculation treatment and controlling language emerged on message fatigue, $F(2, 293) = .62$, $p = 0.54$, $\eta_p^2 = 0.00$) (see Table 11).

Main Study 3

Online Experimental Study (HPV)

Manipulation checks

Prior to hypothesis testing, two independent sample t-tests were performed to confirm whether the experimental manipulations were successful. Two manipulations were assessed: perceived inoculation threat (limited inoculation message vs. non-inoculation message) and controlling language (high vs. low). The first independent t-test showed that perceived inoculation threat was higher in the limited inoculation condition (M = 3.13, SD = 1.42) than non-inoculation condition (M = 2.79, SD = 1.37), $t(348) = -2.27$, $p < .05$. Thus, inoculation manipulation was successful. Another independent t-test was performed to confirm that participants perceived different levels of perceived control according to their assigned

conditions. The results indicated that the participants in the high controlling language condition perceived higher control (M = 5.83, SD = 1.40) than participants in the low controlling language condition (M = 2.63, SD = 1.51), $t(348) = -20.55$, $p < .001$. Thus, controlling language manipulation was successful.

Hypothesis Testing

Hypotheses were tested via moderated mediation analyses using Hayes (2018) PROCESS Macro model 7. In the moderated mediation analysis, inoculation message served as the independent variable (0 = non-inoculation vs. 1= limited threat inoculation), controlling language (0 = low controlling language vs. 1 = high controlling language) served as the moderator, message fatigue served as the mediator, and behavioral intention to receive a vaccine served as the dependent variable. Age and gender were covariates. Sample bootstrapping at 5,000 estimates for the construction of 95% bias-corrected confidence intervals was applied (Hayes, 2013).

H14 predicted that exposure to the limited threat inoculation message would buffer message fatigue when participants saw low controlling language, while the control message would increase message fatigue when participant saw high controlling language. No significant interaction effect between limited inoculation treatment and controlling language emerged on message fatigue, b = -.08, SE = .26, $t(344) = -.31$, p = .75. Level of controlling language significantly related to HPV message fatigue, b = .67, SE = .19, $t(344) = 3.57$, $p < .001$. However, no significant main effect of inoculation treatment emerged, b = .09, SE = .18, $t(344)$ = .49, p = .62 (see Table 12).

H15 predicted that HPV message fatigue would negatively predict behavioral intention to receive a vaccine. Supporting H15, results indicate that message fatigue negatively related to behavioral intention, b = -.40, SE = .07, t(345) = -6.02, $p < .001$ (see Figure 25).

CHAPTER 7

DISCUSSION

Interest in message fatigue has grown among communication scholars, especially amidst the prolonged COVID-19 pandemic. While previous scholars examined factors that determine message fatigue and the counterproductive outcomes of message fatigue, factors that might mitigate or magnify message fatigue have remained relatively unexamined. Given the prevalence of message fatigue in everyday life, understanding which factors might contribute to message fatigue and investigating communication tactics that might reduce message fatigue are essential. To fill this gap in health and risk communication research, I conducted three studies. Study 1 presented the effects of two predictors of message fatigue—perceived overcontrol and perceived overdemand—and how they influence unfavorable message processing given high message fatigue. Studies 2 and 3 were experiments conducted to explore how intensity of inoculation and controlling language might influence message fatigue in conjunction with different vaccination statuses. Results from these studies provide valuable findings in the field of health and risk communication because no scholars have yet investigated possible predictors of message fatigue. In addition, testing communication strategies for various individual-level vaccination statuses can help practitioners design health and risk messages that mitigate the detrimental effects of message fatigue during communication campaigns.

Summary of Findings from Study 1 (Online Survey)

The aim of Study 1 was (a) to investigate the effects of psychological barriers during message processing by testing the extent to which enhanced perceptions of overcontrol and

overdemand influence message fatigue and subsequent consequences, (b) to investigate the mediating role of message fatigue in resistance to the message, including message avoidance, message devaluation, inattention, unfavorable attitude toward the message recommendation, and negative emotions, and (c) to examine which predictors might bolster message fatigue with regard to two health topics with different degrees of pre-existing overexposure: COVID-19 (greater pre-existing overexposure) and HPV (lower pre-existing overexposure).

Findings from the two online surveys confirm that perceived overcontrol positively related to message fatigue. This result suggests that individuals who perceived the message as limiting their control over their own choices, decisions, and behaviors experienced greater message fatigue. Perceived overdemand also positively predicted message fatigue. The results from both samples revealed that the degree of pressure to meet attitudinal and behavioral requirements in the message related to message fatigue. This finding indicates that individuals who felt that the pro-vaccine message pressured them to engage in tasks beyond the limits of their preference experienced greater message fatigue. Interestingly, findings from Study 1 indicate that perceived overcontrol was a stronger predictor of COVID-19 message fatigue, whereas perceived overdemand was a stronger predictor of HPV message fatigue. This finding indicates that in both cases, both perceived overcontrol and perceived overdemand predictors contributed to message fatigue; however, health topic played a role in the strength of those predictors.

Regarding how message fatigue mediated the relationship between proposed two predictors and message resistance, results from both samples revealed indirect effects of perceived overcontrol through message fatigue on the message resistance variables: message avoidance, message devaluation, inattention, unfavorable attitude toward the message

recommendation, and negative emotions. This finding indicates that a high level of perceived overcontrol in the message related to greater message fatigue, influencing resistance to the message. A similar pattern emerged for perceived overdemand. Greater perceived overdemand generated greater message fatigue and, in turn, greater message resistance.

Summary of Findings from Studies 2 and 3 (Online Experiments)

The aim of both experimental studies was to determine how intensity of inoculation message and controlling language might facilitate or mitigate message fatigue. In particular, the aim of Study 2 was (a) to examine the effects of normative and informative inoculation message frames on perceived threat and its link to message fatigue and behavioral intention to receive a vaccine, (b) to investigate how intensity of controlling language influenced perceived overcontrol, which is a cause of message fatigue, and its link to message fatigue and behavioral intention, (c) to investigate the indirect effect of an elaborated inoculation message on behavioral intention through the multiple mediation of perceived threat and message fatigue, (d) to examine the indirect effect of intensity of controlling language on behavioral intention through the multiple mediation of perceived overcontrol and message fatigue, and (e) to examine the moderating role of vaccination status in the relationship between message exposure and behavioral intention. While the focus of Study 2 was the influence of mediators on behavioral intention, the aim of Study 3 was to examine how a limited inoculation message and low controlling language might reduce message fatigue compared to the control message and high controlling language.

The results of Study 2 revealed the main effect of elaborated inoculation on perceived threat. The results also indicate two significant indirect effects. The normative and informative messages both led to greater perceived threat than the non-inoculation message, increasing

message fatigue and, in turn, decreasing behavioral intention. Similarly, high controlling language led to greater perceived overcontrol than low controlling language, increasing message fatigue and, in turn, decreasing behavioral intention. Interestingly, the results from Study 2 revealed that the informative inoculation message predicted greater perceived threat than the normative inoculation message.

Regarding the moderating role of vaccination status, the findings indicate that the influence of message exposure on behavioral intention through the double mediation was more prominent when participants had fewer previous vaccination doses. That is, message fatigue driven by elaborated inoculation or high controlling language negatively influenced behavioral intention; however, this effect was more salient among participants who were unvaccinated relative to those with both standard vaccination doses and the booster dose.

Based on the evidence that enhanced threat from inoculation might impede resistance against a forthcoming persuasive attack, the aim of Study 3 was to investigate how limited inoculation and lower controlling language might confer resistance to HPV message fatigue. The findings revealed no significant interaction effect of limited inoculation and low controlling message on HPV message fatigue. A main effect of controlling language on message fatigue emerged, while a main effect of limited inoculation message on message fatigue did not. Message fatigue had a negative impact on intention to receive a vaccine. Findings from both samples suggest that intensity of controlling language was a stronger predictor of message fatigue and behavioral intention.

Theoretical Implications

The findings have important theoretical implications for fatigued audiences who perceive message repetition and redundancy. The findings provide implications regarding potential

predictors of message fatigue as well as communication tactics that influence the effects of inoculation and controlling language on message fatigue and attitudinal and behavioral outcomes.

Potential predictors of message fatigue.

The overarching purpose of Study 1 was to determine which predictors might bolster message fatigue during health and risk communication. Based on previous findings, the two predictors in this study were perceived overcontrol and perceived overdemand. Although previous scholars found that a thematic frame (i.e., physical vs. mental) predicted message fatigue (So & Alam, 2019), their findings limit generalizability to other health topics because they focused on a persuasive anti-obesity. To address this limitation, the aim of the current study was to examine potential predictors of message fatigue more generally.

The findings indicate that perceived overcontrol in a persuasive health message influenced message fatigue in both health contexts, COVID-19 and HPV. This finding aligns with psychological reactance theory, which posits that a threat to freedom is an antecedent of reactance effects (e.g., Dillard & Shen, 2005). Just as a perceived threat to freedom can lead to reactance, perceived overcontrol of attitudinal and behavioral engagement led to unfavorable persuasion outcomes. Previous scholars found that reactance was an outcome of message fatigue, neglecting other possible pathways between reactance and message fatigue. The current finding that perceived overcontrol predicted message fatigue creates more room to examine whether reactance might lead to message fatigue and whether certain moderators might play a role.

Another important predictor of message fatigue that emerged from this study was perceived overdemand. Health and risk communication messages naturally encourage effort by message recipients to engage in behaviors that avoid target health risks. As people tend to feel

fatigue and discomfort if they encounter too many demands physically or mentally (Blase, 1986), excessive pressure and task demand in health communication messages might lead to exhaustion, which is a cause of message fatigue (McGrath, 1970). The results concerning the influence of perceived overdemand on message fatigue are largely consistent with previous findings about reactance. Although reactance might not directly predict message fatigue, previous findings show that when a message asked the audience to perform a more daunting task (i.e., abstinence from drinking), compared to a less demanding one (i.e., responsible drinking), people perceived a threat to their freedom and engaged in reactance.

Notably, the two datasets show different patterns in the findings. Perceived overcontrol was a stronger predictor of COVID-19 message fatigue, whereas perceived demand was a stronger predictor of HPV message fatigue. One explanation for these findings is that increased perceived overcontrol in COVID-19 messages resulted from pressure to follow social norms. According to research on risk communication, a limited understanding and the low predictability of a new virus can increase risk perception (e.g., Fischhoff, 2020). Because risk perception is a possible cause of higher subjective norms and perceived behavioral control (Lee, 2009), recipients of the COVID-19 message might have perceived higher pressure to take particular action than they might feel from a message about a familiar virus. The current findings contribute to the understanding of message fatigue by identify two new predictors of message fatigue that are applicable to general health communication.

Mediating role of message fatigue.

The current findings explain the relationships among the cognitive (e.g., message avoidance) and affective (e.g., anger) consequences of message fatigue by exploring its mediating role. Results concerning this role in the relationship between perceived overcontrol

and perceived overdemand and unfavorable persuasion outcomes are largely consistent with previous findings (e.g., Kim & So, 2018; So et al., 2017). Message fatigue significantly mediated the influence of perceived overcontrol on resistance to the message (i.e., message avoidance, message devaluation, inattention, unfavorable attitude to the message, and negative emotions). Similarly, message fatigue significantly mediated the effect of perceived overdemand on resistance. As expected, the greater control and demand that individuals perceived from the message, the more likely they were to experience message fatigue. Accordingly, such enhanced message fatigue influenced counterproductive message processing. Similar to previous findings (So et al., 2017), the current findings show several cognitive and affective types of resistance to the message as a result of message fatigue. The mediation results indicate that fatigued audiences were not only the product of message repetition but also the product of the message itself: what the message contained and how the message presented its content. These findings enrich current research on message fatigue by showing that perceptions of message content itself can cause message fatigue and likely affect message processing outcomes. By understanding the message-specific factors that cause message fatigue, practitioners can better develop communication strategies that mitigate the unintended effects of communication.

Paradox of using inoculation.

The results of Study 2 show that reading elaborated inoculation messages framed as normative or informative can lead to greater message fatigue, potentially impeding vaccination behaviors. Previous findings similarly suggest that high perceived threat during inoculation actually led to greater reactance and counterproductive responses to prosocial persuasion (Richards et al., 2017). Although the current study provides findings that are inconsistent with the traditional idea that forewarning of threat during inoculation confers greater resistance

against impending persuasion, they expand current knowledge about inoculation and message fatigue (Compton & Pfau, 2005; Richards at al., 2017).

Notably, the findings also show that elaborated inoculation framed as either normative or informative indirectly weakened behavioral intention to receive a COVID-19 vaccine via the double mediation of perceived threat and message fatigue. As expected, greater threat induced by inoculation reduced the efficacy of inoculation in mitigating message fatigue, leading to counterproductive persuasion outcomes. Moreover, the data indicate that the informative inoculation message elicited greater perceived threat than the normative inoculation message. This result might indicate that fact-based information in health and risk communication might lead to higher perceived threat than is necessary. EPPM posits that when perceived threat outweighs perceived efficacy, fear control and maladaptive response are more likely to occur; messages that highlight susceptibility and severity can lead people to engage in maladaptive responses to the message. Given that threat beyond some optimal level actually lowers the effectiveness of inoculation, informative inoculation messages are problematic.

