

**COVID-19 IS REAL:
EXAMINING INOCULATION THEORY AND TRUST IN SCIENCE TO
INCREASE COMPLIANCE WITH SAFETY GUIDELINES**

by

Steven R. Waldorf

A thesis submitted to the Faculty of the University of Delaware in partial fulfillment of
the requirements of the degree of Master of Arts in Communication.

Summer 2021

© 2021 Steven R. Waldorf

All Rights Reserved

**COVID-19 IS REAL:
EXAMINING INOCULATION THEORY AND TRUST IN SCIENCE TO
INCREASE COMPLIANCE WITH SAFETY GUIDELINES**

by

Steven R. Waldorf

Approved: _____
Paul Brewer, Ph.D.
Professor in charge of thesis on behalf of the Advisory Committee

Approved: _____
Kami Silk, Ph.D.
Chair of the Department of Communication

Approved: _____
John Pelesko, Ph.D.
Dean of the College of Arts and Sciences

Approved: _____
Louis F. Rossi, Ph.D.
Vice Provost for Graduate and Professional Education and
Dean of the Graduate College

TABLE OF CONTENTS

LIST OF TABLESiv
LIST OF FIGURES v
ABSTRACT.....vi

Chapter

1. INTRODUCTION 1
2. LITERATURE REVIEW5
 2.1. Inoculation Theory.....5
 2.2. Psychological Reactance and Message Reactance8
 2.3. Trust in Science 11
3. METHODS 14
 3.1. Participants 14
 3.2. Design and Procedure 15
4. RESULTS20
5. DISCUSSION23
 5.1. Theoretical Implications24
 5.2. Practical Implications26
 5.3. Limitations.....27
 5.4. Directions for Future Research.....30
REFERENCES33

Appendix

A. COVID-19 INTENTIONS BATTERY38
B. COVID-19 BELIEF BATTERY.....39
C. TRUST IN SCIENCE AND SCIENTISTS BATTERY.....40
D. PSYCHOLOGICAL REACTANCE BATTERY.....41
E. IRB HUMAN SUBJECTS.....42

LIST OF TABLES

Table 1:	Means, standard deviations, and alphas for key indices	19
----------	--	----

LIST OF FIGURES

Figure 1:	Diagram depicting mediation and moderation conditions.....	10
-----------	--	----

ABSTRACT

The current COVID-19 pandemic has exposed a critical lack of trust in science and rejection of suggested safety guidelines. This study utilized inoculation theory, a mature persuasive process, to act as an intervention to increase compliance with safety guidelines. It has been asserted that the higher one's trust in science, the greater their compliance to safety guidelines will be (Plohl & Musil, 2020). This study employed 156 currently enrolled college students at a major Mid-Atlantic university for an online experiment. Participants were asked to read one of two messages: either a control message unrelated to coronavirus or an inoculation message aimed at reinforcing the participant's compliance with guidelines and protecting them from pressure to deviate. An additional component was added to the inoculation message, following research by Richards and Banas (2015; 2018), to reduce message reactance induced by the COVID-19 inoculation message. After reading their randomly assigned message, participants were asked to respond to questions measuring their reactance toward the message they read (Richards & Banas, 2015; Richards & Banas, 2018), their behavioral intentions during the pandemic (Biddlestone et al., 2020), their beliefs regarding COVID-19 (Biddlestone et al., 2020), the Trust in Science and Scientists Inventory (TSSI) (Nadelson et al., 2014), and Hong's Psychological Reactance Scale (Hong & Page, 1989). Independent-samples t-tests, linear regressions, and multiple regressions were used to test the effects of the inoculation message against the five batteries listed above. A significant correlation was found between message reactance and COVID-19 beliefs ($p = <0.001$). Significance was also found between condition x trust in science and scientists with COVID-19 beliefs ($p = <0.001$). Implications for future inoculation campaigns, limitations within the sample, and directions for future research are discussed.

Chapter 1

INTRODUCTION

As of the writing of this paper, the COVID-19 pandemic has been an ongoing global struggle that has shifted many aspects of everyday life. Public health institutions and practitioners have experienced great pressure to protect the public from coronavirus. As information campaigns grew in scale, so did pushback against suggested guidelines and precautions (Landsverk, 2020). Efforts to contain the spread of coronavirus have seen mixed results, both at the international level and within the United States of America (Walensky & del Rio, 2020). Given the gaps within national responses to COVID-19, there is a greater responsibility for the public to act with efficacy. Thus, public health campaigns are especially essential to mitigate today's pandemic. The present study sought to identify potential avenues for practitioners to utilize to increase compliance with suggested safety guidelines.

The COVID-19 virus was first detected in Wuhan, China in late 2019 as cases of pneumonia with an unidentified cause (WHO, 2021). This variant of coronavirus has demonstrated a highly infectious nature that is primarily spread through respiratory droplets that become airborne through coughing, sneezing, breathing, or talking (CDC, 2020b). By early 2020, the Center for Disease Control (CDC) and the World Health Organization (WHO) had created and publicized safety guidelines to reduce one's risk of contracting and spreading COVID-19. These safety guidelines highlighted the need for people to maintain a 6-foot distance from others, to wear a mask that covers one's nose and mouth, to avoid crowds, to regularly wash one's hands, to regularly sanitize one's

hands when unable to wash with soap, and to self-quarantine if one is showing COVID-like symptoms or was recently in contact with someone who was infected (CDC, 2020a).

Despite guidelines being comprehensive, clear, and actionable, there has been substantial pushback from some members of the public (Lovelace Jr., 2020). Individuals have stood in opposition to these guidelines, with dissent forming into an anti-science movement of sorts (Hollingsworth et al., 2020). Researchers have worked to identify the causes behind this nonconformity (Biddlestone et al., 2020; Plohl & Musil, 2020). This study seeks to replicate correlations found within prior research (Biddlestone et al., 2020; Plohl & Musil, 2020) and test whether a different mechanism will further support the following of these safety guidelines. Though this current study is centered on the COVID-19 pandemic, implications can serve utility in a broader context.

Public health campaigns have long benefited from the utilization of inoculation theory (Banas & Rains, 2010). First proposed in the second half of the 20th century (McGuire, 1961), inoculation theory follows a medical analogy. The assumption follows that individuals will be confronted with persuasive messages that attempt to change their beliefs or behaviors. A practitioner informs the individual that such messages exist and that the individual will be exposed to them in their everyday life; this is identified in the literature as forewarning. The individual will then be exposed to a limited version of the messaging in question, coined in the literature as a threat. Immediately following the threat comes preemptive refutation. This is a form of counter argument that the practitioner demonstrates to the individual. Thus, the individual will be adequately equipped to resist real-world versions of the persuasive messages being treated against. Acting as a vaccine, the individual was exposed to a weakened version of a persuasive

message and is shown how to resist it, giving them immunity to such messages. The ability for a participant to resist future persuasion is identified as confidence. Given the amount of misinformation and persuasive nonconformity messaging within the public discourse on COVID-19 (Hollingsworth et al., 2020; Lovelace Jr. 2020), practitioners ought to act against such messaging in addition to spreading credible information and updates. This study tested whether inoculation theory would be effective in increasing compliance to COVID-19 safety guidelines proposed by the CDC and the WHO.

An important consideration when utilizing inoculation theory is reactance. Two distinct kinds of reactance are relevant in this context: message reactance and psychological reactance. Message reactance refers to a potential discomfort felt by participants to a message they are exposed to. This generally results in the attempt of the message failing as the participant experienced negative affect toward the message. This is generally due to perceived threats to the participant's autonomy (Richards and Banas, 2015). Research has started to validate the addition of a preemptive inoculative message, one aimed at inoculating participants against experiencing message reactance induced by the main inoculation (Richards and Banas, 2015; Richards and Banas, 2018). This study sought to expand this area by including a preemptive inoculative message within the main inoculative message, constructed and measured in a manner consistent with previous experiments (Richards and Banas, 2015; Richards and Banas, 2018).

