

THE EFFECTS OF MESSAGE THREAT/REFLECTION ON PSYCHOLOGICAL
REACTANCE IN TRAFFIC SAFETY MESSAGING

by

Asher Campbell Townsend

A thesis submitted in partial fulfillment
of the requirements for the degree

of

Master of Science

in

Industrial & Management Systems Engineering

MONTANA STATE UNIVERSITY
Bozeman, Montana

May 2020

©COPYRIGHT

by

Asher Campbell Townsend

2020

All Rights Reserved

ACKNOWLEDGEMENTS

I want to acknowledge my committee members Dr. Maria Velazquez Perez, Dr. Brandon Scott, Dr. Frank Marchak, and my advisor Dr. Nic Ward for their patience, feedback, and assistance throughout the process. I am grateful for their support and with it, I was able to complete what was a long journey for me personally, and even though it took longer than anticipated, I made it through. I would also like to acknowledge Jay Otto for his input on the research and study design as it was crucial to have assistance from someone who is currently researching psychological reactance. I also thank him for his assistance in defining and obtaining the necessary quotas for the survey, as well as the preparation of the Qualtrics survey distribution. Lastly, I thank Dr. Nic Ward and the Center for Health and Safety Culture for funding the research project and making this possible.

TABLE OF CONTENTS

1. UNDERSTANDING BEHAVIOR AND THE HISTORY OF PSYCHOLOGICAL REACTANCE	1
Introduction.....	1
Investigating and Understanding Psychological Reactance	2
Defining Psychological Reactance	3
Reactance and Persuasive Messaging.....	4
Message and Solution Acceptance.....	7
2. PSYCHOLOGICAL REACTANCE AND DRIVING BEHAVIOR.....	9
Reactance and Standard Measures of Risky Driving Behavior	9
Risky Driving Behaviors.....	9
Seat Belt Use.....	10
Distracted Driving.....	11
3. MEASURING PSYCHOLOGICAL REACTANCE	14
A Unidimensional Measure of Psychological Reactance	14
Hong Psychological Reactance Scale	14
4. METHODS OF INVESTIGATION FOR REACTANCE AND MESSAGING	17
Methodology.....	17
Participants & Sample.....	17
Location	17
Approval	17
Purpose.....	17
Hypotheses.....	18
Procedure	19
Methods/Measures	19
Questionnaires.....	19
Reactance Proneness.....	19
Message Threat/Reflection	20
Psychological Reactance Experienced.....	21
Analysis Plan	21
5. ANALYSIS OF MESSAGE THREAT/REFLECTION, REACTANCE, AND PRONENESS	22

TABLE OF CONTENTS CONTINUED

Results.....	22
Sample Size and Demographics.....	22
Reliability.....	22
Correlates of Proneness.....	23
Analysis of Message Factors (ANCOVA): Seat Belt Use.....	25
Reactance Attitude.....	25
Emotional Reactance Experienced.....	26
Threat to Freedom.....	27
Analysis of Message Factors (ANCOVA): Distracted Driving.....	28
Reactance Attitude.....	28
Emotional Reactance Experienced.....	29
Threat to Freedom.....	30
 6. DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS.....	 32
Discussion.....	32
Reactance Attitude.....	32
Emotional Reactance.....	34
Threat to Freedom.....	36
Issues with the Seat Belt Messages.....	37
Message Threat Manipulation.....	39
Message Reflection Manipulation.....	39
Future Research Considerations and Improvements.....	40
Conclusions and Recommendations.....	43
Contributions to Existing Field of Research.....	43
Recommendations and Research Synopsis.....	44
 REFERENCES CITED.....	 47
 APPENDICES.....	 50
APPENDIX A: Demographic Questionnaire – Adapted from Dula (2003).....	51
APPENDIX B: Hong Psychological Reactance Scale.....	57
APPENDIX C: Seat Belt and Distracted Driving Message Sets.....	59
APPENDIX D: Psychological Reactance Measures Questionnaire.....	61
APPENDIX E: Pilot Study.....	63
APPENDIX F: Dula Dangerous Driving Index (©1999, DULA, C.S.).....	71