The primary conclusion from Study 3 is that limited inoculation with low controlling message did not lower health communication message fatigue. Previous scholars found that resistance did not necessarily follow when inoculation treatment enhanced threat and counterargument (e.g., Pfau et al., 2008). The non-significant interaction effect of inoculation and controlling language might be due to a lack of pre-existing HPV message fatigue. As the pretest results indicate, participants showed the lowest levels of message fatigue to the HPV prevention message. If they had not experienced HPV message fatigue prior to exposure to the inoculation message, forewarning that exposure to the subsequent HPV message might lead to fatigue might not have revealed any difference between the control message and the inoculation

message. Indeed, in a previous study, pre-existing message fatigue was a strong determinant of fatigue responses (So & Alam, 2019). Reducing message fatigue, even with an inoculation message, might prove difficult if participants do not believe they have sufficient information about a given topic.

Another possible explanation for this result is the amount of time between inoculation and exposure to the persuasive message. McGuire (1964) argued that resistance requires a certain amount of time to produce, a delay during which the motivation to argue against an upcoming attack can develop. Previous findings consistently suggest that a time delay is an important factor in the efficacy of intervention (e.g., McGuire, 1961; Pfau & Van Bockern, 1994). Therefore, scholars should further explore the impact of time delay between inoculation treatment and persuasive message exposure to determine the optimal delay for reducing message fatigue.

Controlling language as strategy for mitigating message fatigue.

Although inoculation was not effective in reducing message fatigue, findings from Studies 2 and 3 suggest some effective communication tactics for fatigued publics. Another important finding from Studies 2 and 3 is that intensity of controlling language strongly predicted perceived overcontrol, which was a strong predictor of message fatigue in Study 1. Although other pathways might explain how controlling language enhances message fatigue, the current findings suggest that perceived overcontrol led to message fatigue. That is, intensity of controlling language did not merely affect perceived overcontrol. Rather, enhanced perceived overcontrol generated message fatigue, lowering vaccination intention. Notably, persuasive messages that highlight freedom, choice, and autonomy might better reduce message fatigue than an inoculation message.

The findings about the moderating effect of vaccination status as a precondition for inducing message engagement and strengthening behavioral intention are also telling. Previous scholars have suggested that detrimental cognitive and affective responses from message fatigue (So et al., 2017). Indeed, message fatigue negatively influences desired persuasion outcomes; however, according to the current findings this effect depends on vaccination status. Individuals who think that vaccines are safe and effective in preventing the COVID-19 might be engaged in previous vaccination behavior, leading them to less susceptible to the influence of message fatigue on resistance to the message. On the other hand, those who had never received a COVID-19 vaccine showed a strong and significant negative relationship between message fatigue and behavioral intention. Given that vaccination history positively influenced behavioral intention (Wang et al., 2020), even an individual exhausted from hearing repetitive COVID-19 messages will likely engage in future vaccination behavior if they have previously.

Practical Implications

In studies about message fatigue, scholars have largely focused on attitudinal and behavioral outcomes, what message fatigue is, and what it entails. Yet the causes of message fatigue have received limited attention from communication scholars. Although So et al. (2017) suggested that overexposure and redundancy are prominent determinants of message fatigue, other causes are possible. For example, the current findings show that perceived overcontrol and perceived overdemand were strong predictors of message fatigue. This finding has important practical implications for health communication scholars and professionals. Repetitive messaging is a concern, but message designers must also be aware of message components and whether they might elicit greater perceived overcontrol or overdemand, regardless of overexposure.

Furthermore, public health organizations should limit their coercive and pressuring language to reduce message fatigue in recipients. Findings from the two experimental studies indicate that controlling language was a stronger determinant of message fatigue than inoculation message strategy. While persuasive messages should use less forceful and demanding language, inoculation message strategy remains an important factor in reducing message fatigue. Prior exposure to certain health topics might have impeded the efficacy of inoculation intervention in the experimental studies. Scholars should consider examining the combination of threat level and pre-existing message fatigue level to see whether similar patterns emerge.

Finally, campaign manager should regularly disseminate persuasive health messages that highlight vaccine safety and efficacy. The current findings show a significant moderating role of vaccination status in the relationship between message fatigue and behavioral intention to receive a vaccine. That is, individuals who had already engaged in vaccination behavior were unlikely to feel deterred by message fatigue, whereas message fatigue strongly influenced the behavioral intention of those who were unvaccinated. Therefore, instead of disseminating repetitive pro-vaccine encouragement messages frequently, spreading messages that highlight vaccine safety and effectiveness might increase confidence in vaccines and reduce the impact of message fatigue on counterproductive responses.

Limitations and Future Direction

Despite its substantial contributions to message fatigue research, the current study has limitations that open pathways to future research. The impact of the limited inoculation message on message fatigue was unexpected. Two reasons might account for this finding. First, the different health topics in Study 2 and Study 3 might not have elicited the same level of perceived threat due to differences in previous overexposure. If participants in the HPV dataset perceived

low level of pre-existing message fatigue level due to lack of overexposure, then the forewarning of message fatigue might not have influenced perceived threat level. In this case, inoculation messages with various degrees of threat might better reveal the efficacy of inoculation.

Another possible reason for this finding could be methodological. Traditionally, the manipulation check for inoculation occurs between the inoculation and the persuasive appeal according to the following sequence: exposure to inoculation treatment, measurement of perceived threat as a manipulation check, and exposure to the persuasive message (Richards et al., 2017). If participants were sensitized by a more recent persuasive message due to its salience, exposure to the inoculation treatment might not have a substantial impact on message fatigue. Because no scholars had conducted studies to determine how inoculation might reduce message fatigue, whether a single inoculation treatment (i.e., without varying intensity of controlling language) might elicit sufficient resistance to message fatigue when people encounter a persuasive health message is worth exploring. Doing so could provide a clearer picture of the efficacy of inoculation in reducing message fatigue. In addition, I captured the effects of inoculation and controlling language based on responses immediately after exposure to the stimuli. As an inoculation effect might occur after and optimal amount of time has passed (McGuire, 1964) and a significant effect of controlling language might diminish over time, scholars should ascertain whether these effects exert a similar pattern in a longitudinal study setting.

Study 3 was conducted using a self-administered Internet survey via Prolific. Although such an Internet survey service has advantages (e.g., inexpensive samples, high-speed collection, reliable and representational samples; Buhrmester et al., 2011), previous scholars have expressed concern about prominent disadvantages (e.g., high rate of dropout, failure to answer attention

check item correctly). Although I ruled out potential disadvantages by using attention check items and setting a timing question to ensure that participants stayed on stimulus for a while, other factors remain beyond experimental control (e.g., distraction by a text or call during the experiment); therefore, readers should interpret the findings with caution.

Finally, because findings from both experimental studies relied on self-reported online survey, it is possible that individuals' actual resistant behaviors such as message avoidance or inattention to the message may differ from current findings. Future study would be well-served by examining same experimental design with psychophysiological measures including eye-tracking to capture individuals' cognition, affection, and arousal during exposure to inoculation and persuasive message. This is important as measures in the current study focused on traditionally flawed self-assessment toward message, examining eye-tracking measures offer an important opportunity of insights how individuals actually react against message that induce fatigue in the real situation.

Conclusion

Despite several limitations, the findings contribute both theoretical and practical value to health and risk communication endeavors. The purpose of this dissertation was to identify predictors of message fatigue and communication strategies that might mitigate message fatigue by examining inoculation and the intensity of controlling language. First, the findings indicate that perceived overcontrol and perceived overdemand were strong determinants of message fatigue. Accordingly, enhanced message fatigue predicted several counterproductive message processing responses: avoidance, inattention, devaluation of message, unfavorable attitude toward the health message, and negative emotions. Among the two types of communication tactics (inoculation message strategy and intensity of controlling language) tested in conjunction

with the mediating role of perceived threat and perceived control in message fatigue and behavioral intention, controlling language was effective in mitigating unintended effects and outcomes. The current findings shed more light on the factors that facilitate message fatigue and the particular communication strategies that might weaken the effects of message fatigue during health communication.

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APPENDIX A

EXPERIMENTAL STIMULI – STUDIES 2 AND 3

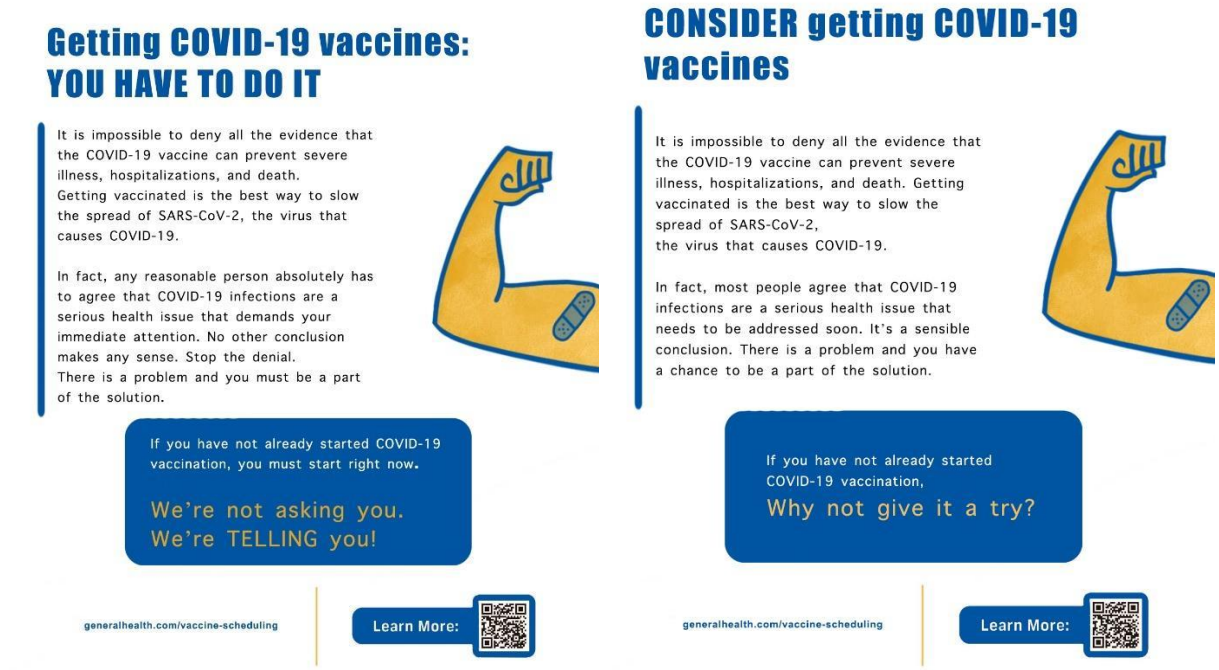


Figure 1. Intensity of controlling language in persuasive message (high vs. low).

APPENDIX B

TABLES FOR RESULTS

Table 1

Inoculation manipulations in Studies 2 and 3

Study 2		Study 3	Studies 2 and 3
Normative	Informative	Limited Inoculation	Control
"You are about to read information from the Public Health Institute related to the COVID-19 vaccination. You might feel that you've already heard a lot of messages telling you to get the COVID-19 vaccine for your health and wonder why you have seen so many messages about it. However, we can never emphasize too much the importance of getting across the powerful facts associated with COVID-19 vaccination. Indeed, the percentage of the US population who received one or more doses of COVID-19 was 77.6% as of May 1, 2022. A lot of people aren't aware that fully vaccinated rates have been rising among the US population**,** and many of them think other people should be vaccinated to protect both themselves and others."	"You are about to read information from the Public Health Institute related to the COVID-19 vaccination. You might feel that you've already heard a lot of messages telling you to get the COVID-19 vaccine for your health and wonder why you have seen so many messages about it. However, we can never emphasize too much the importance of getting across the powerful facts associated with COVID-19 vaccination. The delta (B.1.617.2) variant is nearly twice as contagious as earlier variants and might cause more severe illness. The omicron (B.1.1.529) variant spreads more easily than both the original virus and the delta variant. COVID-19 vaccines have shown to be highly effective in preventing infection, serious illness, and death."	"You are about to read information from the Public Health Institute related to the HPV vaccination. You might feel that you've already heard a lot of messages telling you to get the HPV vaccine for your health and wonder why you have seen so many messages about it. The message's recommendation may still be a good one, even if it makes you a little mad."	"The history of Mexican food is a long and diverse one. It is believed that authentic Mexican food might have been derived from the Mayan Indians. In the mid 1300's, The Aztec Empire was thriving, and though the Mayan food staples were still in use, chili peppers, honey, salt and chocolate found its way into their cooking. In 1521 Spain invaded Mexico. Spanish foods had the most influence on the Mexican cuisine. They introduced new livestock, such as sheep, pigs and cows. They brought with them dairy products, and garlic as well as many different herbs, wheat and spices. It was at this time that the Mexican people saw the assimilation of many other cuisines including Caribbean, South American, French, West African and Portuguese."