In contrast, psychological reactance is a relatively stable trait within an individual that describes their disposition toward autonomy violations and authority figures (Brown & Finney, 2011; Hong & Page, 1989). Considering psychological reactance in this context is important, as it may serve an explanatory function as to why inoculation

treatments may fail some individuals. At a larger scope, psychological reactance may also help explain why individuals oppose CDC and WHO safety guidelines; they do not trust institutions and/or do not want to be told what to do.

An additional factor relevant to an individual's likelihood to comply with safety guidelines is their trust in science (Plohl & Musil, 2020). If an individual trusts science and scientists, then they should be more likely to comply with safety guidelines proposed by the CDC and WHO. A complicating component to this is the increasingly politicized nature surrounding public discourse on science (Gauchat, 2012; Samet et al., 2017; Thorp, 2020). The inoculation message created for this experiment targeted the participant's disposition toward science and scientists as a secondary means to reinforce compliance with safety guidelines.

Utilizing original data, an experiment was launched. Participants were separated randomly into two groups; one group read an inoculation message aimed at increasing safety guideline compliance and the other group read a control message. After reading their message, participants completed five question batteries to measure their message reactance, intentions to act during the pandemic, beliefs regarding COVID-19, trust in science and scientists, and psychological reactance. Significant correlations were found between the two groups regarding their self-reported message reactance, psychological reactance, and trust in science and scientists. These individual factors combined with participant condition to adjust the likelihood of accurate beliefs regarding COVID-19. Although these results do not provide support for the primary inoculation message, they do not negate the potential for a partial conference. Directions for practitioners and future research are further discussed.

Chapter 2

LITERATURE REVIEW

Inoculation Theory

Inoculation theory is a mature theory of communication that elicits a comparison to medical vaccination. This theory proposed by McGuire (1961) asserts that individuals do not want to be persuaded. By informing an individual that their beliefs will be attacked by a persuasive attempt, the individual will try to resist the persuasive attempt (McGuire & Papageorgis, 1961). By having the participant recognize that they were the victim of a persuasive attempt, the persuasive attempt will fail to get the victim to change their behaviors or beliefs. This can extend beyond the now failed persuasive attempt, leading participants to have more negative perceptions of the entity that tried to persuade them. This informative message is named in the literature as a threat (Banas & Rains, 2010). The participant is made aware that their beliefs and behaviors will be attempted to be altered. The forewarning is twofold; the participant is given the threat and they are shown an example attempt (Burgoon et al., 1978; Ivanov et al., 2017). The participant is shown the weaknesses in the example message. This gives them the ability to dismantle real-world persuasive messages that are similar to the tested content. This is termed preemptive refutation (Banas & Rains, 2010).

The ultimate goal of inoculation theory-based campaigns is to elicit confidence in participants (Banas & Rains, 2010). Confidence refers to the ability of participants to maintain their inoculated beliefs in the face of nonexperimental threats. Participants have been given a weakened dose of a persuasive attempt, now giving them the ability to fight off similar persuasion. If the confidence is maintained, then they will successfully resist

the persuasive attempt. Whether the conference is maintained is determined by the strength of the preemptive refutations and the motivation of the participant. This necessitates practitioners to craft preemptive refutation that is cohesive and strong so that participants will be better equipped to resist varied persuasive attempts long after the treatment. Participants generally have higher motivation to maintain conference when the inoculation treatment was most recent, though long-term conference is possible and often strived for.

The concept of time delay is a contested component in the inoculation literature. Early development originally posited that a delay between the inoculation and the attack message was necessary for the treatment to be effective (McGuire, 1964), befitting the medical analogy central to inoculation theory (McGuire, 1961). Yet subsequent research has shown this variable to be nonconstant (Banas & Rains, 2010). Scholars have found effective conferences when an experimental threat is given months afterward (Pfau & Burgoon, 1988), days afterward (McGuire, 1964), and immediately afterward (Nabi, 2003). A meta-analysis revealed that there is very little difference in effectiveness across different times when the delays are within 13-days of treatment, however, there is a decay effect that begins to occur after this period (Banas & Rains, 2010). This supports a treatment that employs an immediate application while still demonstrating sustained resistance to future attitude persuasion (Banas & Rains, 2010).

Inoculation theory has been demonstrated to be effective in both reinforcing already held beliefs and converting opposing views (Banas & Rains, 2010). Although support for this dual effect has been shown, it is not a fully equitable one. Inoculation treatments have stronger effects on participants who already agree with the overarching

intention of the treatment. Put differently, a participant will be more positively responsive to the inoculation if it fits within their already held beliefs. When a participant holds a belief that is inconsistent with the inoculation treatment or is being inoculated against, then they will be affected by the inoculation treatment to a lesser degree. There is a greater chance that the inoculation will fail in this situation, however, such instances still often result in conferences consistent with the inoculation treatment. This supports the use of inoculation treatments on samples containing varied opinions related to the tested material.

Various health campaigns have used inoculation theory as their central mechanism (Banas & Rains, 2010; Compton et al., 2016), with focuses including underage alcohol consumption (Donaldson et al., 1997; Duryea, 1983; Godbold & Pfau, 2000), drug use (Compton & Pfau, 2005; Donaldson, 1995), and eating disorder prevention (Austin, 2000; Clear, 2019; Killen, 1996) as well as larger public safety concerns like avoiding induction into gangs (Breen & Matusitz, 2009; Compton & Pfau, 2005) and driving safely (Gidron et al., 2015). One area that has seen limited application is for the containment of viruses, with prior studies only focusing on sexually transmitted infections (Olley et al., 2011) rather than more broadly against contagions. This study will add to the body of research by addressing a new context wherein inoculation theory can be utilized.

H1: Individuals who receive an inoculation treatment will report a greater willingness to follow recommended safety guidelines, compared to those not exposed to the inoculation.

H2: Individuals who receive an inoculation treatment will report more accurate beliefs regarding COVID-19, compared to those not exposed to the inoculation.

Psychological Reactance and Message Reactance

To better understand why there has been resistance to COVID-19 restrictions, it is important to reflect upon the theory of psychological reactance. Reactance theory proposes that individuals feel entitled to certain freedoms (Brehm, 1966). When the individual feels said freedoms are threatened or oppressed, they will be motivated to restore them (Brehm, 1966; Brehm, 1989). Psychological reactance has also come to describe an individual's disposition toward authority, authority figures, and perceptions of autonomy violations (Hong & Page, 1989). Health messages may face reactance from viewers, as the viewer may interpret the message as a threat against their freedoms (Dillard & Shen, 2005; Rains & Turner, 2007; Richards & Banas, 2015). This may explain why many health campaigns fail to produce results (Blondel et al., 2012) or produce results that are directly opposed to the intention of the campaign (Foxcraft et al., 1997; Guttman et al., 1996).

To better understand this boomerang effect, the intertwined-process cognitive-affective model was developed (Dillard & Shen, 2005; Rains & Turner, 2007). This model builds on previous models and proposes that reactance occurs through the interaction of a viewer's cognition and affect upon viewing a persuasive health message. Cognition, in the intertwined model, is representative of negative thoughts that occur as a result of message reception. The viewer compares the information of the message to their existing knowledge and then develops one of three cognitive outcomes. The potential outcomes will either be agreeable, disagreeable, or neutral (Rains & Turner, 2007).

Affect, in the intertwined model, is representative of anger as a specific response to the health message. Anger has been isolated in this model as it represents a negative emotion that involves a guilty party other than the individual (Dillard & Shen, 2005; Lazarus, 1991; Rains & Turner, 2007). Using measures developed by Hong and Page (1989), this study will seek to identify whether psychological reactance can serve an explanatory function in an inoculation treatment. If the inoculation treatment fails, psychological reactance can be examined to identify whether the failure was due to perceived autonomy violations or negative dispositions toward perceived authority.

Inoculation has been demonstrated to be an effective reactance-reducing agent (Richards & Banas, 2015; Richards & Banas, 2018; Richards et al., 2017). In these cases, inoculation messages were given to participants to forewarn the potential for reactance to occur after receiving a subsequent health message. Using inoculation messages to forewarn participants of reactance is largely seen as effective (Richards & Banas, 2015), however, the construction of the inoculation message and persuasive health message appear to play superordinate roles in the occurrence of reactance (Amazeen, 2020; Richards & Banas, 2018; Richards et al., 2017).