LIST OF TABLES

Table	Page
1. Scale Reliabilities.....	23
2. Seat Belt Message Correlations	24
3. Distracted Driving Message Correlations.....	25
4. Descriptive Statistics – Seat Belt Reactance Attitude.....	25
5. Descriptive Statistics – Seat Belt Emotional Reactance	26
6. Parameter Estimates – Seat Belt Emotional Reactance	27
7. Descriptive Statistics – Seat Belt Threat to Freedom	27
8. Parameter Estimates – Seat Belt Threat to Freedom	28
9. Descriptive Statistics – Distracted Driving Reactance Attitude	28
10. Descriptive Statistics – Distracted Driving Emotional Reactance.....	29
11. Parameter Estimates – Distracted Driving Emotional Reactance.....	30
12. Descriptive Statistics – Distracted Driving Threat to Freedom	30
13. Parameter Estimates – Distracted Driving Threat to Freedom	31

LIST OF FIGURES

Figure	Page
1. Language types and reactions	5
2. Intertwined Process Model	15
3. Model of relationship(s) between message, proneness, and reactance	16

ABSTRACT

Psychological reactance is a motivation to regain a freedom after it has been lost or threatened, which has led people to largely resist the social influence of others (Steindl et al., 2015). Steindl et al. (2015, pg. 205) also define psychological reactance as “an unpleasant motivational arousal that emerges when people experience a threat to or loss of their free behaviors.” Seat belt use and distracted driving are two of the highest-fatality behaviors and they pose the greatest threat to other drivers’ health and safety on U.S. roadways (NHTSA, 2018a). The purpose of this research is to investigate whether psychological reactance may be a significant factor in influencing people’s reactions and their choices to continually engage in risky behaviors. Moreover, this research looks at whether select individuals are more prone to experiencing reactance and how it may influence their willingness to follow driver safety messaging. Specifically, this research will investigate whether varying message threat and message reflection influence the amount of reactance experienced. Three main components of psychological reactance are of concern in the study: Reactance Attitude, Emotional Reactance, and Threat to Freedom. Each of these behaviors is measured for varying message conditions for two different message sets: one for Seat Belt Use and another for Distracted Driving. For the Emotional Reactance and Threat to Freedom reactance measures, there is a significant correlation between the measures and reactance proneness. It was found that as proneness increases, the resulting psychological reactance increases as well. For the Distracted Driving messages, there was a significant effect of Message Threat for the Emotional Reactance and Threat to Freedom conditions such that low threat messages elicited less psychological reactance than high threat messages. From this study, we recommend the following aspects for designing traffic safety messages: 1) Messages should use non-controlling language (consider, can, could, may, try) over controlling language (should, ought, must, need), 2) Messages should aim to be suggesting (try to do this), rather than commanding (you MUST do this!). Additionally, high threat messages may tend to elicit stronger reactance independent of reactance proneness, supporting the proposal of avoiding high threat messages for traffic safety.

UNDERSTANDING BEHAVIOR AND THE HISTORY OF PSYCHOLOGICAL REACTANCE

Introduction

Have you ever noticed a sign displaying messaging about driving safe, whether it be avoiding drinking and driving or wearing a seatbelt? Most likely you have, as these are common issues that are addressed through traffic safety messaging. However, there is reason to question the effectiveness of such messaging.

People read or hear these messages and react differently depending on a variety of factors. Of particular interest is the influence of psychological reactance upon driver behavior as it might be sensitive to individual differences and result in behavioral changes that may be detrimental to the safety of drivers on the road. In a review by Steindl, Jonas, Sittenthaler, Traut-Mattausch, and Greenberg, (2015), psychological reactance is defined as “an unpleasant motivational arousal that emerges when people experience a threat to or loss of their free behaviors” (pg. 205). The review offers a comprehensive and insightful look into the role of reactance in determining how one responds to certain situations and stimuli, which should help to explain behaviors that arise in a driving context addressed in the current study.