Table 2

Sample Characteristics for Study 1

	Covid-19 (*N* = 536)		HPV 19 (*N* = 506)	
	N	%	*N*	%
Education				
High school graduate	130	24.3	137	27.1
Some college, no degree	144	26.9	149	29.4
Bachelor's degree	210	39.2	189	37.4
Master's degree	38	7.1	27	5.3
Doctorate degree	5	0.9	1	0.2
Other	9	1.7	3	0.6
Gender				
Male	234	43.7	107	21.1
Female	302	56.3	382	75.5
Non-binary	0	0	17	3.4
Race/ethnicity				
White	269	50.2	184	36.4
Hispanic	113	21.1	220	43.5
Black	122	22.8	67	13.2
Native American	1	0.2	3	0.6
Asian	23	4.3	23	4.5
Other	8	1.5	9	1.8
Employment				
Full-time student	148	27.6	223	44.1
No employment	97	18.1	100	19.8
Part-time employment	90	16.8	88	17.4
Full time employment	172	32.1	85	16.8
Other	29	5.4	10	2.0
Age	*M* = 28.10	*SD* = 0.50	*M* = 22.18	*SD* = 2.18

Table 3

Sample Characteristics for Studies 2 and 3

	Covid-19 (*N* = 301)		HPV 19 (*N* = 350)	
	N	%	*N*	%
Education				
High school graduate	92	30.6	64	18.3
Some college, no degree	94	31.2	128	36.6
Bachelor's degree	58	19.3	131	37.4
Master's degree	30	10.0	19	5.4
Doctorate degree	8	2.7	1	0.3
Other	19	6.3	7	2.0
Gender				
Male	140	46.5	153	43.7
Female	156	51.8	177	50.6
Non-binary	5	1.7	20	5.4
Race/ethnicity				
White	174	57.8	196	56.0
Hispanic	56	18.6	41	11.7
Black	37	12.3	40	11.4
Native American	9	3.0	3	0.9
Asian	13	4.3	54	15.4
Other	12	4.0	16	4.6
Household income				
Less than $20,000	66	21.9	52	14.9
$20,000 to $39,999	69	22.9	85	24.3
$40,000 to $59,999	57	18.9	59	16.9
$60,000 to $79,999	48	15.9	51	14.5
$80,000 to $99,999	17	5.7	37	10.5
More than $100,000	44	14.6	66	18.9
Age	*M* = 46.62	*SD* = 17.60	*M* = 22.67	*SD* = 0.59

Table 4

Summary descriptive statistics of the variables

Variables	Mean	*SD*
Study 1 (COVID-19)		
Message fatigue	4.80	1.32
Perceived overcontrol	4.86	1.42
Perceived overdemand	4.16	1.49
Message avoidance (cognitive)	3.49	1.74
Message avoidance (behavioral)	3.46	1.69
Attention to the message recommendation	4.14	1.54
Perceived message value	4.81	1.39
Issue involvement	5.31	1.52
Vaccine confidence	4.56	1.92
Study 1 (HPV)		
Message fatigue	2.88	0.96
Perceived overcontrol	3.48	1.23
Perceived overdemand	3.03	1.11
Message avoidance (cognitive)	2.71	1.38
Message avoidance (behavioral)	2.21	1.69
Attention to the message recommendation	4.85	1.22
Perceived message value	5.72	0.88
Issue involvement	5.02	1.30
Vaccine confidence	5.68	1.03
Study 2 (COVID-19)		
Perceived inoculation threat	3.12	1.77
Perceived overcontrol	4.86	1.45
Message fatigue	4.60	1.57
Behavior intention	4.36	2.29
Personal experience with COVID-19	yes: n = 82, 27.2%	no: n = 219,72.8%
Study 3 (HPV)		
Perceived inoculation threat	2.96	1.40
Perceived overcontrol	4.54	1.38
Message fatigue	3.09	1.29
Behavior intention	5.26	1.67

Table 5

Correlations matrix of variables for Study 1 (COVID-19)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Age	—													
2. Gender	.08	—												
3. Education	.19**	.10*	—											
4. Race/Ethnicity	-.14**	.16**	.02	—										
5. Issue involvement	-.00	.06	-.01	.09*	—									
6. Vaccine confidence	-.22**	-.10*	-.01	-.06	.51**	—								
7. Perceived overcontrol	.12**	.04	.07	.01	-.29**	-.46**	—							
8. Perceived overdemand	-.00	.07	.06	.07	-.24**	-.42**	.70**	—						
9. Message fatigue	-.02	-.08	.10*	-.03	-.48**	-.46**	.59**	.56**	—					
10. Message avoidance (cognitive)	-.022	-.04	.04	-.10*	-.46**	-.44**	.34**	.33**	.61**	—				
11. Message avoidance (behavioral)	.002	.08	.08	-.07	-.44**	-.44**	.43**	.47**	.66**	.67**	—			
12. Information processing depth	.07	-.01	-.01	.05	.46**	.35**	-.21**	-.15**	-.49**	-.55**	-.50**	—		
13. Perceived message value	-.08	.03	-.06	.11**	.60**	.60**	-.36**	-.32**	-.60**	-.63**	-.60**	.58**	—	
14. Attitude toward the message	-.09*	.00	-.05	.06	.57**	.63**	-.47**	-.45**	-.63**	-.63**	-64**	.51**	.81**	

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

Table 6

Correlations matrix of variables for Study 1 (HPV)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Age	___													
2. Gender	.05	___												
3. Education	.45**	.06	___											
4. Race/Ethnicity	.01	.23**	.00	___										
5. Issue involvement	.08	.20**	.05	.29**	___									
6. Vaccine confidence	.11*	.12**	.10*	.06	.42**	___								
7. Perceived overcontrol	-.01	-.19**	-.02	-.06	-.07	-.08	___							
8. Perceived overdemand	.01	-.12**	-.02	.07	.01	-.10*	.54**	___						
9. Message fatigue	-.03	-.15**	-.04	.00	-.02	-.10*	.37**	.43**	___					
10. Message avoidance (cognitive)	-.00	-.18**	-.00	-.16	-.44**	-.27**	.20**	.12**	.35**	___				
11. Message avoidance (behavioral)	-.05	-.24**	-.08	-.08	-.34	-.31**	.24**	.28**	.50**	.56**	___			
12. Information processing depth	.03	.18**	.01	.17**	.44**	.28**	-.14**	-.04	-.28**	-.67**	-.45**	___		
13. Perceived message value	.03	.17**	.06	.18**	.46**	.40**	-.12**	-.12**	-.33**	-.54**	-.49**	.61**	___	
14. Attitude toward the message	.06	.18**	.02	.17**	.42**	.44**	-.16**	-.19**	-.30**	-.44**	-.48**	.51**	.61**	

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

Table 7

Hierarchical regression results for predictors on message fatigue (COVID-19)

Variables	Message fatigue
Block 1: Demographics	
Age	−.035
Gender (Male = 0)	−.075
Race/Ethnicity (White = 0)	−.021
Education	.109*
Block 1 ΔR^2	.017
Block 2	
Issue involvement	−.299***
Vaccine confidence	−.336***
Block 2 ΔR^2	.299***
Block 3: Message-level predictors	
Perceived overcontrol	.297***
Perceived overdemand	.245***
Block 3 ΔR^2	.190***
R^2	.506***
Total adjusted R^2	.498***

Note. Entities are standardized beta-coefficient.
Beta weights are from the final regression equation with all blocks of variables in the model; $N = 536$.
* $p < .05$; ** $p < .01$; ** $p < .001$.

Table 8

Hierarchical regression results for predictors on message fatigue (HPV)

Variables	Message fatigue
Block 1: Demographics	
Age	-.007
Gender (Male = 0)	-.162***
Race/Ethnicity (White = 0)	.042
Education	-.031
Block 1 ΔR^2	.027**
Block 2	
Issue involvement	.042
Vaccine confidence	-.093
Block 2 ΔR^2	.007
Block 3: Message-level predictors	
Perceived overcontrol	.038***
Perceived overdemand	.042***
Block 3 ΔR^2	.183***
R^2	.217***
Total adjusted R^2	.204***

Note. Entities are standardized beta-coefficient.
Beta weights are from the final regression equation with all blocks of variables in the model; $N = 536$.
* $p < .05$; ** $p < .01$; ** $p < .001$.

Table 9

Correlations matrix of variables for Study 2 (COVID-19)

	1	2	3	4	5	6	7
1. Age	___						
2. Personal history with COVID-19	-.17**	___					
3. COVID-19 vaccination status	.03	.10	___				
4. Perceived threat	.10	-.06	-.18**	___			
5. Perceived overcontrol	.03	.02	-.30**	.05	___		
6. Message fatigue	.03	.13*	-.42**	.14*	.64**	___	
7. Behavioral intention	.71**	-.04	.71**	-.14*	-.46**	-.65**	___

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

Table 10

Results of the Moderated Mediation Model with Inoculation Treatment as an Independent Variable (Study 2)

Predictor	*b*	*SE*	*t*	*p*	95% CI
Mediator variable model (perceived threat): $R^2 = 0.03$, $F(5, 295) = 3.76$, $p < .01$					
Inoculation treatment (0 = control message, 1 = inoculation message)					
Normative (ref. = control)	.51	.25	2.02	.044	[.01, 1.01]
Informative (ref. = control)	.92	.24	3.83	.000	[.45, 1.39]
Controlling message (0 = low controlling message, 1 = high controlling message)	-.12	.20	-.58	.560	[-.51, .28]
Age	.01	.01	1.39	.164	[-.00, .02]
COVID-19 diagnosed history	-.15	.23	-.64	.522	[-.59, .31]
Predictor	*b*	*SE*	*t*	*p*	95% CI
Mediator variable model (message fatigue): $R^2 = 0.06$, $F(6, 294) = 3.07$, $p < .01$					
Inoculation treatment (0 = control message, 1 = inoculation message)					
Normative (ref. = control)	-.48	.23	-2.11	.036	[-.93, -.03]
Informative (ref. = control)	-.40	.22	-1.82	.070	[-.83, .03]
Perceived threat	.15	.05	2.87	.004	[.05, .25]
Controlling message (0 = low controlling message, 1 = high controlling message)	.13	.18	.71	.481	[-.23, .48]
Age	.01	.01	.90	.368	[-.01, .02]
COVID-19 diagnosed history	.54	.20	2.65	.009	[.14, .94]
Predictor	*b*	*SE*	*t*	*p*	95% CI
Dependent variable model (intention toward the COVID-19 vaccines): $R^2 = 0.71$, $F(9, 291) = 71.49$, $p < .001$					
Inoculation treatment (0 = control message, 1 = inoculation message)					
Normative (ref. = control)	.09	.19	.45	.653	[-.29, .46]
Informative (ref. = control)	-.06	.18	-.32	.750	[-.42, .30]
Perceived threat	.01	.04	.17	.862	[-.08, .09]

Message fatigue	-1.22	.10	-11.82	.000	[-1.43, -1.02]
Message fatigue × COVID-19 Vaccine status	.25	.04	6.58	.000	[.17, .32]
Controlling message (0 = low controlling message, 1 = high controlling message)	.14	.15	.97	.333	[-.15, .43]
Age	.00	.00	.01	.993	[.01, .01]
COVID-19 diagnosed history	-.01	.17	-.06	.957	[-.34, .32]

Model indices	*b*	*SE*			95% CI
Index of moderated mediation	-.12	.06			[-.24, -.01]
Conditional indirect effects of inoculation					
Normative (ref. = control)					
Mediator	Moderator		Effect	Boot *SE*	95% CI
Message fatigue	Non-vaccine		.47	.23	[.03, .92]
Message fatigue	Completed vaccines		.23	.12	[.01, .46]
Message fatigue	Completed booster		.11	.07	[.00, .28]
Index of moderated mediation	-.10		.06		[-.22, .01]
Conditional indirect effects of inoculation					
Informative (ref. = control)					
Mediator	Moderator		Effect	Boot *SE*	95% CI
Message fatigue	Non-vaccine		.39	.22	[-.03, .83]
Message fatigue	Completed vaccines		.19	.11	[-.02, .42]
Message fatigue	Completed booster		.09	.07	[-.01, .25]

Model indices	*b*	*SE*			95% CI
Index of moderated mediation	.02	.01			[.00, .05]
Conditional indirect effects of inoculation					
Normative (ref. = control)					
Mediators	Moderator		Effect	Boot *SE*	95% CI

Perceived threat and message fatigue	Non-vaccine	-.08	.05	[-.20, -.00]
Perceived threat and message fatigue	Completed vaccines	-.04	.03	[-.10, -.00]
Perceived threat and message fatigue	Completed booster	-.02	.01	[-.05, -.00]
Index of moderated mediation	.03	.02		[.01, .08]
Conditional indirect effects of inoculation				
Informative (ref. = control)				
Mediators				
Perceived threat and message fatigue	Non-vaccine	-.13	.07	[-.29, -.03]
Perceived threat and message fatigue	Completed vaccines	-.07	.03	[-.15, -.01]
Perceived threat and message fatigue	Completed booster	-.03	.02	[-.08, -.00]