To account for these considerations, a limited inoculation message forewarning potential reactance (Richards & Banas, 2015; Richards et al., 2017) will be incorporated into the inoculation treatment. Message reactance will be measured to quantifiably show whether participants felt reactance specifically toward the inoculation treatment, as is illustrated in Figure 1.

H3: Message reactance will mediate the effects of the inoculation, such that greater reactance will result in a lower likelihood of an individual following safety guidelines.

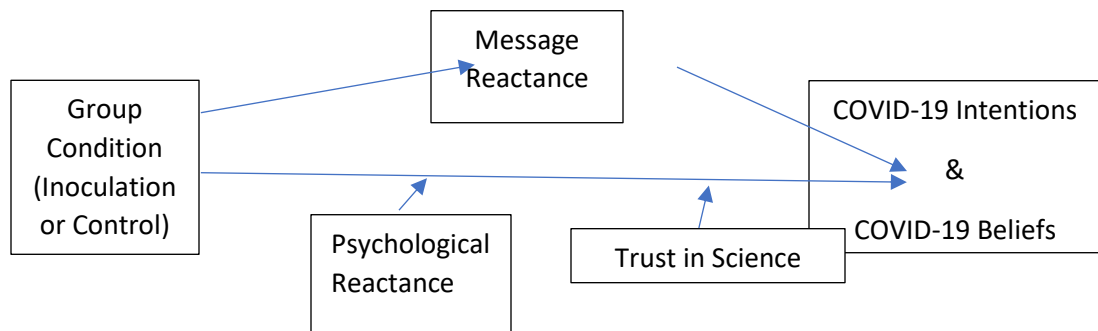


Figure 1: Diagram depicting mediation and moderation conditions.

An additional concern is whether the reactance a participant feels toward the inoculation message may impact their beliefs regarding COVID-19 (see Figure 1). The potential exists for an interaction to occur wherein the participant feels such strong message reactance that a boomerang effect occurs (Dillard & Shen, 2005). Since the focus of the inoculation intervention is to reinforce accurate safety behaviors and beliefs, such boomeranging may result in participants reporting inaccurate beliefs about COVID-19.

H4: Message reactance will mediate the effects of the inoculation, such that greater message reactance will result in a greater likelihood of an individual to report inaccurate beliefs regarding COVID-19.

Expanding upon this, the baseline psychological reactance of participants will be examined. An individual will likely experience reactance toward a persuasive message, but this study seeks to examine the individual's general likelihood to react against authority and autonomy threats. Individuals who have higher psychological reactance will be less likely to accept direction from a perceived authority source. It could be assumed that participants with sufficiently high psychological reactance will not follow messaging aimed at spurring them to act, even when the message has been consciously designed to circumvent such opposition (see Figure 1). For this reason, the psychological reactance of participants will be tested to identify probable reasons behind the potential failure of the inoculation message.

H5: Psychological reactance will moderate the effects of the inoculation, such that greater reactance will reduce the individual's willingness to follow recommended safety guidelines.

H6: Psychological reactance will moderate the effects of the inoculation, such that greater reactance will reduce the individual's reported accuracy in COVID-19 beliefs.

Trust in Science

Science, by its very nature, is an ongoing process. A central tenet of science requires scientists to utilize the best available data to test explanations (Nadelson & Hardy, 2015). This causes shifts to occur in accepted scientific explanations. New data become available, replication studies are conducted, and methods become more accurate, all thereby increasing the explanatory power of science (Nadelson & Hardy, 2015).

However, individuals may interpret these shifts in scientific explanations as indicating a lack of competency in scientists. This may extend into the belief that science is flawed, in turn leading to a lack of trust in science and scientists (Nadelson & Hardy, 2015).

Scientific research is the foundation of successful health campaigns. Trust in science has been identified as an important factor for health campaigns to see wide success (Nadelson & Hardy, 2015). Also, the general trust in the expertise of scientists has been demonstrated to be a significant factor in compliance with health campaigns (Nadelson et al., 2014). Individuals who do not trust science or scientists will be less likely to abide by the messages of such campaigns.

This difficulty in maintaining the public's trust in science is not a new challenge (Haerlin & Parr, 1999), though recent tensions have made this task harder (Eichengreen et al., 2021; Gauchat, 2012; Hendriks et al., 2016; Master & Resnik, 2013; Samet et al., 2017; Thorp, 2020). This increased divide partly reflects the politicization of science, the role that corporate scientists have played in policy discourse, and heightened public discourse surrounding biotechnology. As such, modern health campaigns must work to identify ways to foster trust in science or to circumvent the inherent opposition the campaign will face.

The coronavirus pandemic exemplifies the importance of the public's trust in science and scientists. Nejc Plohl and Bojan Musil (2020) found that an individual's trust in science could predict their compliance with COVID-19 safety recommendations. Thus, an individual's trust in science may moderate the effects of any treatment aimed at increasing compliance with preventative guidelines (see Figure 1).

H7: Trust in science will moderate the effects of inoculation, such that greater trust will magnify any such effects on willingness to follow recommended safety guidelines.

The degree of trust that participants place in science may impact their beliefs regarding COVID-19, as well. If participants have a high level of trust in science, they will presumably understand plausible causes behind COVID-19 and recognize false assertions.

H8: Trust in science will moderate the effects of inoculation, such that greater trust will magnify accuracy in beliefs regarding COVID-19.

Chapter 3

METHODS

Participants

This study recruited a sample of 187 participants from a pool at a major Mid-Atlantic university. Of these, 31 participants were excluded from analysis for failing an attention check, leaving a valid sample of 156 participants. Participants who were currently enrolled in a university were employed to better equalize the education level of participants. Participants participated in this experiment using the SONA system, wherein participants may engage in multiple studies, are unaware of who the principal investigators are, and are protected with anonymity through their SONA account. Individuals were rewarded with extra credit in an undergraduate communication course for participating in the study. Education level has been demonstrated to be a relevant factor in an individual's trust in science (Achterberg et al., 2015; Nadelson et al., 2014; Plohl & Musil, 2020). This justifies the use of such a sample to control for participation education.

The majority of participants self-identified as female (71.7%), followed by those who identified as male (27%), those who identified as non-binary (>1%), and those who preferred to not self-report (>1%). Most participants were between the ages of 19 and 22, with the largest proportion of participants reporting an age of 19 years old (28.8%), 22 years old (27.5%), and 21 years old (23.5%). Participants were mostly white (80.4%), followed by Asian (9.1%), Black (6.3%), Hispanic (2.1%), and multiracial (2.1%). Most respondents were somewhat liberal (38.2%), moderate (25.7%), or very liberal (21.1%); relatively few were somewhat conservative (13.8%) or very conservative (1.3%). Self-

reported political affiliation also followed this trend, with 52% of participants reporting affiliation with the Democratic party, 20.4% identifying as independent, 18.4% identifying as Republican, and 9.2% reporting affiliation with a party not listed.

Design and Procedure

This study was conducted online and constructed through Qualtrics. For participants to take this experiment, they had to register through their SONA account which then provided them with a survey link. Participants were randomly divided into one of two groups: a control group or an inoculation group. The control group was comprised of 78 participants and the inoculation group was comprised of 78 participants.

All participants were first met with an informed consent prompt. Upon the acceptance of the informed consent, the participant was shown a message. The control group was shown a brief message summarizing the history of sushi. Sushi was selected as the control message as it is sufficiently disconnected from coronavirus and is the accepted standard control message for inoculation experiments (Banas & Miller, 2012; Banas & Rains, 2010), however, considerations for using this content is further discussed. The inoculation group was shown an inoculation message, which follows:

You are about to read information about today's COVID-19, or coronavirus, pandemic. After reading this information, you might feel that your freedom to act independently is being threatened. However, the facts about the COVID-19 pandemic are clear and quite significant. The suggestions that are proposed to limit the spread and scale of COVID-19 actually make a lot of sense in light of the course the pandemic has taken.

The COVID-19 pandemic has ravaged our world. Every country has been affected by it, over 2,000,000 people have died from it, and undoubtedly you have had to make drastic changes to daily life due to it. Institutions like the Center for Disease

Control (CDC) and the World Health Organization (WHO) have worked tirelessly to spread vital information to help contain the coronavirus pandemic.