People may see a message that aims to reduce road rage, telling them to be mindful of other drivers or make sure they are not speeding, and their reaction may vary depending on the psychological reactance and moral disengagement that follows. Some might become more cautious and pay attention to the speed limit, other drivers, and potential road hazards, while others might become emotional aroused by being told what

or what not to do. However, these messages are not limited to roadside or overhead displays, as common forms include television, newspaper, and radio ads, as well as informative posters and fliers. A person could feel negative emotional reactance if they are a pedestrian and have a walking signal indicating it is okay to cross the road, but right before they cross, a car turns and almost hits them. Any kind of situation that imposes a threat upon an individual's free will can lead to reactance since they may feel threatened. Regardless of the type or source of a threat, the purpose of the study at hand will be to investigate the reactance that one experiences for a particular threat made toward them, and how attributes of the threat influence its acceptance. Moreover, the hope is that there can be some observation and evidence to support how reactance relates to standard measures of risky driving behavior.

Investigating and Understanding Psychological Reactance

Before we dive into the connections of reactance and driving behavior, it is important to layout the foundations of psychological reactance and utilize what findings have already been established and what implications there might still be. Reactance theory is especially interesting to investigate in Western culture, specifically the United States, as the rights and freedoms of the people are especially important given they were the basis for founding the country. This leaves people to be predisposed to feeling threatened any time their freedoms seem to be restricted or changed, at least compared to other countries where the citizens might not have as many freedoms or where the culture is more collectivistic (Steindl et al., 2015). In contrast, collectivistic cultures focus on the progress and status of the group as one, rather than an individual, so the threats they

experience would have greater influence if impacting the group (Steindl et al., 2015). The point is that when investigating reactance in our culture, we must account for the sensitivities pertaining to freedom that people may experience, which is even more reason that psychological reactance should play a significant role in influencing dangerous driver behaviors.

The theory of psychological reactance can first be attributed to Jack Brehm who proposed it in 1966 and extended it further as he continued to investigate the topic well into the 1990's. This theory offers an interesting explanation as to why people react in specific, sometimes detrimental, ways and discussed the initial processes that have laid the foundation for reactance theory as a current field of interest today (Brehm, 1967). Dillard and Shen (2005a, 2005b) offered an important advancement to the theory with the intertwined model theorizing that affect and cognition are part of each other or intertwined, like the name suggests. Additionally, their study used a four-item assessment with persuasive messaging on perceived threat to freedom and found that highly threatening messages aroused reactance (Dillard & Shen, 2005a, 2005b, 2006). The takeaway from their research is that affect and cognition are hard to distinguish from one another, highlighting the sensitivities that measures of reactance have.

Defining Psychological Reactance

Reactance is an unpleasant motivational state that occurs when an individual faces a threat, feels they are at a loss of free behavior, and then become aroused, motivating the individual to restore their freedom (Steindl et al., 2015). The degree to which one is aroused can vary depending on how important the freedom being threatened is, as well as

whether threats are internal; arise from making the choice of one option over others; or external; arise from situational influences that form barriers to freedom (Steindl et al., 2015). The unpleasant motivational state that develops from arousal leads to both a behavioral and cognitive effort of an individual to regain the freedom that has been threatened or that they feel they have lost. Being threatened is an emotional experience, which can result in an uncomfortable situation for an individual, triggering behavioral efforts in regaining freedom where they can become overly hostile and aggressive (Steindl et al., 2015). Behavioral efforts can be depicted through direct restoration, when one exhibits a prohibited behavior, and indirect restoration, when one observes others demonstrating a behavior. Cognitive efforts, the counterpart to behavioral, occur when an individual diminishes a threat and then reinforces their restricted freedom and when they might encounter a change in attractiveness to an option (Steindl et al., 2015). Overall, reactance is a complicated process, with some studies showing that freedom threats can lead to arousal that results in an amalgamated state of affect and cognition, and others showing an immediate emotional arousal occurs.