Table 11

Results of the Moderated Mediation Model with Controlling Message as an Independent Variable (Study 2)

Predictor	*b*	*SE*	*t*	*p*	95% CI
Mediator variable model (perceived overcontrol): $R^2 = 0.04$, $F(4, 296) = 3.20$, $p < .05$					
Controlling message (0 = low controlling message, 1 = high controlling message)	.50	.17	3.02	.003	[.17, .82]
Inoculation treatment (0 = control message, 1 = inoculation message)	-.17	.10	-1.71	.089	[-.36, .03]
Age	.00	.01	.53	.595	[-.01, .01]
COVID-19 diagnosed history	.08	.19	.42	.673	[-.29, .45]
Predictor	*b*	*SE*	*t*	*p*	95% CI
Mediator variable model (message fatigue): $R^2 = 0.66$, $F(5, 295) = 45.13$, $p < .001$					
Controlling message (0 = low controlling message, 1 = high controlling message)	-.24	.14	-1.68	.093	[-.51, .04]
Perceived overcontrol	.71	.05	14.56	.000	[.61, .80]
Inoculation treatment (0 = control message, 1 = inoculation message)	-.00	.08	-.05	.958	[-.17, .16]
Age	.00	.00	.75	.456	[-.01, .01]
COVID-19 diagnosed history	.44	.16	2.83	.005	[.14, .75]
Predictor	*b*	*SE*	*t*	*p*	95% CI
Dependent variable model (intention toward the COVID-19 vaccines): $R^2 = 0.71$, $F(8, 292) = 87.39$, $p < .001$					
Controlling message (0 = low controlling message, 1 = high controlling message)	.16	.15	1.05	.297	[-.14, .45]
Perceived overcontrol	-.04	.07	-.58	.564	[-.17, .10]
Message fatigue	-1.19	.12	-10.35	.000	[-1.41, -.96]
Message fatigue × COVID-19 Vaccine status	.24	.04	6.43	.000	[.17, .32]
Inoculation treatment (0 = control message, 1 = inoculation message)	-.03	.09	-.35	.727	[-.21, .14]
Age	.00	.00	.12	.903	[-.01, .01]

COVID-19 diagnosed history	-.01	.17	-.06	.955	[-.34, .32]

Model indices	*b*	*SE*			95% CI
Index of moderated mediation	-.06	.04			[-.13, .01]
Conditional indirect effects of inoculation					
Mediator	Moderator		Effect	Boot *SE*	95% CI
Message fatigue	Non-vaccine		.22	.13	[-.04, .49]
Message fatigue	Completed vaccines		.11	.07	[-.02, .24]
Message fatigue	Completed booster		.05	.04	[-.01, .14]

Model indices	*b*	*SE*		95% CI
Index of moderated mediation	.09	.03		[.03, .16]
Conditional indirect effects of inoculation				
Mediators	Moderator	Effect	Boot *SE*	95% CI
Perceived threat and message fatigue	Non-vaccine	-.33	.12	[-.60, -.11]
Perceived threat and message fatigue	Completed vaccines	-.16	.06	[-.30, -.05]
Perceived threat and message fatigue	Completed booster	-.08	.04	[-.17, -.01]

Table 12

Univariate Test Result for Study 2 (COVID-19)

Independent variables	Dependent variable	*df*	*F*	Partial η2
Inoculation treatment	Message fatigue	(1,293)	1.65	.01
Controlling message		(1,293)	.27	.00
Inoculation × controlling message		(1,293)	.62	.00

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

Table 13

Results of the Moderated Mediation Model (Study 3)

Predictor	*b*	*SE*	*t*	*p*	95% CI
Mediator variable model (message fatigue): $R^2 = 0.10$, $F(5, 344) = 7.54$, $p < .001$					
Inoculation treatment (0 = control message, 1 = inoculation message)	.09	.18	.49	.624	[-.27, .45]
Controlling message (0 = low controlling message, 1 = high controlling message)	.67	.19	3.57	.000	[.30, 1.04]
Inoculation treatment × Controlling message	-.08	.26	-.31	.753	[-.60, .44]
Age	.01	.02	.32	.746	[-.03, .05]
Gender	-2.48	1.47	-1.69	.093	[-5.37, .41]
Predictor	*b*	*SE*	*t*	*p*	95% CI
Dependent variable model (intention toward the HPV vaccines): $R^2 = 0.15$, $F(4, 345) = 15.18$, $p < .0001$					
Message fatigue	-40.	.07	-6.02	.000	[-.53, -.27]
Inoculation treatment (0 = control message, 1 = inoculation message)	.03	.17	.19	.849	[-.30, .36]
Age	-.06	.03	-2.43	.016	[-.11, -.01]
Gender	.40	.14	2.82	.005	[.12, .67]
Model indices	*b*	*SE*			95% CI
Index of moderated mediation	.03	.11			[-.18, .24]
Conditional indirect effects					
Mediator	Moderator		Effect	Boot *SE*	95% CI
Message fatigue	Low controlling (0)		-.04	.07	[-.19, .11]
Message fatigue	High controlling (1)		-.00	.07	[-.15, .15]

APPENDIX C

FIGURES FOR RESULTS

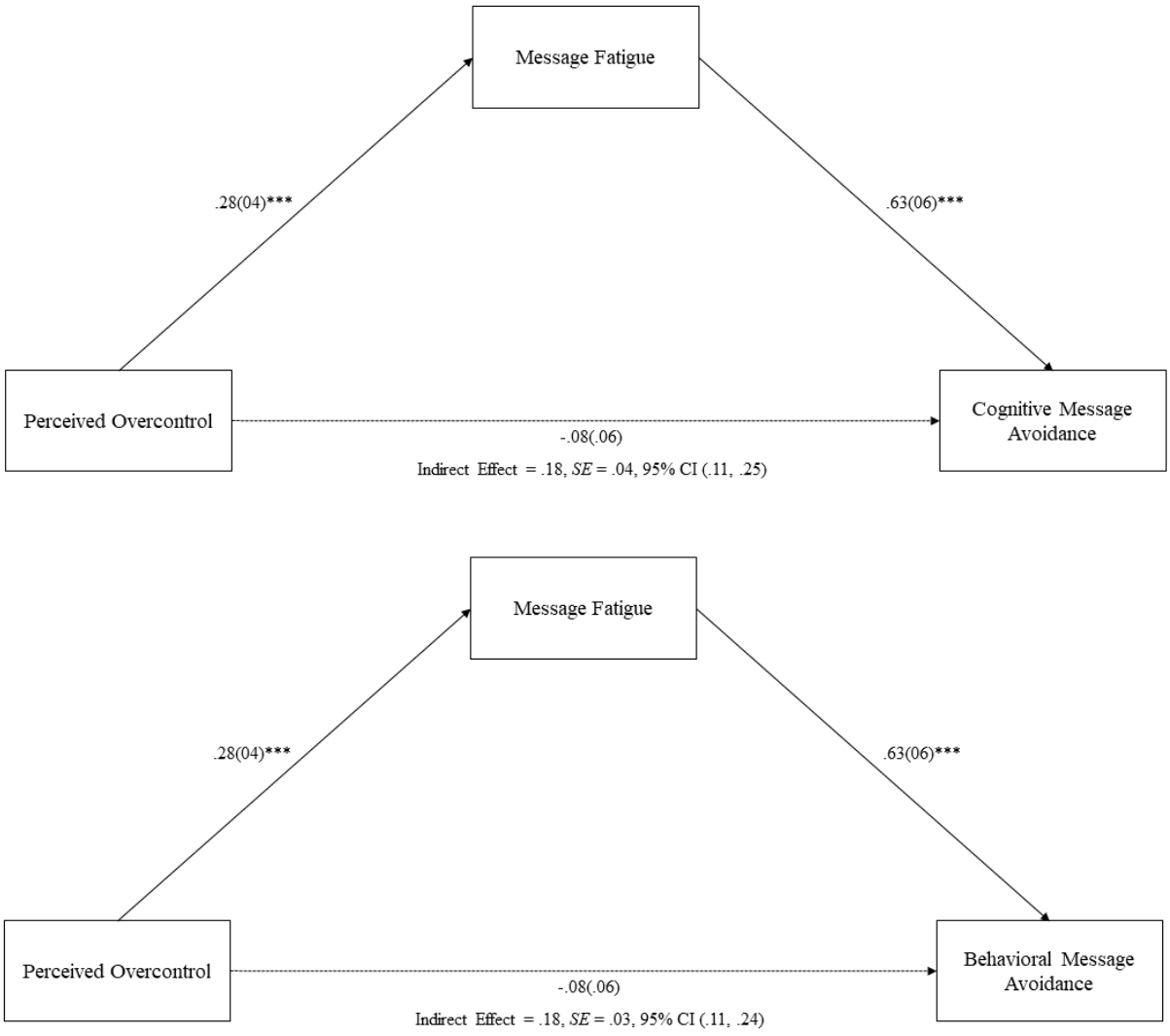
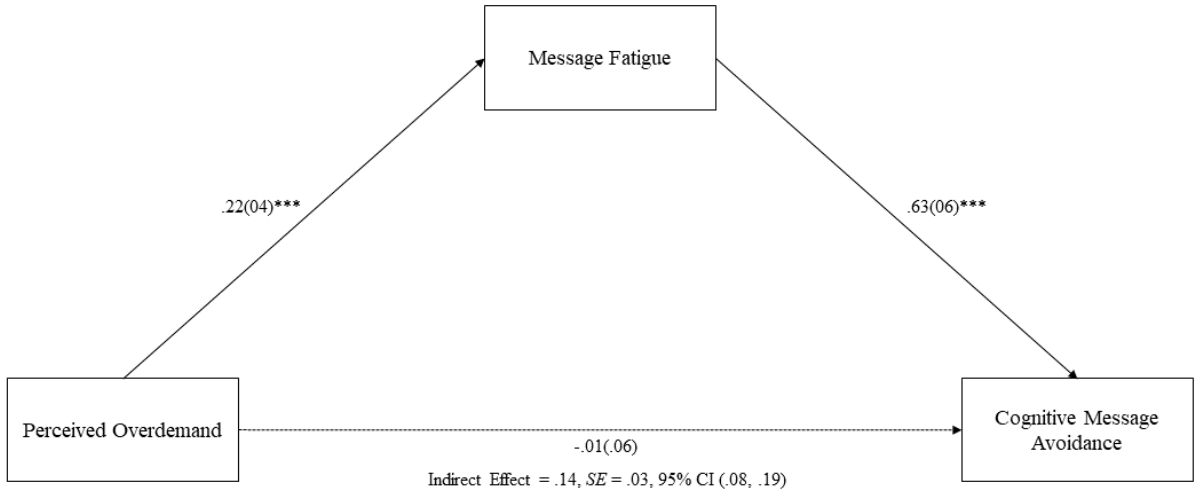


Figure 2. Model depicting the mediating role of message fatigue between perceived overcontrol and message avoidance (COVID-19). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.



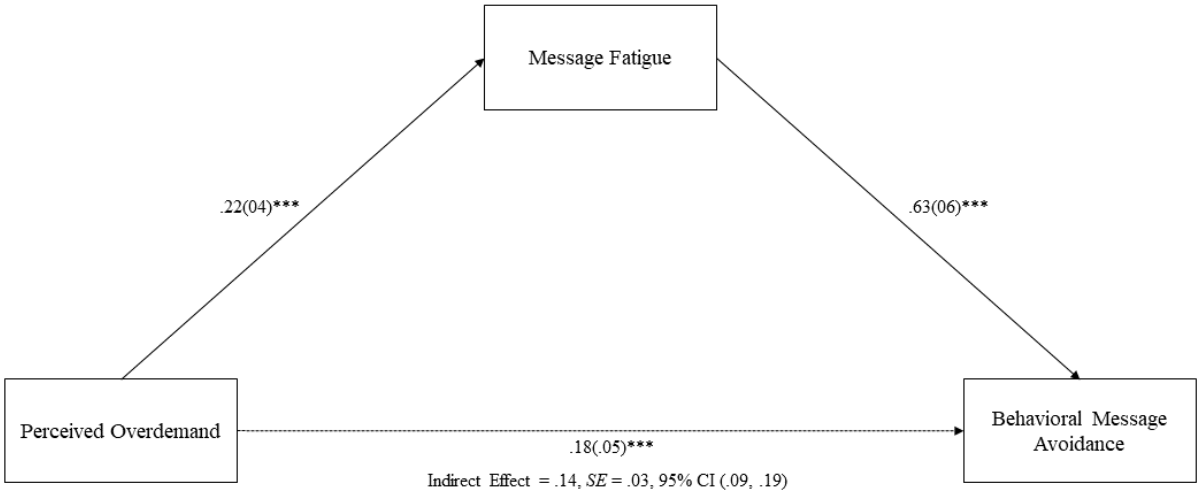


Figure 3. Model depicting the mediating role of message fatigue between perceived overdemand and message avoidance (COVID-19). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.