Unfortunately, the efforts of the CDC and WHO have been subverted. Groups have circulated unscientific claims and conspiracy theories about COVID-19 that have resulted in the unnecessary deaths of those who believed them.

COVID-19 is real. Viruses like coronavirus are most easily spread when people are near each other, so the belief that COVID-19 is fake does not just put the believer in danger. It is not a matter of personal beliefs or ideologies; it is the endangerment of others.

Viruses can mutate quickly and can have long-term effects. COVID-19 is still being studied and has already mutated into an additional strain, B.1.1.7., that was detected in the United Kingdom last September. We must take personal responsibility for our role in COVID-19 by staying informed with reputable updated from the CDC and WHO. We cannot know how to act if we do not stay informed.

Please wear a mask when you are out. Please stand 6-feet apart from others. Please avoid crowds. Please self-quarantine as much as possible. Please stay up to date with the CDC and WHO so that you can properly respond to any new findings. If we take personal responsibility, we can help to end this pandemic.

The inoculation message was similar in length to the control message. The inoculation message targeted participant reactance toward the actual inoculation message, provided a description of current COVID-19 circumstances, forewarned participants of threats to persuade them, equipped participants with preemptive refutation, and included information intended to provide benefits to readers. The inclusion of anticipatory reactance toward the inoculation message was done in a manner consistent with previous research (Richards & Banas, 2015; Richards & Banas, 2018). The inoculation message included the components for a successful conference of attitude (Banas & Rains, 2010).

The inoculation message was processed using sentiment analysis software to ensure it was positive in tone and strong in its message.

Following the message, participants were given an attention checking question that asked whether they were able to read the previously displayed message. All participants who reported that they could not read the message were excluded from the analysis. Three questions followed to measure reactance to the experimental message. These questions were adapted from Richards and Banas' 2015 study and measured whether the participant felt threatened by the message they read, whether the message violated their autonomy, and whether the message attempted to make a decision for the participant. These items were placed on 5-point Likert-style scales, ranging from Strongly Disagree to Strongly Agree. The index based on this question battery was only somewhat reliable ($\alpha = 0.69$), potentially reflecting the relatively few items contained within it.

Participants also answered a series of 18 questions adapted from Biddlestone et al.'s 2020 study. These questions were constructed as 5-point Likert-style items, ranging from Not Likely to Very Likely, about their intentions within the context of the COVID-19 pandemic (see Appendix A). This battery asked participants how likely they would be to act in ways that have been previously identified as either safe (e.g., washing hands, self-isolating when experiencing flu-like symptoms) or dangerous (e.g., vacationing, hugging loved ones, flying on a plane). This battery was highly reliable ($\alpha = 0.84$).

After this battery came an additional battery, also adapted from the same Biddlestone et al. article, which measured the participant's belief in the COVID-19 pandemic. This battery included 13 questions organized on a 5-point Likert-style scale,

ranging from Strongly Disagree to Strongly Agree, and yielded a reliable index ($\alpha = 0.87$). Participants were asked to identify their level of agreement with statements addressing misbeliefs about COVID-19 (e.g., COVID-19 is a media hoax, COVID-19 was created by an institution for a nefarious purpose, whether they trust the CDC) and personal expectations of COVID-19 (e.g., whether they are worried about contracting COVID-19, whether they are taking the pandemic seriously) (see Appendix B).

To assess the participant's trust in science, participants were asked to complete the Trust in Science and Scientists Inventory (Nadelson et al., 2014), which consisted of 21 5-point Likert-style questions, ranging from Strongly Disagree to Strongly Agree, that measured the participant's level of agreeability across various statements relevant to their trust in science and scientists (see Appendix C). The resulting index was highly reliable ($\alpha = 0.92$).

The final question battery included in the experiment was the Hong's Psychological Reactance Scale (HPRS) (Brown & Finney, 2011; Hong & Page, 1989). The HPRS included 14 items that ask for the participant's level of agreement through a 5-point Likert-style scale, ranging from Strongly Disagree to Strongly Agree. Items measured the psychological reactance of participants by asking their disposition toward perceived autonomy violations and emotions of seeing others submit to authority (see Appendix D). The HRPS yielded a reliable index ($\alpha = 0.82$).

For the analyses, each question battery was used to create an index (see Table 1). Upon completing the HPRS, participants were also asked a few demographic questions. After this, participants were taken to a debrief screen that thanked them for their

participation and asked for their SONA pin number so that they could receive credit while maintaining full anonymity.

<u>Table 1: Means, standard deviations, and alphas for key indices.</u>			
	M	SD	α
Message Reactance	2.68	0.47	0.82
COVID Intention	3.59	0.56	0.74
COVID Belief	4.09	0.68	0.76
Trust in Science	3.84	0.54	0.75
Psych. Reactance	3.35	0.57	0.74

Chapter 4

RESULTS

Before main analyses were conducted, a randomization check was performed to ensure that the composition of the groups was random. A t-test was conducted measuring participant demographics, trust in science, and psychological reactance against their group assignment, returning nonsignificant results. This means that the composition of groups was random, allowing for further analysis. To test Hypothesis 1 and Hypothesis 2, independent-samples t-tests were conducted. The test found no significant differences between the control group ($M = 3.58$; $SD = 0.58$) and the inoculation group ($M = 3.61$; $SD = 0.54$) on COVID-19 intentions ($p = 0.71$; $t = -0.37$; $df = 152$). When testing Hypothesis 2, no significant difference between the control group ($M = 4.09$; $SD = 0.64$) and the inoculation group ($M = 4.08$; $SD = 0.73$) was observed on COVID-19 beliefs ($p = 0.88$; $t = 0.15$; $df = 149$). Across the control and inoculation groups, participants reported similarly high likelihoods to follow suggested safety guidelines and generally high accuracy in COVID-19 information. Possible explanations for this finding are considered in the Discussion.

Linear regression was used to test Hypothesis 3 and Hypothesis 4. A preliminary regression tested the relationship between condition and message reactance. This test found a significant relationship ($\beta = -0.17$; $SE = 0.03$; $p = 0.04$). Given this result, Hypothesis 3 and Hypothesis 4 were further tested by looking at the relationship between message reactance and the outcome variables. The test of whether message reactance influenced COVID-19 behavioral intentions returned nonsignificant results ($\beta = 0.06$; $SE = 0.58$; $p = 0.50$); thus, Hypothesis 3 was not supported. However, the test of Hypothesis

4 returned significant results ($\beta = 0.27$; $SE = 0.50$; $p = <0.001$), consistent with mediation of the condition effect through message reactance to COVID-19 beliefs. An additional regression that included both condition and message reactance found a significant coefficient for message reactance significance ($\beta = 0.27$; $SE = 0.50$; $p = <0.001$) and a nonsignificant coefficient for condition ($\beta = 0.03$; $SE = 1.41$; $p = 0.73$). In sum, these results support Hypothesis 4 and suggest direct mediation.

To test Hypothesis 5 and Hypothesis 6, multiple regression was used. An interaction term for condition x psychological reactance was created to test for moderation. None of the coefficients in the model - psychological reactance ($\beta = 0.44$; $SE = 0.31$; $p = 0.08$), condition ($\beta = 0.42$; $SE = 9.69$; $p = 0.38$), or the interaction term ($\beta = -0.48$; $SE = 0.20$; $p = 0.39$) – was statistically significant for COVID-19 intentions. These results failed to support Hypothesis 5. Hypothesis 6 was tested using the same approach as for Hypothesis 5. As with the previous model, the coefficients in this model for psychological reactance ($\beta = 0.14$; $SE = 0.28$; $p = 0.56$), condition ($\beta = -0.50$; $SE = 8.43$; $p = 0.30$), and the interaction term ($\beta = 0.51$; $SE = 0.18$; $p = 0.35$) all fell short of statistical significance. Thus, the results did not support Hypothesis 6.