Reactance and Persuasive Messaging

One of the most common areas of investigation is how persuasive messages vary in the resulting reactance a person experiences when being persuaded, as well as how resistant some may be to change attitudes or accept the persuasive message (Steindl et al., 2015). For forceful messages, a person may be coerced to act or do something a certain way, which threatens their own free will and behavior, feeling this has been taken away. For nonforceful messages, the person is given more freedom to approach an issue,

situation, or meaning which leads to less negative arousal. Thus, forceful persuasion motivates people to present an argument against the threat, which leads to negative attitudes toward a message, resulting in lower behavioral intention to act upon the message's intended outcome (Steindl et al., 2015). This means that for driver safety messaging, forceful messaging should be avoided as the most likely outcome would be drivers not exhibiting an intention to follow the message at hand. This is an important aspect that will be essential to the current study when designing effective messages. The language types, words, and reactions people experience in common persuasive messaging is summarized in Figure 1.

Figure 1. Language types and reactions

	Common Words	Reaction
Forceful/Controlling Language	Should, ought, need, must	More threatening, more reactance
Noncontrolling Language	Consider, can, could, may, might, try	Less threatening, less reactance

Further examination of persuasive messaging has found evidence that the position of the threat to freedom within a message can lead to varying experiences of reactance (Silvia, 2006). The study found that if the threat to freedom was at the end of a message, people would directly disagree with the message, whereas if the threat was at the beginning of a message, people perceived the source to have low credibility. In turn, because the threat at the end of a message caused disagreement that diminished over time, compared to a threat at the beginning of a message which resulted in disagreement

that was stable over time, a reflective reactance process would be more stable (Steindl et al. 2015; Silvia, 2006). A reflective reactance process involves someone experiencing reactance by imagining themselves in the other's shoes and considering how they might feel in this position (Steindl et al., 2015). Thus, persuading someone to engage in a meaningful and reflective process may enable a more stable experience as they are not directly being threatened. Returning to the specific format of messaging, it has also been shown that the framing of messages has an influence on reactance as to suggest that messages framed as a loss will be seen as more threatening than messages framed as a gain (Cho and Sands, 2011). From these studies, it is clear that persuasive messaging can be sensitive depending upon the format of the message, framing, and location of the perceived threat.

An interesting finding about psychological reactance is that when trying to convince people to believe something or take certain actions, or lack of actions, they can sometimes adopt a position that is opposite the objective (Rains, 2013). This may be problematic for messages or goals of safe driving campaigns that are attempting to increase the safety of roadways by convincing people to behave safer, but they might actually make some act in a riskier manner. In fact, the risky behaviors seem to become more attractive, and the safer behaviors less attractive, to individuals who are prone to experiencing psychological reactance (Rains, 2013). The sensitivity of how and what information is presented when trying to increase safety of drivers is an important consideration that cannot be taken lightly. If too many people experience negative reactance towards messages, they can end up rejecting the source, which would become

problematic for focused risk campaigns promoted by organizations like the NHTSA (Rains, 2013).

To look at persuasive messaging and driving behavior specifically, a study by Chen (2013) investigated how reactance impacted the acceptance of a campaign message for college students to stop texting and driving. The study found that in high and low threat conditions, there was a positive correlation between the perceived degree of threat upon a freedom and the strength of reactance experienced (Chen, 2013). Moreover, in the high-threat condition the experience of stronger reactance led to more negative attitudes toward the texting and driving campaign (Chen, 2013). This shows that the more threatening the message is perceived to be, the more likely people are to have negative attitudes towards the message. However, the study did not find significant results showing that reactance negatively correlated with behavioral intention to follow the message (Chen, 2013).