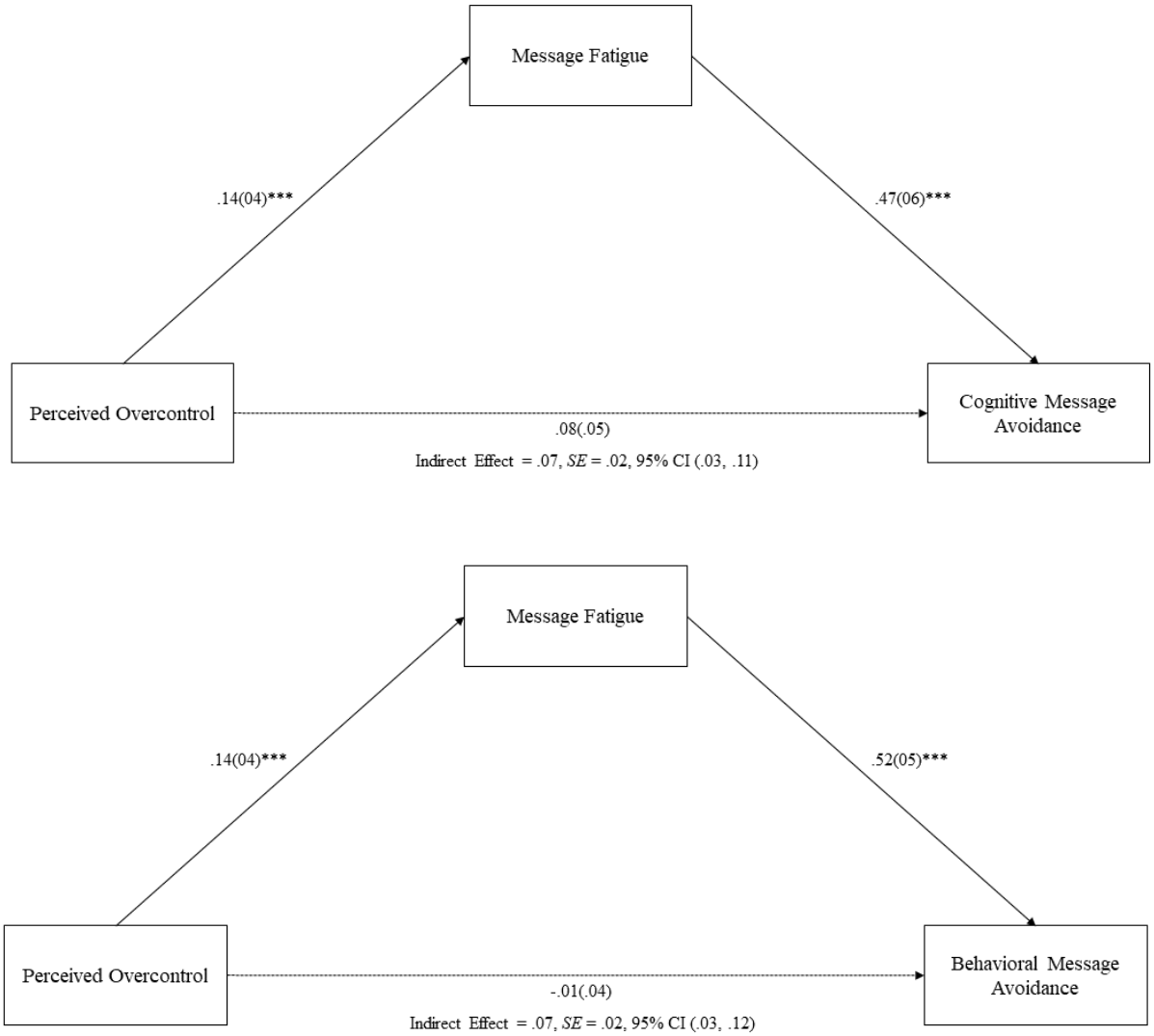


Figure 4. Model depicting the mediating role of message fatigue between perceived overcontrol and message avoidance (HPV). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.

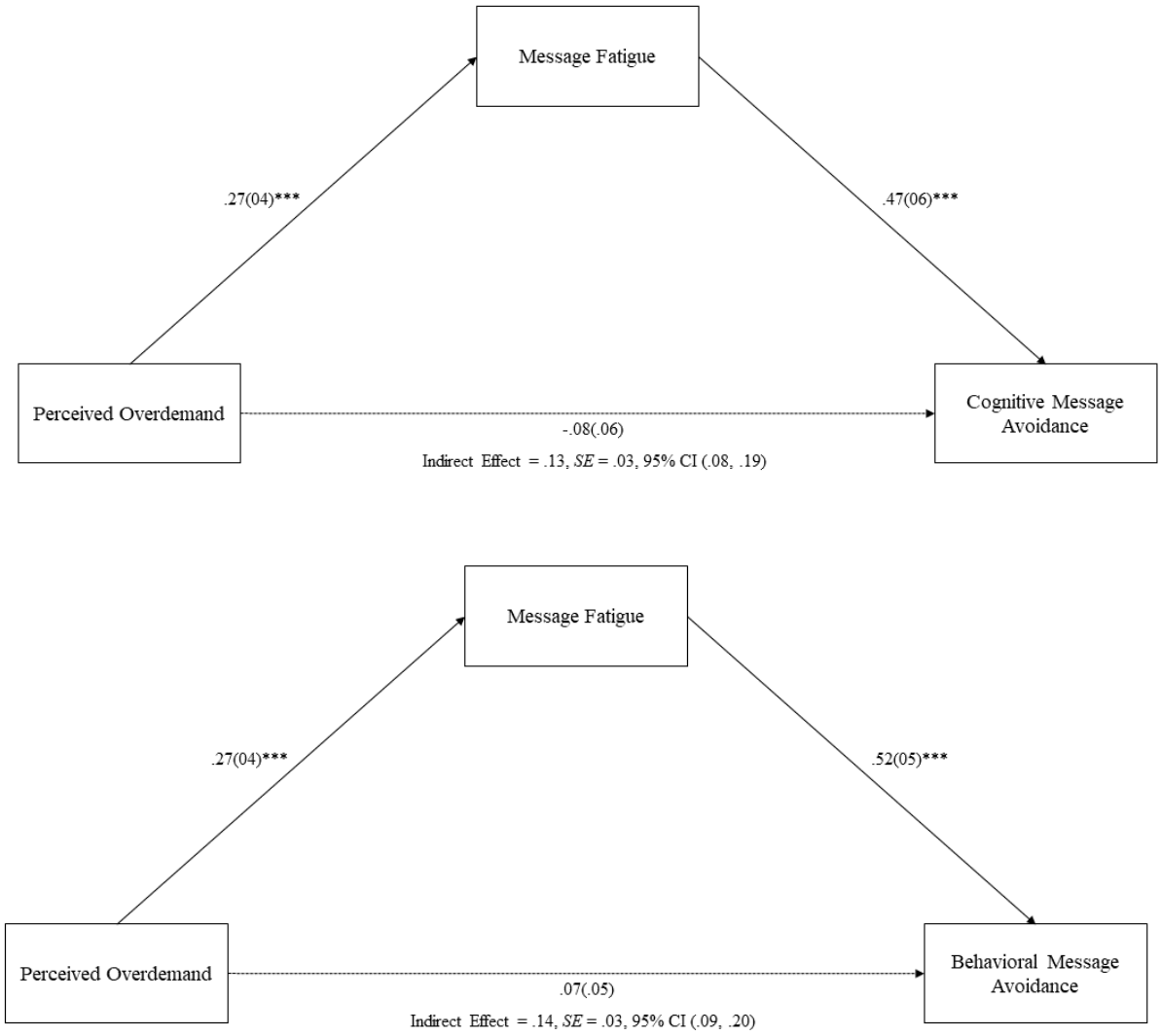


Figure 5. Model depicting the mediating role of message fatigue between perceived overdemand and message avoidance (HPV). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.

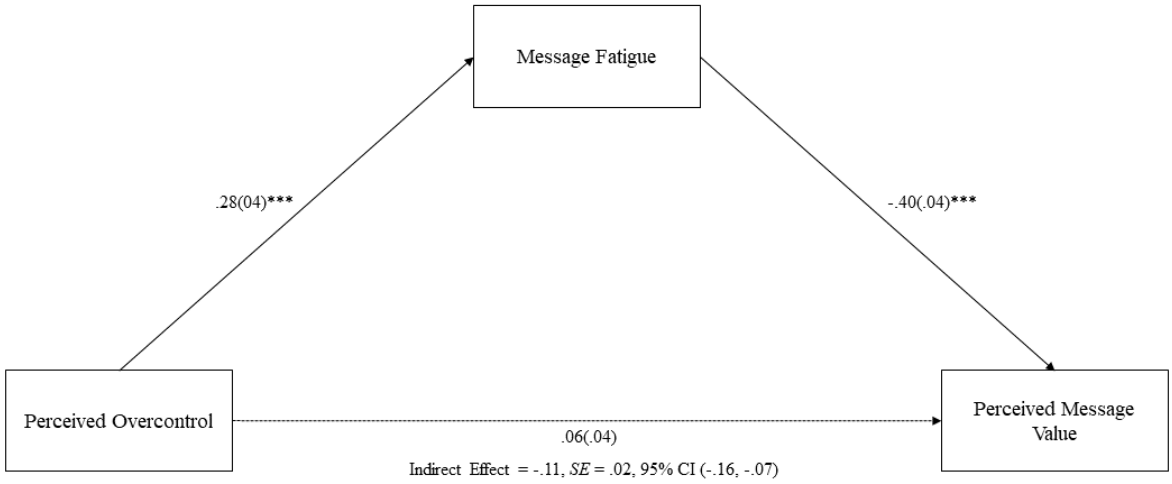


Figure 6. Model depicting the mediating role of message fatigue between perceived overcontrol and perceived message value (COVID-19). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.

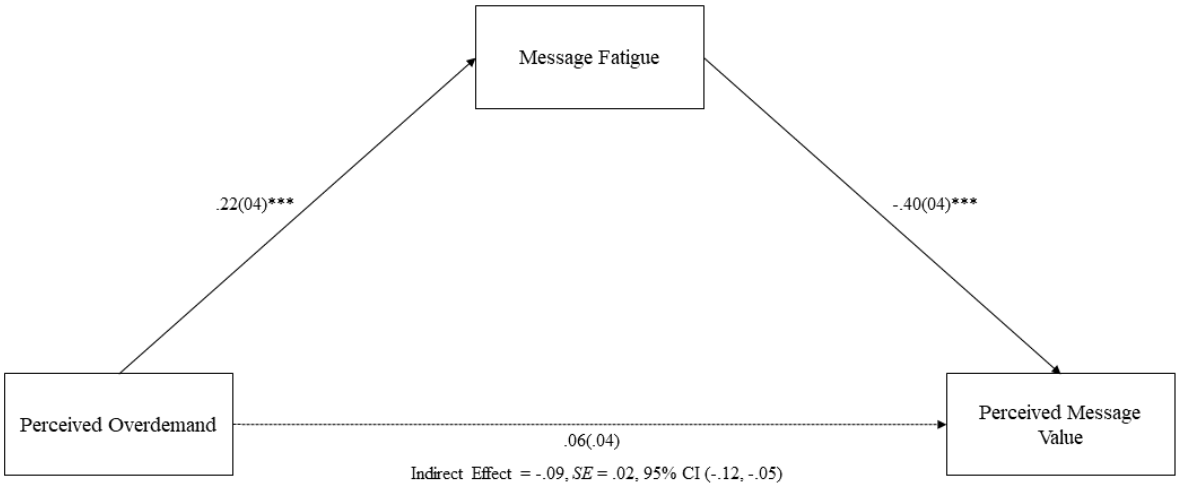


Figure 7. Model depicting the mediating role of message fatigue between perceived overdemand and perceived message value (COVID-19). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.

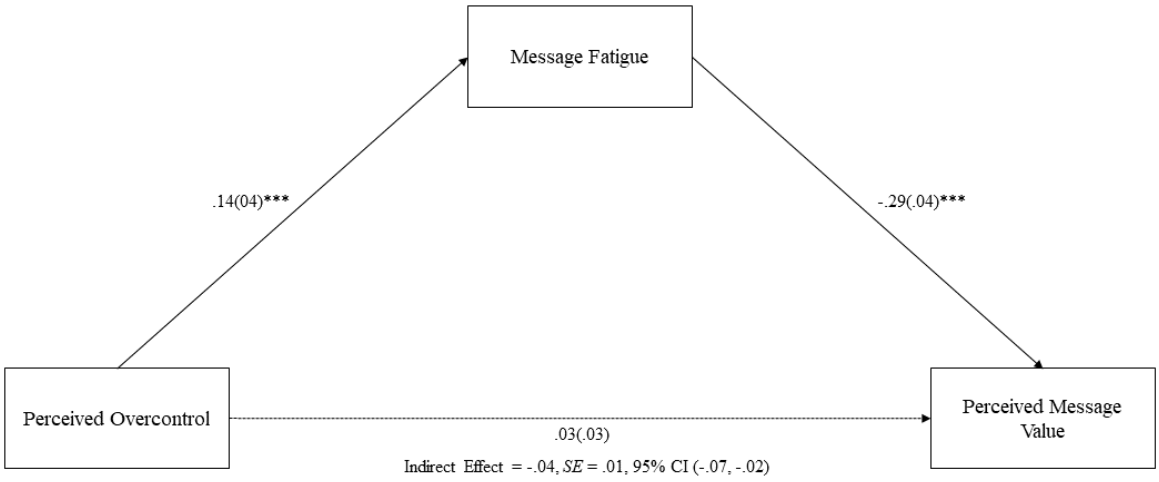


Figure 8. Model depicting the mediating role of message fatigue between perceived overcontrol and perceived message value (HPV). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.