Additional multiple regressions tested Hypothesis 7 and Hypothesis 8. For these tests, a new interaction term was created for condition x trust in science. In the model testing whether trust in science moderated the impact of condition on COVID-19 intentions, no significant results effected for trust in science ($\beta = 0.18$; $SE = 0.22$; $p = 0.44$), condition ($\beta = -0.49$; $SE = 11.21$; $p = 0.38$), or the interaction term ($\beta = 0.56$; $SE = 0.14$; $p = 0.36$). In short, the results did not support Hypothesis 7. Hypothesis 8 was tested using a similar model, which revealed a significant and positive coefficient for

trust in science ($\beta = 0.44$; $SE = 0.16$; $p = 0.02$); but not for condition ($\beta = -0.70$; $SE = 8.09$; $p = 0.13$) or the interaction term ($\beta = 0.70$; $SE = 0.10$; $p = 0.16$). Upon these findings, a supplemental linear regression was conducted testing trust in science and COVID-19 beliefs. This linear regression uncovered significant findings ($\beta = 0.69$; $SE = 0.05$; $p = <0.001$). Taken together, these results fail to support Hypothesis 8 but indicate a direct relationship between trust in science and COVID-19 beliefs.

Chapter 5

DISCUSSION

Given the absence of significant findings for Hypotheses 1 and 2, it appears that the central inoculation message did not directly affect the likelihood of participants following COVID-19 safety guidelines more closely, nor did it increase the accuracy of their coronavirus-related beliefs. Potential reasons for this are explored below, though this absence of evidence should not discourage the use of inoculation in such contexts. Additionally, the nonsignificant finding for Hypothesis 3 suggests that reactance elicited by the inoculation message did not alter the behavioral intentions of participants during the COVID-19 pandemic. The lack of support for Hypothesis 3 suggests that respondents felt so strongly about following safety guidelines before the inoculation that they were not likely to change, even when experiencing message reactance. However, the experiment yielded evidence for Hypothesis 4; message reactance impacted the participant's reporting of accurate COVID-19 information. This relationship concurs with prior research on message reactance on a boomerang effect.

Testing the impact of the message reactance experienced by participants uncovered a relationship between what condition a participant was placed in and their beliefs regarding COVID-19. Participants who had higher message reactance reported a greater likelihood of holding inaccurate beliefs about COVID-19. This matches with the past research on message reactance. Participant trust in science garnered a similar relationship, with a direct relationship being found connecting to COVID-19 beliefs. This also matches previous literature; individuals will be more likely to accurately understand health information and be more likely to listen to public health institutions when they

have higher trust in science. Considering these findings, the stable individual differences of participants play a significant role in their acceptance of public health messaging. Although this study tried to capture psychological reactance, no significant findings were uncovered. The failure to find significance is likely due to the composition of the participants. Future studies that use a more diverse sample will likely uncover new relationships. The message reactance that individuals experience impacts their beliefs regarding the subject of the message. The amount of trust that an individual place on scientists and science similarly adjusts their likelihood to comply with health messages and to report accurate beliefs regarding the subject. Additionally, message reactance was shown to impact reported beliefs. This creates areas of consideration when crafting a public health campaign.

Theoretical Implications

This study extended the literature of inoculation theory by demonstrating an instance wherein it did not succeed. Potential reasons behind this shortcoming are discussed further. More research using inoculation theory within this context is needed. If these subsequent studies garner significant results, then inoculation will continue to serve researchers in this area and can be further analyzed. Uncovering usefulness in inoculation theory will benefit practitioners, researchers, and ultimately the public by allowing for more successful public health messaging. If these subsequent studies fail to show significant results for their inoculation treatments, as occurred in this study, then a potential limit of inoculation theory will have been identified. Knowing the limits of a theory or mechanism is key to properly use it. If this context is beyond the limits of inoculation theory, then future researchers can isolate the conditions that make this so.

Since the central inoculation did not produce significant results, this study cannot say whether the secondary inoculation against reactance was successful. As the dual inoculation structure is still new and being further understood, these results should not dissuade its consideration.

Psychological reactance was not found to play a significant role in this study. Though these findings are unfortunate, they may indicate qualities of the sample drawn rather than the experiment administered. The psychological reactance of viewers should be a central concern to message crafters, especially when targeting the general population. The better that a message can circumvent psychological reactance, the more successful and broadly applicable the message will be. It is novel to consider psychological reactance in the context of message design; the testing of new variables will help to create more effective messages. Another novel consideration is the use of inoculation to reduce reactance. It could be found that successful inoculation treatments may mitigate the psychological and message reactance felt by receivers. Although such use would require independent campaigns to test, the findings could be easily applied to unrelated health campaigns.

Trust in science and scientists was found to play a role in the accuracy of participant COVID-19 beliefs. This finding matches previous findings within the literature and reinforces the connection within this context. Though this finding seems expected, it offers insight to researchers and helps to direct conversation. The complex nature of fostering trust in science offers the clear benefit of fostering a more aware public, something that is critical during a pandemic. Scientists and activists can use this replication as a directive to increase trust in science and scientists. Interventions within

the education system would be a probable stem to address this, though opinion leaders and the general population should also be considered. The higher trust in science the public holds, the more accurate their understanding of public health issues should be.

Practical Implications

Given the lack of significance for H1 and H2, this study cannot suggest the immediate use of inoculation for COVID-19 centered campaigns. This does not rule out the possibility for inoculation theory to serve utility in future health campaigns, but further testing is required for a responsible endorsement to be made. Inoculation has worked in previous health contexts, but the issues surrounding COVID-19 may exceed the utility of inoculation theory. For topics less central to the public's eye, inoculation theory may garner greater success. However, the effects of message reactance have shown immediate relevance.

A direct relationship was found between message reactance and the accuracy of participant COVID-19 beliefs. This matches with findings within the literature but is an important replication for this context. This mediation reinforces the importance of successful messaging. Beyond this, this finding highlights the potential for a health message to incur an effect that runs opposite to the intention of the message. Message reactance must be centrally considered by practitioners when crafting messages. To reduce the chance of inducing message reactance in receivers, the wording of the message should be closely examined, pretested, and processed with sentiment analysis software. Crafters should also practice empathy to try to see from the perspective of receivers, both generally and for target groups. Language should be open and simple to reduce the risk of message reactance. The better that a message can make a receiver think

that the idea was their own, the less message reactance the receiver will feel. Activating the autonomy of receivers, but directing them toward positive outcomes, should be a goal of public health campaigns. Additionally, multiple messages that contain different wording or content could be used. This approach has been utilized in previous public health campaigns and current messaging centered on COVID-19.

Limitations

One limitation of this study is the composition of its sample. Every participant was currently pursuing a bachelor's degree. Although this was intentionally done to control for participant education level, a sample containing varied education levels may help to illuminate potentially unidentified correlations. Another limitation reflecting the lack of variance in participant education level is a probable augmentation of their trust in science and scientists. Currently enrolled college students may hold atypically high levels of trust in science and scientists. This could be attributed to the fact that college students have made a financial investment and time commitment to pursue higher education. An additional limitation of the sample is the relative homogeneity of participants. The average participant was a White female between the ages of 19 and 22. Although the findings of this study are still generalizable, a sample more representative of the population would be beneficial.

Participants answering questions in socially desirable ways may have occluded relationships. Although social desirability bias is a common limitation of self-report measures, this study faced the additional lens of prominent COVID-19 safety messaging. The university where participants were attending has conducted comprehensive information and awareness campaigns regarding COVID-19 safety since the spring of

2020. This means that every participant was acutely aware of what behavior guidelines they were expected to follow (e.g., maintaining a 6-foot distance from others, self-quarantining when exposed to coronavirus). This may be indicative of participants responding in socially desirable ways, in that they knew what they were expected to say rather than being honest in their responses.

Another limitation of this study is that there was no test of an anti-mask message. Although it is common in inoculation experiments to test conference by exposing participants to a persuasive message, this study elected to use a post-test model. The reasoning behind this was to mitigate the chance of directing participants into unsafe behaviors, to more clearly test reactance induced by the inoculation treatment, to provide participants with a parsimonious survey, and to more clearly identify whether the psychological reactance of participants was a relevant confounding factor that was activated by the inoculation treatment. Since there was not a tested persuasive message, the conference of participants was measured in a comparatively limited capacity.