Message and Solution Acceptance

The NHTSA has a goal of reaching zero roadway fatalities in the future, but to do so, promoting proper awareness and acceptance of safety campaigns and new technologies must be done in a way that minimizes negative reactance of the target audience. The acceptance of a message is important, as people can be influenced to be more likely to follow a message depending on the strategies used. There is exciting and very applicable evidence that persuasiveness of a message can be enhanced by utilizing a short story format instead of a direct argument or direction, as people seem to perceive this format as less threatening (Gardner, 2010). The format also placed an emphasis on

family and friends instead of an individual, which led to reactance being successfully attenuated. Moreover, the narrative form make sense in conjunction with a reflective reactance process as people must picture the effects of decisions upon others and not just themselves. While the study was used to address the impacts of healthy decision making, regarding diabetes and the reactance faced towards those messages, one could argue that there are similarities to driving behavior. The choices you make while driving, especially if aggressive in nature, can lead to direct consequences to the wellbeing of others, and thus you must weigh how they might be affected.

PSYCHOLOGICAL REACTANCE AND DRIVING BEHAVIOR

Reactance and Standard Measures of Risky Driving Behavior

Now that psychological reactance has been well defined, and its implications identified, we can look at the more pressing issues pertaining to the current study: 1) how might varying levels of message threat and reflection relate to the amount of psychological reactance experienced, and 2) how does reactance proneness relate to psychological reactance experienced? While reactance can be experienced due to messaging, as primarily discussed earlier, it can also be the result of actions or inactions that a person experiences, as well as interactions with our environment and other external stimuli that influence our behavior. This is especially true for many aggressive driving behaviors, given they are often prompted or triggered by interactions with a driver's environment on the road, including incidences involving other drivers and/or pedestrians. This form of reactance is especially important when considering traffic safety and influencing driver behavior, considering drivers can encounter many different stimuli that could result in reactance being experienced.

Risky Driving Behaviors

Risky driving is best exhibited by the risky behaviors that people engage in as laid out by the NHTSA, which are drunk driving, drug-impaired driving, distracted driving, use of seat belts, speeding, and drowsy driving. The focus of this study will be to address some of the behaviors responsible for the highest number of fatalities: the use of seatbelts and distracted driving (National Highway Traffic Safety Administration, 2018a). The

following sections will discuss each risk behavior, as well as relevant best-practice and promising strategies/solutions. Ensuring these solutions are successful may depend on understanding what forms of messaging influences reactance so that the proper approach is taken to design messages that minimize psychological reactance experienced.

Seat Belt Use

As simple of a device as a seat belt may seem, it really can be the difference between life and death of vehicle occupants when a collision occurs. Kahane (2015) reported wearing your seat belt can reduce the risk of fatal injury by 45% for passenger cars and by 60% for trucks (National Highway Traffic Safety Administration, 2018a). Moreover, in 2017, the national seat belt use rate was at 89.7%, but the 11.3% who were not wearing seatbelts are the problem (Li and Pickrell, 2018). If these drivers are willing to risk to their own safety and health on U.S. roadways, there must be a reason they refuse to wear a seatbelt. Most vehicles are equipped with some form of seat belt reminder technology that has a visual and/or auditory signal indicating that a driver or passenger is not wearing their seat belt, yet people elect not to wear one. Why they do so is still a question evident to traffic safety researchers, and in this case, the study looks at whether more forceful messages lead to an increase in reactance experienced where they ignore the signals instead.

The most well-known strategy for addressing seat belt use would be the Click It or Ticket campaign, which promotes seatbelt use through media as well as an increased enforcement period by officers (National Highway Traffic Safety Administration, 2018a; Toward Zero Deaths Steering Committee, 2014). In North Carolina, the program has

saved \$135 million since 1993 in health-related costs that were a result of roadway injury or fatality (National Cooperative Highway Research Program, 2004). In Montana, there was heavy emphasis on creating a solid community program as a joint effort with the law enforcement, and by doing so, usage went up to 78%, which was an immense improvement (National Cooperative Highway Research Program, 2004). Cooperation between enforcement and communities is critical in developing and implementing a proper program, as seen by the previous examples. Furthermore, utilizing current resources such as the Click It or Ticket campaign can make it easier for states to adapt and implement a program fit for a particular community, rather than starting from scratch. The important part about increasing awareness of seat belt use may be how the message is presented, especially for the drivers who still refuse to use them. Thus, it is a focus of the study at hand to evaluate different seat belt messages to see how people react to them, and whether varying the threat and reflection of messages may influence the reactance experienced. If we can understand how an individual's reactance proneness relates to how much reactance they experience, we can work towards designing better messaging that people will be more willing to follow through on.