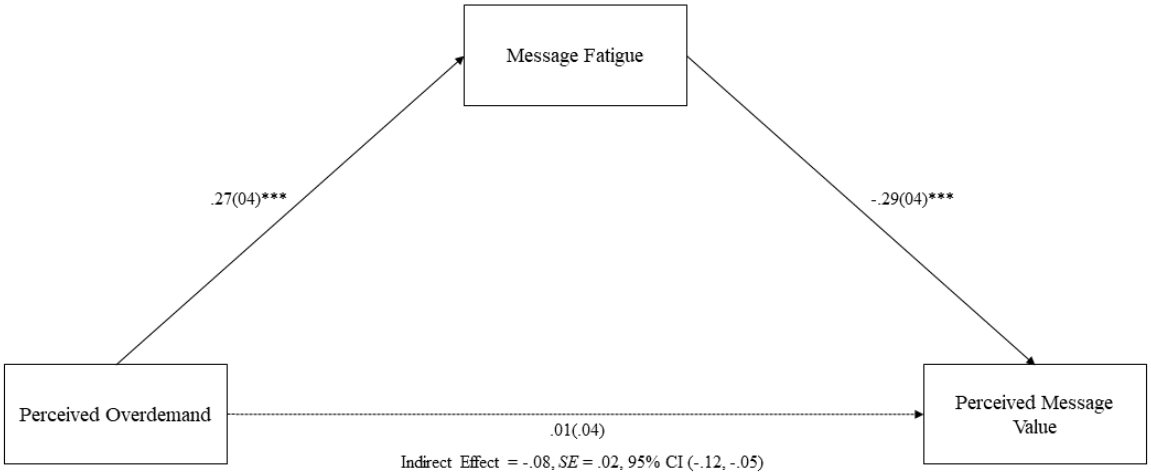


Figure 9. Model depicting the mediating role of message fatigue between perceived overdemand and perceived message value (HPV). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.

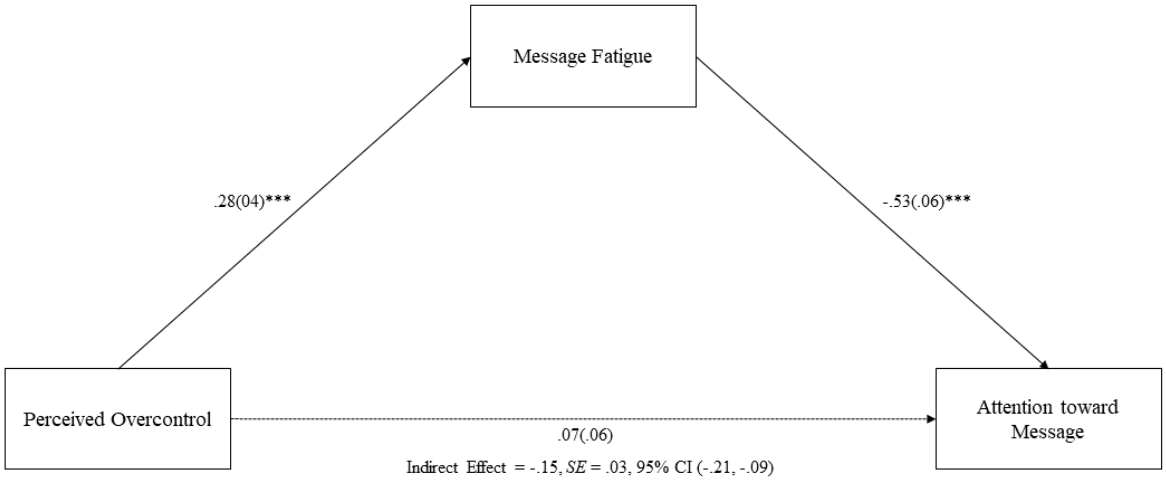


Figure 10. Model depicting the mediating role of message fatigue between perceived overcontrol and attention to the message (COVID-19). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.

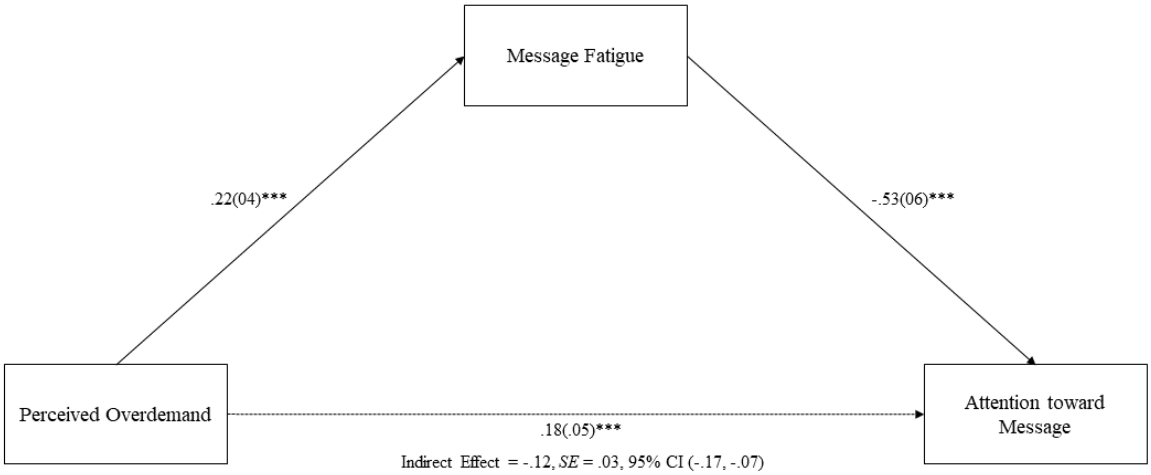


Figure 11. Model depicting the mediating role of message fatigue between perceived overdemand and attention to the message (COVID-19). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.

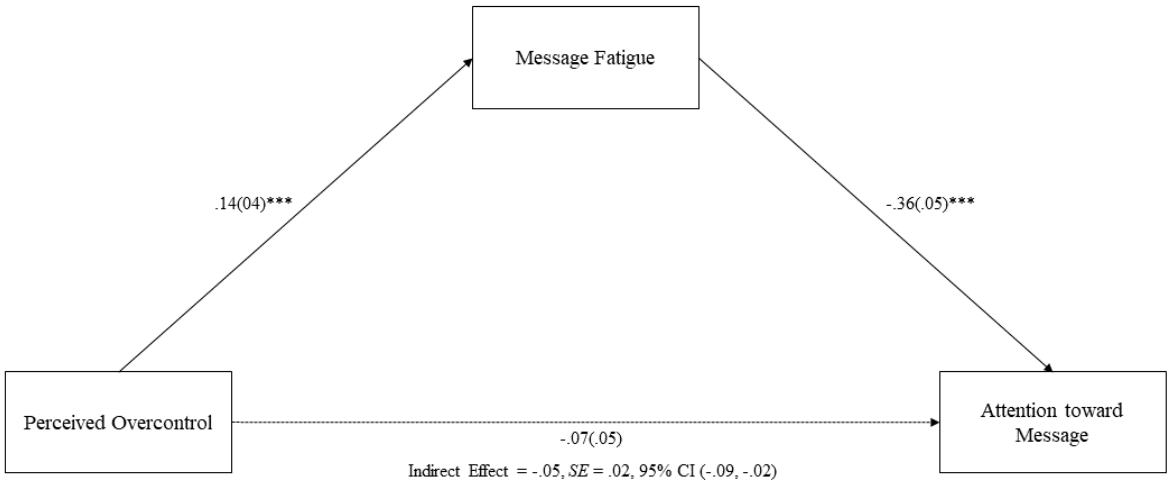


Figure 12. Model depicting the mediating role of message fatigue between perceived overcontrol and attention to the message (HPV). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.

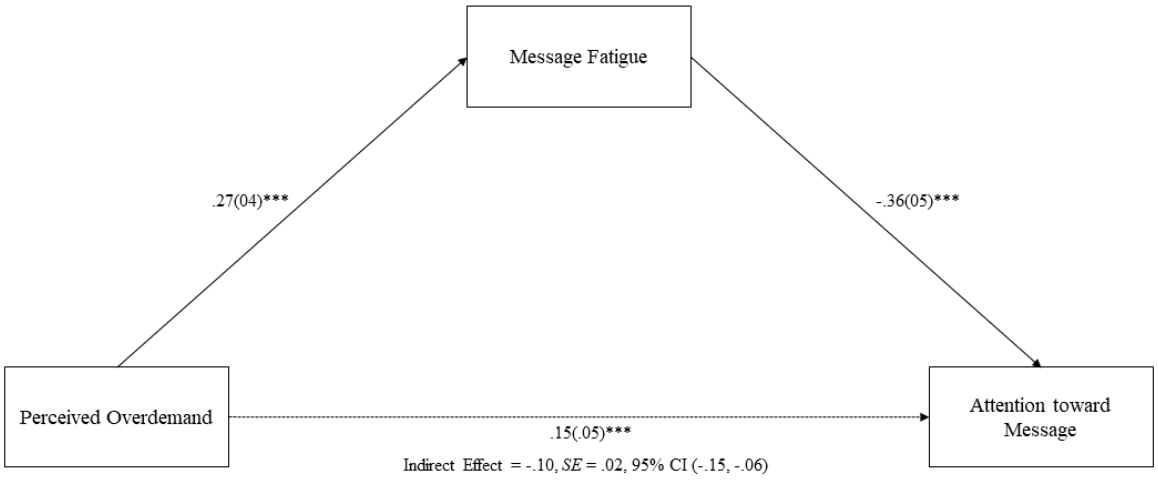


Figure 13. Model depicting the mediating role of message fatigue between perceived overdemand and attention to the message (HPV). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.

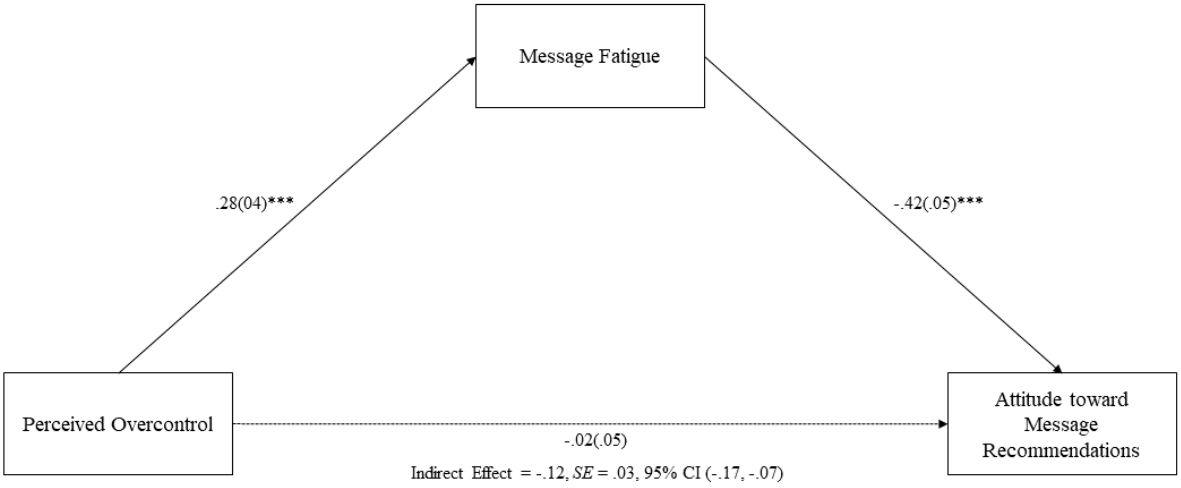


Figure 14. Model depicting the mediating role of message fatigue between perceived overcontrol and attitude to the message (COVID-19). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.