A potential consideration of this experiment was the choice of the control message. The use of a sushi-related control message has been an accepted norm of inoculation research, but there is the possibility that the use of this message could have primed or otherwise influenced participants. Given the prominence of anti-Asian bigotry during the pandemic, a message focusing on a traditional Japanese dish may have primed participants in an unforeseen way. However, this is unlikely given the lack of significant findings associated with the central inoculation message. Still, the testing and validation of new and different control messages may help to grow the utility of inoculation theory. One limitation of the inoculation treatment is the lack of pretesting behind its wording.

Although the message contained the necessary components of an inoculation message and was processed with sentiment analysis software, the lack of a traditional pretest may have hindered the success of the overall inoculation treatment. In covering numerous concepts and tested components in the inoculation message, participants may have been somewhat overwhelmed. This may explain the lack of significance associated with the central inoculation. Another limitation of the inoculation was that there were no booster treatments. Booster treatments entail a similar but reduced message that closely follows the central inoculation message and comes after the initial treatment. Had this study utilized booster treatments, different nuances may have been exposed.

A macro-scale limitation of this study is the timing of data collection. Participant responses were taken during March 2021; this timing could have hindered the effects of an inoculation treatment. By this time, participants had been overexposed to COVID-19 and safety guidelines. Participants had time to form their own opinions regarding the safety guidelines and had been living through a pandemic for a year, meaning they had also developed their own behaviors during the pandemic. An inoculation treatment is most effective when the participant is not overly familiar with the tested topic. This timing may explain why the inoculation treatment failed to produce significant differences. Adjacent to the issue of timing is the increased politicization of science and COVID-19 that occurred throughout 2020 into 2021. Due to numerous factors, public discussion of the pandemic became infused with politics such that acts like wearing a mask, or choosing not to, became political statements. This discourse has shifted with the availability and use of COVID-19 vaccines, but such treatments were limited during data collection. The politicization of COVID-19 likely altered the effectiveness of the central

inoculation message. Different results would have likely been uncovered had data collection occurred earlier in 2020.

A consideration regarding the question batteries is the use of indices for analysis. Given that the indices were used in their entirety, the potential remains for secondary analysis to uncover different results if the analysis is conducted item by item, without measures that do not directly mirror actual safety guidelines, or if less reliable items were removed. Finally, the battery used to test message reactance contained fewer items than all other question batteries. The battery yielded a somewhat reliable index, but it is possible that including more items would have enhanced its reliability. The addition of new items to make the message reactance battery more like the others would have involved the creation and validation of more items than had previously been used in research. As the focus of this study was not the creation of a message reactance scale, it was decided to only borrow existing measures. This leaves the opportunity for future researchers to construct a scale measuring message reactance more robustly.

Directions for Future Research

Contagions are an inevitable problem that society will have to address over time. As such, medical and public health practitioners must be prepared to conduct research on new outbreaks and launch information campaigns to help protect the public. Given the stakes associated with pandemics and epidemics, it is important to test new strategies to create stronger and more effective campaigns. Pilot studies that adjust minor components of proven methods are essential in identifying best practices. Changing methodological aspects, such as inoculating against message reactance, and seeking to identify and replicate relevant audience factors, such as psychological reactance and trust in science,

are preliminary steps toward better health campaigns. Researchers should continue to test such adjustments, as this work will provide great benefits to the public.

Inoculation theory has been a high-yield component for health campaigns, and it can continue to provide great utility for future campaigns. Further testing of a dual inoculation model that aims to reduce reactance created by the main inoculation message may benefit the literature and future campaigns. This extension of inoculation theory could fundamentally strengthen its utility and versatility. Inoculation researchers should continue to test this addition in future experiments.

Trust in science and scientists has been demonstrated to be a critical factor in an individual's perception of the COVID-19 pandemic. These findings reinforce previous research emphasizing the importance of trust in science and scientists. Beyond the current pandemic, trust in science and scientists is an important characteristic for the public to possess. Scientists and researchers must actively engage the public in scientific matters to help foster greater trust. Although disciplines recognize their inherent distinctions, the public is unlikely to do so. No matter the field, scientific work must be translatable to be understood by nonscientists. The use of open-source publications and the creation of less technically worded copies can help to provide nonscientists with access to research, potentially increasing their trust. Additionally, education campaigns to promote science are invaluable in fostering continued trust. Researchers should recognize the impact their work holds and try to engage the public to foster trust and beneficial discourse.

The psychological reactance of individuals plays a clear role in the success of public health campaigns. As such, researchers should experiment with different styles of campaigns to test for more effective messaging. Specifically, messages that mitigate

feelings of autonomy violations may help circumvent the psychological reactance of individuals. The more practitioners can prevent a potential autonomy violation, the more widely effective their campaign should be. Given that no direct moderation was uncovered in this analysis, more extensive measures could be used to study such reactance. Pilot studies could help more clearly identify the role that psychological reactance plays in the context of health campaign acceptance and accuracy of health knowledge.

A relevant finding of this study was the seemingly unmotivated nature of participants to follow the CDC and WHO guidelines that they believed to be credible and trustworthy. If individuals who trust science and scientists are not sufficiently motivated to comply with safety guidelines, then focus must be placed on how to help motivate them. Although the length of the pandemic could be seen as a factor in this lack of motivation, researchers must work to identify potential solutions. Working to motivate the public to act under safety guidelines is a critical task given the stakes of COVID-19. People who already trust science and scientists are showing difficulty in following their suggestions; people who do not trust science and scientists are even less likely to follow guidelines. In the context of contagions, it is important to motivate the public to act accordingly to resolve the virus more quickly. To this end, identifying ways to better motivate the public may be more critical to the success of health campaigns than a more general bolstering of their trust in science.

REFERENCES

- Achterberg, P., Koster, W. D., & Waal, J. V. D. (2015). A science confidence gap: Education, trust in scientific methods, and trust in scientific institutions in the United States, 2014. *Public Understanding of Science*, 26(6), 704-720.
- Amazeen, M. A. (2020). Resisting covert persuasion in digital news: Comparing inoculation and reactance in the processing of native advertising disclosures and in article engagement intentions. *Journalism & Mass Communication Quarterly*. <https://doi.org/10.1177/1077699020952131>
- Austin, S. B. (2000). Prevention research in eating disorders: Theory and new directions. *Psychological Medicine*, 30(6), 1249-1262.
- Banas, J. & Miller, G. (2012). Inducing resistance to conspiracy theory propaganda: Testing inoculation and meta-inoculation strategies. *Human Communication Research*, 40, 1-24.
- Banas, J., & Rains, S. (2010). A meta-analysis of research on inoculation theory. *Communication Monographs*, 77(3), 281-311.
- Biddlestone, M., Green, R., & Douglas, K. M. (2020). Cultural orientation, power, belief in conspiracy theories, and intentions to reduce the spread of COVID-19. *British Journal of Social Psychology*, 59(3), 663-673. <https://doi.org/10.1111/bjso.12397>
- Blondel, B., Mahjoub, N., Drewniak, N., Launay, O., & Goffinet, F., (2012). Failure of the vaccination campaign against A(H1N1) influenza in pregnant women in France: Results from a national survey. *Vaccine*, 30(38), 5661-5665.
- Breen, G. M., & Matusitz, J. (2009). Preventing youths from joining gangs: How to apply inoculation theory. *Journal of Applied Security Research*, 4(1), 109-128.
- Brehm, J. W. (1966). *A theory of psychological reactance*. Academic Press.
- Brehm, J. W. (1989). *Psychological reactance: Theory and application*. in Thomas K. Srull (ed.). *Advances in consumer research*, Vol. 16, p. 71-75. UT: Association for Consumer Research.
- Brown, A. R. & Finney, S. J. (2011). Low-stakes testing and psychological reactance: Using the Hong psychological reactance scale to better understand compliance and non-compliant examinees. *International Journal of Testing*, 11(3), 248-270. <https://doi.org/10.1080/15305058.2011.570884>
- Burgoon, M., Miller, M., Cohen, M., & Montgomery, C. L. (1978). An empirical test of a model of resistance to persuasion. *Human Communication Research*, 5(1), 27-39.
- Center for Disease Control (CDC). 2020 March 1). Get your community ready: Interim guidance for COVID-19. CDC. Retrieved from <https://www.cdc.gov/coronavirus/2019-ncov/php/open-america/public-health-communicators-get-your-community-ready.html>