Distracted Driving

Distracted driving can be defined as performing or engaging in an activity while driving a vehicle that diverts your attention from the primary task of driving (NHTSA, 2018). Such activities such as talking on a cell phone or texting while driving are the primary distractors, but eating, drinking, and talking to other passengers in your vehicle can also be considered distractions. Thus, distracted driving can include any form of

distraction that takes the driver's attention away from the primary task of driving, putting safety at risk (battle for attention). Aside from cell phones, distracted driving is still a problem as people do not always realize the demands driving has, in terms of cognitive function, and they believe they can multitask even though most people cannot (Kinnear and Stevens, 2015). The issue of distracted driving has become more prevalent as cell phone technology has advanced, however, and more people have access to cell phones. Moreover, most drivers that were distracted during a fatal crash fell in the Teen age group, as would be expected given teens increasingly common use of cell phones and other devices (NHTSA, 2018). Some of the objectives for reducing crashes resulting from distracted driving include: 1) making roadways safer and 2) increasing awareness of the risks of distracted driving, with an emphasis for drivers to focus on the task of driving (NCHRP, 2005b). The main solutions are technology, infrastructure, and social awareness based, but all of them must work together to address the issue of distracted driving effectively (Toward Zero Deaths Steering Committee, 2014).

One of the issues with distracted driving is the public's lack of awareness when it comes to safety implications and how even the slightest distraction can put them at risk (NCHRP, 2005). Slogans like "arrive alive, don't text and drive" or "don't text and drive" are common messages presented in media and roadside displays to discourage drivers from using their phones. Law enforcement and traffic laws attempt to highlight the risk of distracted driving by prohibiting cell phone usage while driving (NCHRP, 2005; Toward Zero Deaths Steering Committee, 2014). Primary enforcement laws are an aspect of most texting bans that have been enacted, with texting banned for any driver in

41 states (Toward Zero Deaths Steering Committee, 2014). Thirty-seven states also ban cell phone use for novice drivers specifically, and only 11 states ban cell phone use for all drivers (Toward Zero Deaths Steering Committee, 2014). The primary recommendation for enforcement of cell phone laws is that it needs to be “highly visible and publicized to maximize its effect on driver behavior” (Kinnear and Stevens, 2015, pg. 15). In the end, it comes down to the fact that distracted driving takes your eyes off the road, and you endanger yourself and other drivers by engaging in it. Thus, addressing this behavior through driver safety messaging is important and must be done effectively. The study looks at how different messages effect the psychological reactance experienced and identifies meaningful ways to reduce reactance.

MEASURING PSYCHOLOGICAL REACTANCE

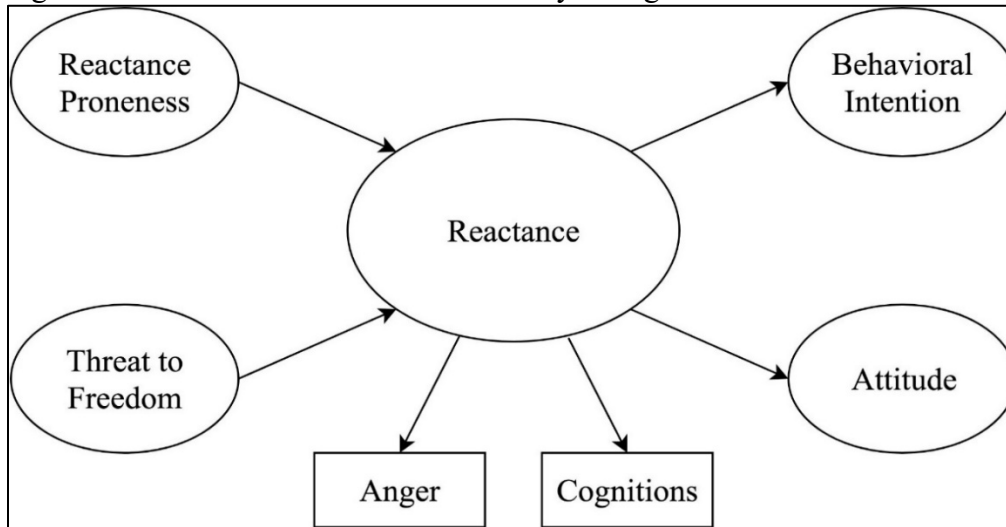
A Unidimensional Measure of Psychological Reactance