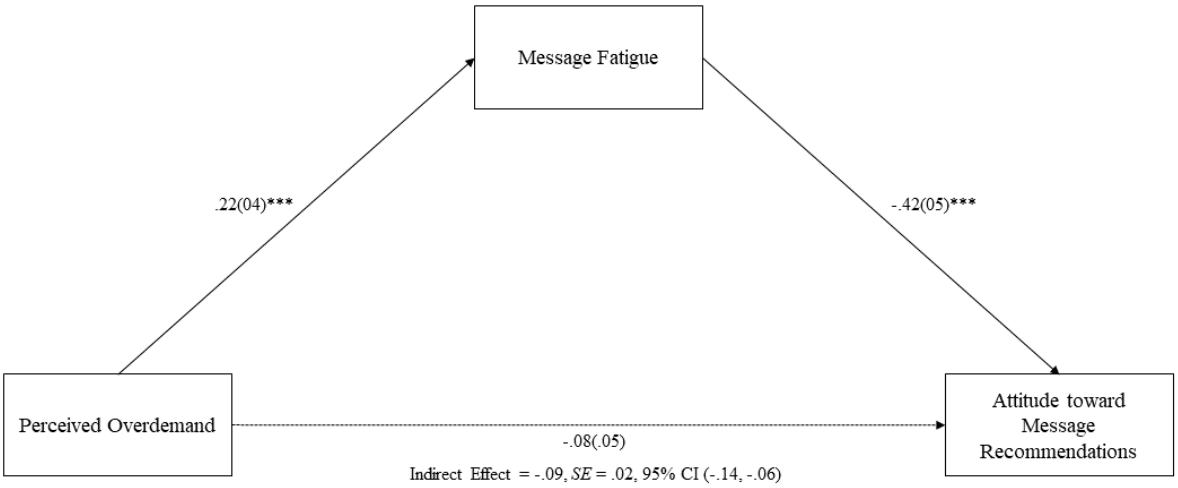


Figure 15. Model depicting the mediating role of message fatigue between perceived overdemand and attitude to the message (COVID-19). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.

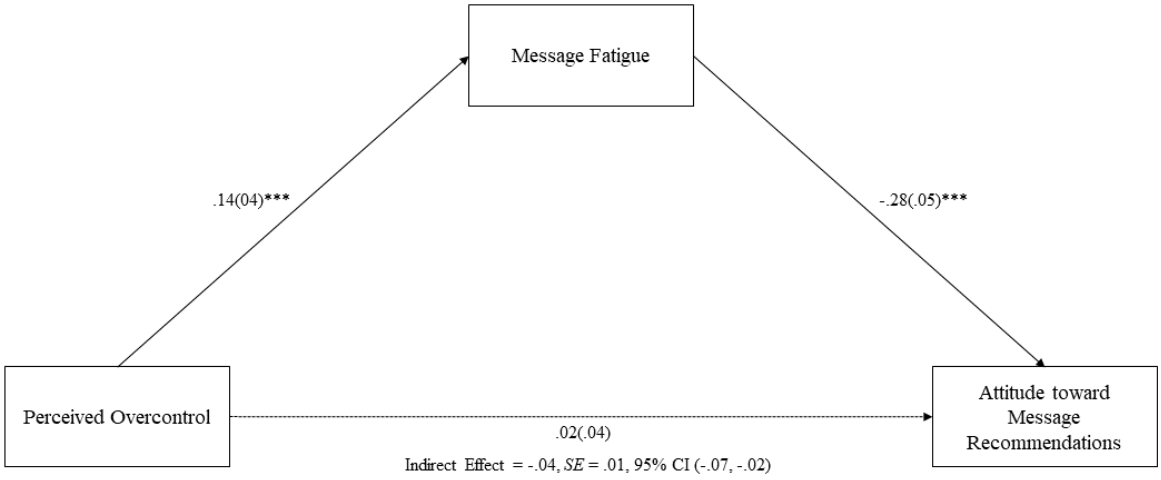


Figure 16. Model depicting the mediating role of message fatigue between perceived overcontrol and attitude to the message (HPV). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.

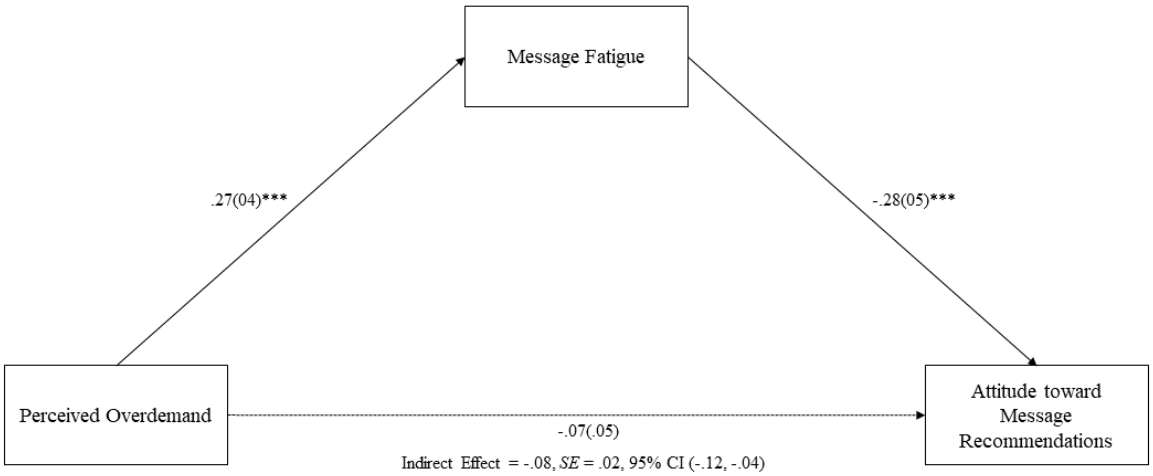


Figure 17. Model depicting the mediating role of message fatigue between perceived overdemand and attitude to the message (HPV). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.

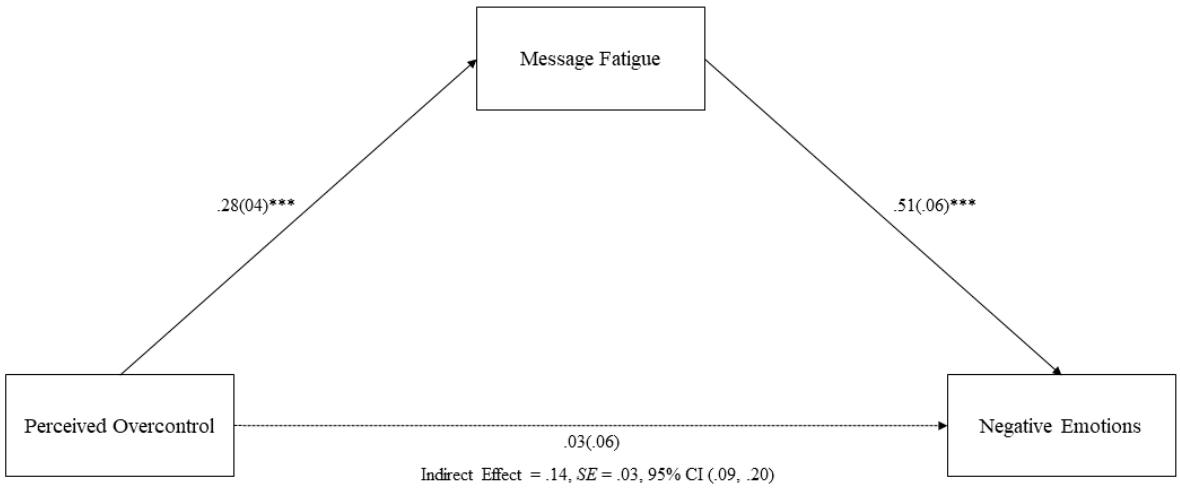


Figure 18. Model depicting the mediating role of message fatigue between perceived overcontrol and negative emotions (COVID-19). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.

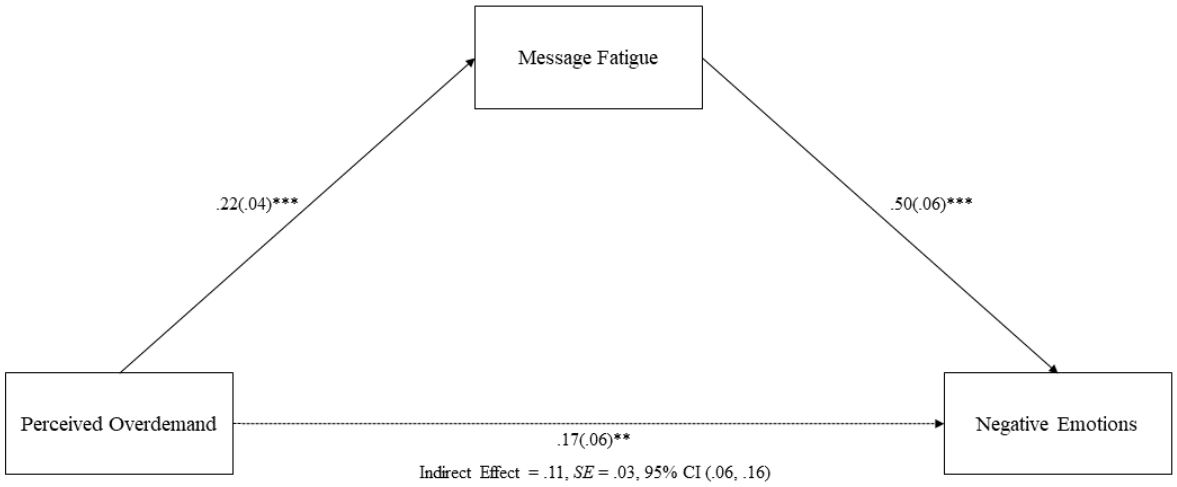


Figure 19. Model depicting the mediating role of message fatigue between perceived overdemand and negative emotions (COVID-19). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.

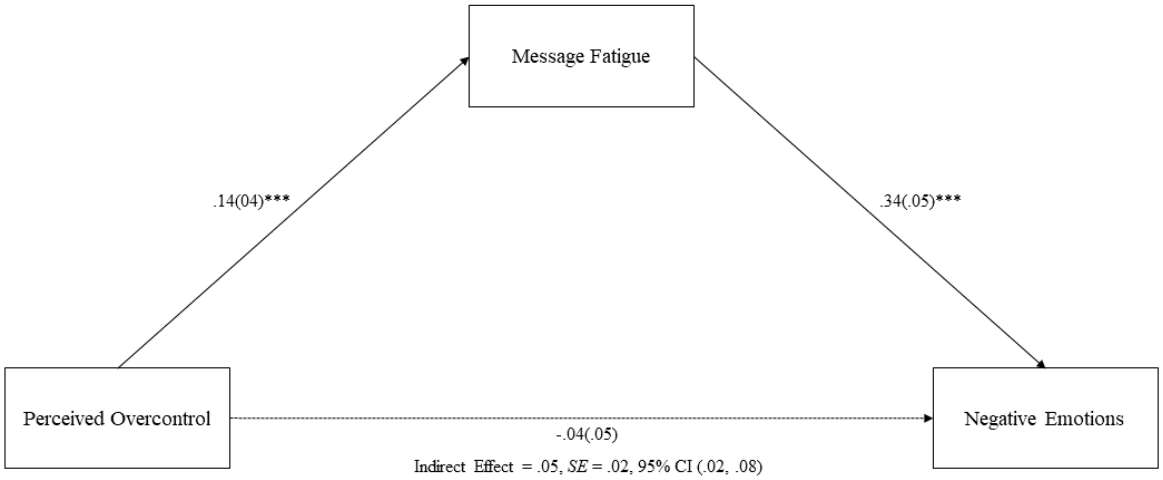


Figure 20. Model depicting the mediating role of message fatigue between perceived overcontrol and negative emotions (HPV). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.