- Center for Disease Control (CDC). (2020 October 28). Ways COVID-19 spreads. CDC. Retrieved from <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html>
- Clear, S. E. (2019). *Inoculation theory: A dual-route framework and an application to health behaviour* [Unpublished doctoral dissertation]. The University of Western Australia School of Human Sciences.
- Compton, J. & Pfau, M. (2005). Inoculation theory of resistance to influence at maturity: Recent progress in theory development and application and suggestions for future research. *Annals of the International Communication Association*, 29, 97-146.
- Compton, J., Jackson, B., & Dimmock, J. (2016). Persuading others to avoid persuasion: Inoculation theory and resistant health attitudes. *Frontiers in Psychology*, 7.
- Dillard, J. P., & Shen, L. (2005). On the nature of reactance and its role in persuasive health communication. *Communication Monographs*, 72(2), 144-168.
- Donaldson, S. I. (1995). Peer influence on adolescent drug use: A perspective from the trenches of experimental evaluation research. *American Psychologist*, 50(9), 801-802.
- Donaldson, S. I., Graham, J. W., Piccinin, A. M., & Hasen, W. B. (1997). *Resistance-skills training and onset of alcohol use: Evidence for beneficial and potentially harmful effects in public schools and in private Catholic schools*. In G. A. Marlatt & G. R. VandenBos (Eds.), *Addictive behaviors: Readings on etiology, prevention, and treatment* (p. 215-238). (Reprinted from "Health Psychology," 14, 1995, pp. 291-300) American Psychological Association.
- Duryea, E. J. (1983). Utilizing tenets of inoculation theory to develop and evaluate a preventive alcohol education intervention. *Journal of School Health*, 53(4).
- Eichengreen, B., Aksoy, C. G., & Saka, O. (2021). Revenge of the experts: Will COVID-19 renew or diminish public trust in science? *Journal of Public Economics*, 193, 104343. <https://doi.org/10.1016/j.jpubeco.2020.104343>
- Foxcraft, D. R., Lister-Sharp, D., & Lowe, G. (1997). Alcohol misuse prevention for young people: A systematic review reveals methodological concerns and lack of reliable evidence of effectiveness. *Addiction*, 92, 531-537.
- Gauchat, G. (2012). Politicization of science in the public sphere: A study of public trust in the United States, 1974 to 2010. *American Sociological Review*, 77(2), 167-187. <https://doi.org/10.1177/0003122412438225>
- Gidron, Y., Slor, Z., Toderas, S., Hertz, G., & Friedman, S. (2015). Effects of psychological inoculation on indirect road hostility and simulated driving. *Transportation Research Part F: Traffic Psychology and Behavior*, 30, 153-162.
- Godbold, L. C., & Pfau, M. (2000). Conferring resistance to peer pressure among adolescents: Using inoculation theory to discourage alcohol use. *Communication Research*, 27(4), 411-437.
- Guttman, N., Kegler, M., & McLeroy, K. R. (1996). Health promotion paradoxes, antinomies, and conundrums. *Health Education Research, Theory, and Practice*, 11.
- Haerlin, B., & Parr, D. (1999). How to restore public trust in science. *Nature*, 400(499).

- <https://doi.org/10.1038/22867>
- Hendriks, F., Kienhues, D., & Bromme, R. (2016). Trust in science and the science of trust. In: Blöbaum B. (eds) *Trust and Communication in a Digitized World*. Progress in IS. Springer, Cham. https://doi.org/10.1007/978-3-319-28059-2_8
- Hollingsworth, H., Forster, N., & Noveck, J. (2020, September 25). Virus cases rise in US heartland, home to anti-mask feelings. *Associated Press*. Retrieved from <https://apnews.com/article/virus-outbreak-iowa-new-york-city-new-york-michael-brown-050ddaa249c97c222d4fd2f1460dbd94>
- Hong, S. M., & Page, S. (1989). A psychological reactance scale: Development, factor structure and reliability. *Psychological Reports*, 64(3), 1323-1326. <https://doi.org/10.2466/pr0.1989.64.3c.1323>
- Ivanov, B., Rains, S. A., Geegan, S. A., Vos, S. C., Haarstad, N. D., & Parker, K. A. (2017). Beyond simple inoculation: Examining the persuasive value of inoculation for audience with initially neutral or opposing attitudes. *Western Journal of Communication*, 81(1), 105-126.
- Killen, J. D. (1996). Development and evaluation of a school-based eating disorder symptoms prevention program. In L. Smolak, M. P. Levine, R. Striegel-Moore (Eds.), *The developmental psychopathology of eating disorders: Implications for research, prevention, and treatment* (pp. 313-339). Psychology Press.
- Landsverk, G. (2020, October 8). Why Trump's illness probably won't persuade anti-maskers to take the coronavirus seriously. *Business Insider*. Retrieved from <https://www.businessinsider.com/why-anti-maskers-ignore-risks-after-trumps-covid-19-diagnosis-2020-10>
- Lazarus, R. S. (1991). Progress on a cognitive-motivational-relational theory of emotion. *American Psychologist*, 46(8), 819-834.
- Lovelace Jr., B. (2020, June 4). CDC is worried Americans aren't following its advice as the number of U.S. coronavirus cases continues to rise. *CNBC*. Retrieved from <https://www.cnbc.com/2020/06/04/coronavirus-cdc-is-worried-americans-arent-following-its-advice-as-us-cases-continue-to-rise.html>
- Master, Z., & Resnik, D. B. (2013). Hype and public trust in science. *Science and Engineering Ethics*, 19, 321-335. <https://doi.org/10.1007/s11948-011-9327-6>
- McGuire, W. J. (1961). The effectiveness of supportive and refutational defenses in immunizing and restoring beliefs against persuasion. *Sociometry*, 24(2), 184.
- McGuire, W. J. (1964). Inducing resistance to persuasion: Some contemporary approaches. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 1, pp. 191-229). New York, NY: Academic Press.
- McGuire, W. J., & Papageorgis, D. (1961). The relative efficacy of various types of prior belief defense in producing immunity against persuasion. *Journal of Abnormal and Social Psychology*, 62(2), 327-337.
- Miller, C. H., Ivanov, B., Sims, J., Compton, J., Harrison, K. J., Parker, K. A., Parker, J.

- L., & Averbeck, J. M. (2013). Boosting the potency of resistance: Combining the motivational forces of inoculation and psychological reactance. *Human Communication Research*, 39(1), 127-155.
- Miller, C. H., Massey, Z. B., & Ma, H. (2020). Psychological reactance and persuasive message design. In H. D. O'Hair, M. J. O'Hair, E. B. Hester, & S. Geegan (Eds.), *The handbook of applied communication research* (Ch. 27). John Wiley & Sons, Inc.
- Nabi, R. L. (2003). Feeling resistance: Exploring the role of emotionally evocative visuals in inducing inoculation. *Media Psychology*, 5, 199-223.
- Nadelson, L., & Hardy, K. (2015). Trust in science and scientists and the acceptance of evolution. *Evolution: Education and Outreach*, 8(1), 9.
- Nadelson, L., Jorcyk, C., Yang, D., Smith, M. J., Matson, S., Cornell, K., & Husting, V. (2014). I just don't trust them: The development and validation of an assessment instrument to measure trust in science and scientists. *School Science and Mathematics*, 114(2), 76-86. <https://doi.org/10.1111/ssm.12051>
- Olley, B., Abbas, M., & Gidron, Y. (2011). The effects of psychological inoculation on cognitive barriers against condom use in women with HIV: A controlled pilot study. *SAHARA-J: Journal of Social Aspects of HIV/AIDS*, 8(1).
- Pfau, M., & Burgoon, M. (1988). Inoculation in political campaign communication. *Human Communication Research*, 15, 91-111.
- Plohl, N., & Musil, B. (2020). Modeling compliance with COVID-19 prevention guidelines: The critical role of trust in science. <https://doi.org/10.31234/osf.io/6a2cx>
- Rains, S. A., & Turner, M. M. (2007). Psychological reactance and persuasive health communication: A test and extension of the intertwined model. *Human Communication Research*, 33(2).
- Richards, A. S. & Banas, J. A. (2015). Inoculating against reactance to persuasive health messages. *Health Communication*, 30(5), 451-460. <https://doi.org/10.1080/10410236.2013.867005>
- Richards, A. S., & Banas, J. A. (2018). The opposing mediational effects of apprehensive threat and motivational threat when inoculating against reactance to health promotion. *Southern Communication Journal*, 83(4), 245-255.
- Richards, A. S., Banas, J. A., & Magid, Y. (2017). More on inoculating against reactance to persuasive health messages: The paradox of threat. *Health Communication*, 32(7), 890-902.
- Samet, J. M., Burke, T. A., & Goldstein, B. D. (2017). The Trump administration and the environment: Heed the science. *The New England Journal of Medicine*, 376, 1182-1188. [10.1056/NEJMms1615242](https://doi.org/10.1056/NEJMms1615242)
- Thorp, H. H. (2020). Trump lied about science. *Science*, 369(6510), 1409. [10.1126/science.abe7391](https://doi.org/10.1126/science.abe7391)
- Walensky, R. P., & del Rio, C. (2020). From mitigation to containment of the COVID