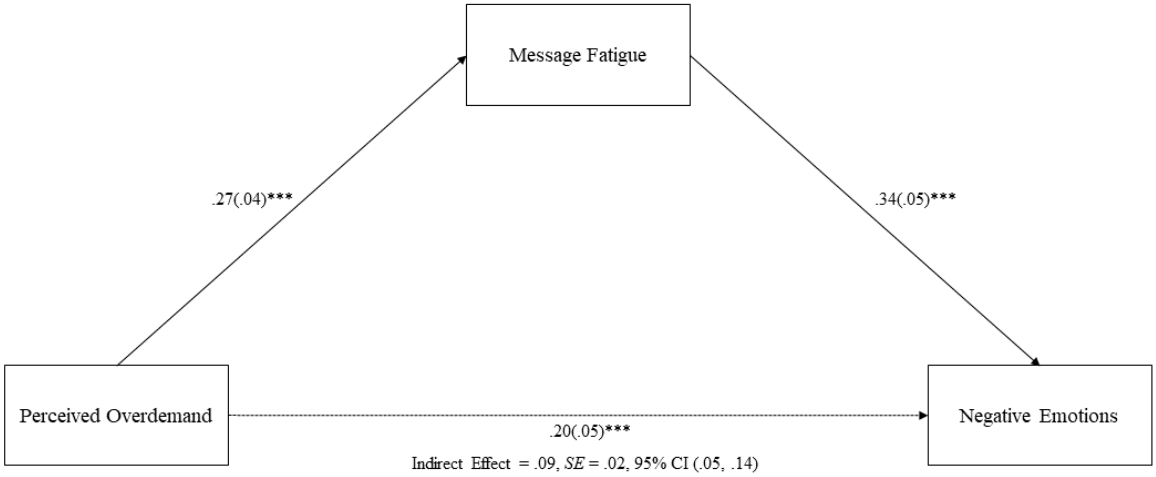
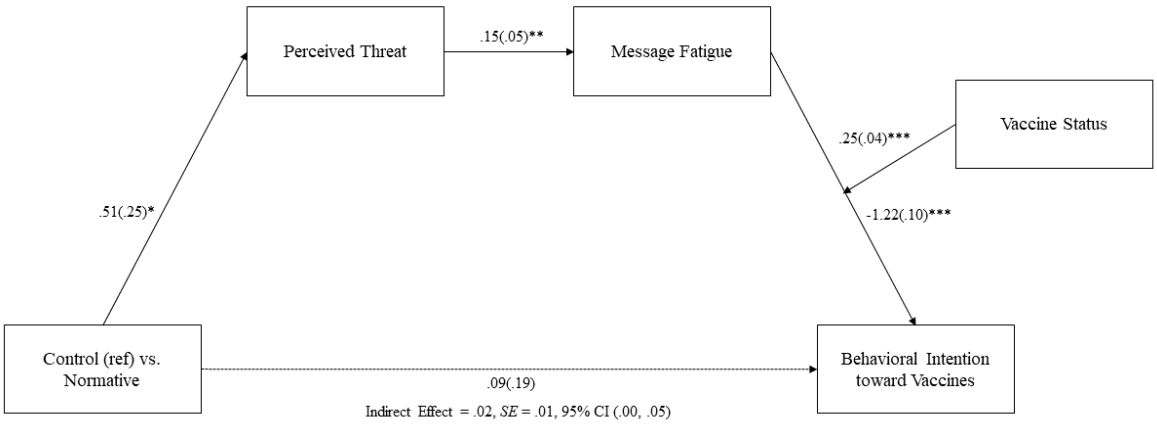
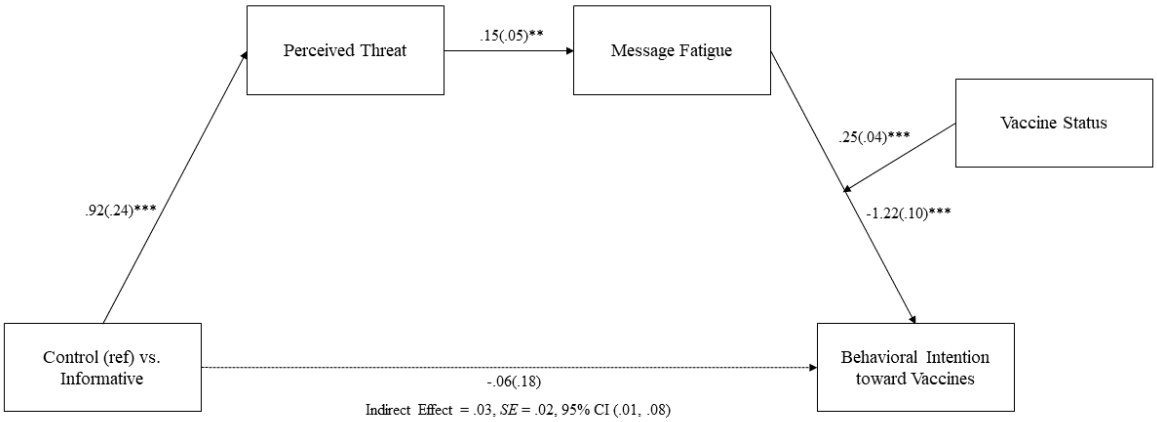


Figure 21. Model depicting the mediating role of message fatigue between perceived overdemand and negative emotions (HPV). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.





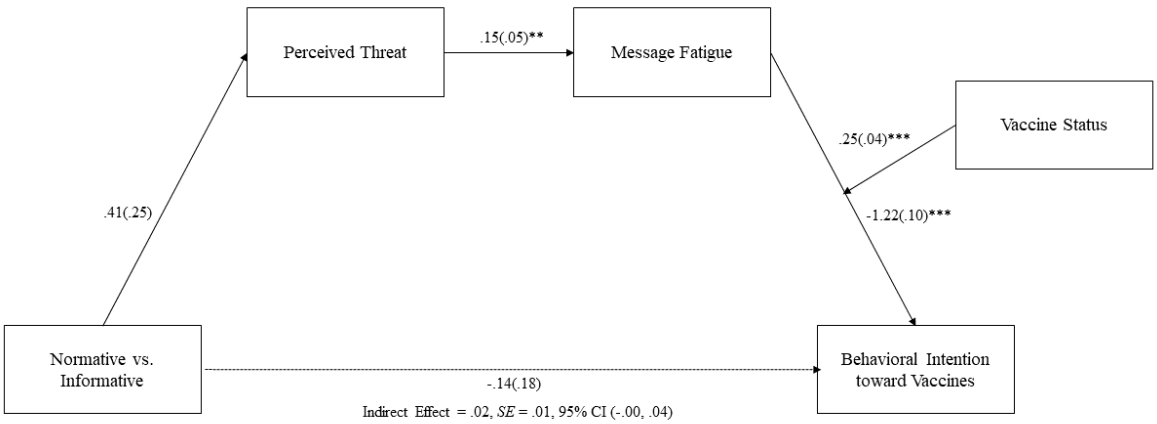


Figure 22. Model depicting the moderated mediation results for the effects of inoculation treatment on behavioral intention to vaccines (COVID-19). Coefficients are unstandardized regression coefficients. * $p < .05$; ** $p < .01$; ** $p < .001$.

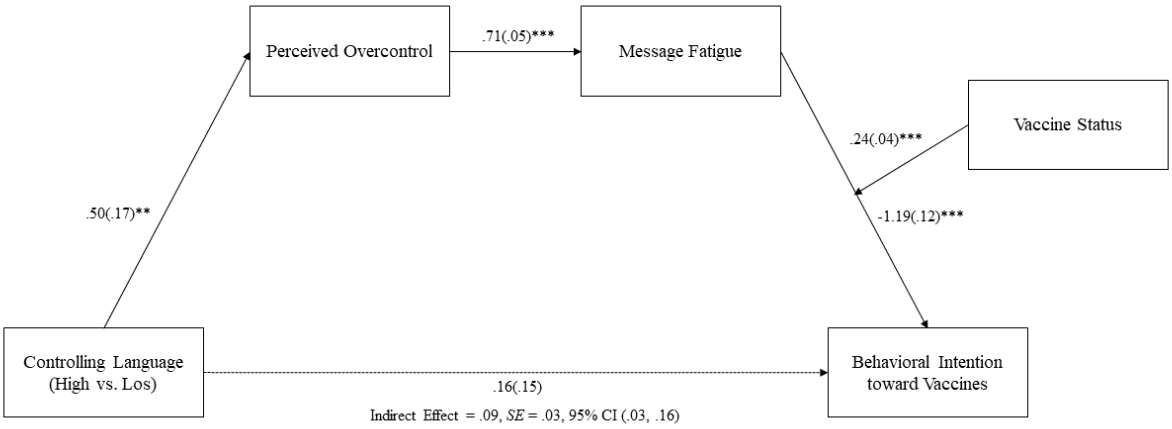


Figure 23. Model depicting the moderated mediation results for the effects of controlling language on behavioral intention to vaccines (COVID-19). Coefficients are unstandardized regression coefficients. * $p < .05$; ** $p < .01$; ** $p < .001$.

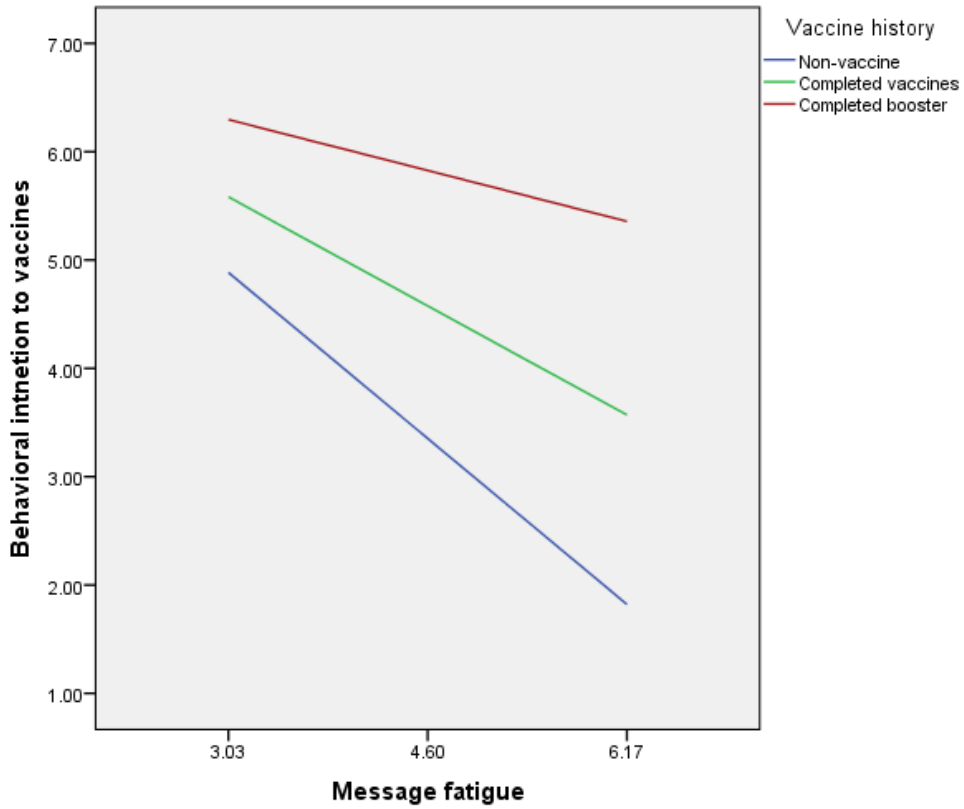


Figure 24. Conditional indirect effects of controlling language on behavioral intention to vaccines through perceived overcontrol and message fatigue (COVID-19).

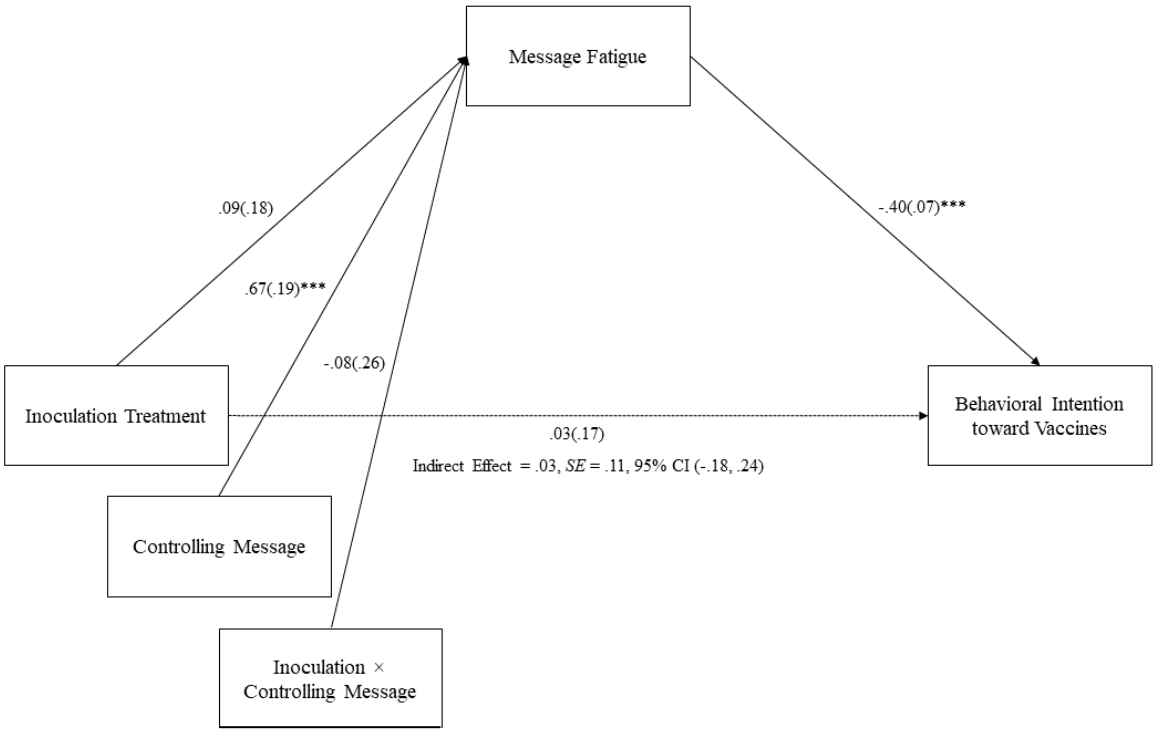


Figure 25. Model depicting the moderated mediation results for the effects of inoculation treatment and controlling language on behavioral intention to vaccines (HPV). Coefficients are unstandardized regression coefficients.
* $p < .05$; ** $p < .01$; ** $p < .001$.