-19 pandemic: Putting the SARS-CoV-2 genie back in the bottle. JAMA, 323(19), 1998-1890. doi:10.1001/jama.2020.6572

World Health Organization (WHO). (2021) Timeline: WHO's COVID-19 response. *WHO*.

Retrieved from <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/interactive-timeline#>

Appendix A

COVID-19 INTENTION BATTERY

Please indicate how likely you are to engage in the following behaviors in the next month. (1 – Not Likely, 2 – Somewhat Likely, 3 – Not Sure, 4 – Likely, 5 – Very Likely)

1. Wash your hands after using the toilet.
2. Wash your hands after every outing.
3. Wash your hands before eating.
4. Use hand sanitizer frequently when in public.
5. Remain at least 6-feet away from other people.
6. Scratch an itch on your face while in public. (Reverse coded)
7. Shake someone's hand to greet them. (Reverse coded)
8. Hug a friend or loved one to greet them. (Reverse coded)
9. Kiss a friend or loved one. (Reverse coded)
10. Isolate yourself for at least 1-week if you show even mild cold or flu symptoms.
11. Isolate yourself for at least 1-week if you know you have been in contact with someone with Coronavirus.
12. Attend a social gathering. (Reverse coded)
13. Board a flight in order to attend the funeral of a loved one. (Reverse coded)
14. Wear a mask when in public.
15. Check the Center for Disease Control (CDC) or the World Health Organization (WHO) for updates to their safety guidelines.
16. Eat at a sit-in restaurant. (Reverse coded)
17. Go on a vacation that does not require significant travel. (Reverse coded)
18. Go on a vacation that requires significant travel. (Reverse coded)

Appendix B

COVID-19 BELIEF BATTERY

Please indicate your agreement with the following statements. (1 – Strongly Disagree, 2 – Disagree, 3 – Not Sure, 4 – Agree, 5 – Strongly Agree)

1. I take COVID-19 seriously.
2. A lot of information about COVID-19 is deliberately held back from the public. (Reverse coded)
3. There is a cure for COVID-19, but it is being withheld by the government. (Reverse coded)
4. Coronavirus was created and spread by the CIA. (Reverse coded)
5. Coronavirus was purposefully created in, and released from, a biochemistry lab in Wuhan, China. (Reverse coded)
6. The existence of COVID-19 is a hoax perpetuated by media companies. (Reverse coded)
7. The US government purposefully released COVID-19 into the Chinese population to severely hurt its economic growth. (Reverse coded)
8. Pharmaceutical companies created and released COVID-19 in order to sell their medications and vaccines. (Reverse coded)
9. I am worried about contracting COVID-19.
10. I am worried about spreading COVID-19.
11. I trust the CDC and WHO.
12. The guidelines proposed by the CDC and WHO are not trustworthy. (Reverse coded)
13. Wearing a mask doesn't do much to prevent spreading or contracting COVID-19. (Reverse coded)

Appendix C

TRUST IN SCIENCE AND SCIENTISTS BATTERY

Rank your level of agreement to each of these statements on the scale provided. (1 – Strongly Disagree, 2 – Disagree, 3 – Not Sure, 4 – Agree, 5 – Strongly Agree)

1. When scientists change their mind about a scientific idea it diminishes my trust in their work. (Reverse coded)
2. Scientists ignore evidence that contradicts their work. (Reverse coded)
3. Scientific theories are weak explanations. (Reverse coded)
4. Scientists intentionally keep their work secret. (Reverse coded)
5. We can trust scientists to share their discoveries even if they don't like their findings.
6. Scientists don't value the ideas of others. (Reverse coded)
7. I trust that the work of scientists make life better for people.
8. Scientists don't care if laypersons understand their work. (Reverse coded)
9. We should trust the work of scientists.
10. We should trust that scientists are being honest in their work.
11. We should trust that scientists are being ethical in their work.
12. Scientific theories are untrustworthy. (Reverse coded)
13. When scientists form a hypothesis they are just guessing. (Reverse coded)
14. People who understand science have more trust in science.
15. We can trust science to find the answers that explain the natural world.
16. I trust scientists can find solutions to our major technological problems.
17. We cannot trust scientists because they are biased in their perspectives. (Reverse coded)
18. Scientists will protect each other even when they are wrong. (Reverse coded)
19. We cannot trust scientists to consider ideas that contradict their own. (Reverse coded)
20. Today's scientists will sacrifice the well being of others to advance their research. (Reverse coded)
21. We cannot trust science because it moves too slowly. (Reverse coded)

Appendix D

PSYCHOLOGICAL REACTANCE BATTERY

The following statements concern your general attitudes. Please indicate your level of agreement with each statement. (1 – Strongly Disagree, 2 – Disagree, 3 – Not Sure, 4 – Agree, 5 – Strongly Agree)

1. Regulations trigger a sense of resistance in me.
2. I find contradicting others stimulating.
3. When something is prohibited, I usually think, “That’s exactly what I am going to do.”
4. The thought of being dependent on others aggravates me.
5. I consider advice from others to be an intrusion.
6. I become frustrated when I am unable to make free and independent decisions.
7. It irritates me when someone points out things which are obvious to me.
8. I become angry when my freedom of choice is restricted.
9. Advice and recommendations usually induce me to do just the opposite.
10. I am content only when I am acting of my own free will.
11. I resist the attempts of others to influence me.
12. It makes me angry when another person is held up as a role model for me to follow.
13. When someone forces me to do something, I feel like doing the opposite.
14. It disappoints me to see others submitting to standards and rules.

Appendix E

IRB HUMAN SUBJECTS



Institutional Review Board
2100 Halliken Hall
Newark, DE 19716
Phone: 302-831-2137
Fax: 302-831-2828

DATE: February 25, 2021

TO: Steven Waldorf
FROM: University of Delaware IRB

STUDY TITLE: [1714779-1] COVID-19 Is Real
SUBMISSION TYPE: New Project

ACTION: DETERMINATION OF EXEMPT STATUS
EFFECTIVE DATE: February 25, 2021

REVIEW CATEGORY: Exemption category # (3)

Thank you for your New Project submission to the University of Delaware Institutional Review Board (UD IRB). According to the pertinent regulations, the UD IRB has determined this project is EXEMPT from most federal policy requirements for the protection of human subjects. The privacy of subjects and the confidentiality of participants must be safeguarded as prescribed in the reviewed protocol form.

This exempt determination is valid for the research study as described by the documents in this submission. Proposed revisions to previously approved procedures and documents that may affect this exempt determination must be reviewed and approved by this office prior to initiation. The UD amendment form must be used to request the review of changes that may substantially change the study design or data collected.

Unanticipated problems and serious adverse events involving risk to participants must be reported to this office in a timely fashion according with the UD requirements for reportable events.

A copy of this correspondence will be kept on file by our office. If you have any questions, please contact the UD IRB Office at (302) 831-2137 or via email at irb-research@udel.edu. Please include the study title and reference number in all correspondence with this office.

INSTITUTIONAL REVIEW BOARD

www.udel.edu