Hong Psychological Reactance Scale

For measuring proneness to psychological reactance, the Hong Psychological Reactance Scale (HPRS) is a tool that can be applied. The original scale consisted of 14 items that were respectfully grouped to evaluate four factors of reactance: emotional response towards a restricted choice, reactance to compliance, resisting influence from others, and reactance to advice/recommendations. In 1996, Hong and Faedda performed a study in which they were able to eliminate 3 of the 14 items, making it a little more refined. However, there have been critiques regarding the inconsistency of the HPRS, claiming it may be problematic if relying on it as the measurement of determining levels of reactance for each of the four factors. (Jonason and Knowles, 2006). To address this issue, Dillard and Shen (2005a, 2006) investigated the HPRS, supporting that it still had external and internal consistency when reduced to 11 items, as well as finding that it was unidimensional. This means that rather than measuring reactance for multiple factors and reporting levels of reactance for each, it is more accurate to state that the HPRS measures overall reactance proneness in general. Put simply, the HPRS will be used to measure the reactance proneness on an overall spectrum from low/high. Moreover, they concluded it was still more valid than other reactance measures and that it offered a more parsimonious solution for reactance data (Dillard and Shen, 2006).

As mentioned in the introduction, Dillard and Shen proposed the intertwined process model for reactance which has been found to be the most valid and reliable way of measuring reactance that is experienced (Quick, 2012). Figure 2 depicts the relationship of factors proposed by the intertwined process model.

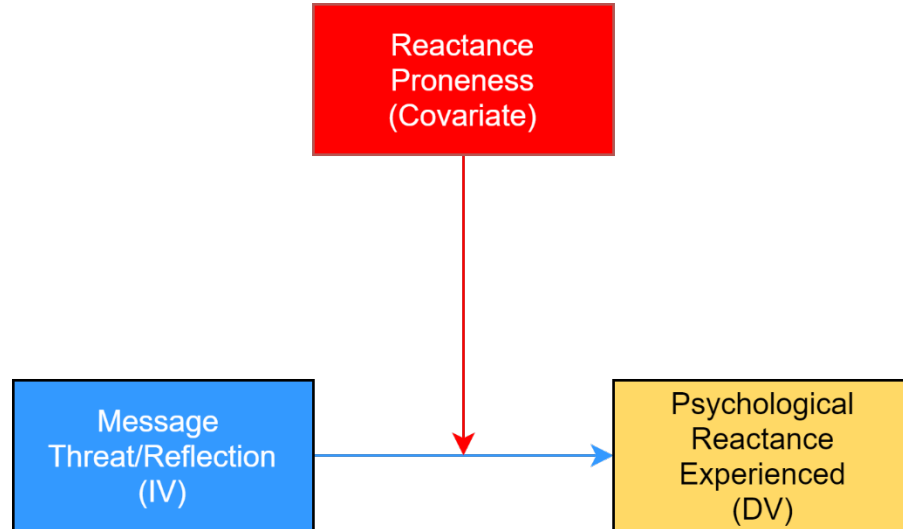
Figure 2. Intertwined Process Model for Psychological Reactance



This model is different from the HPRS as it includes reactance proneness as one of the factors, where the HPRS is an overall measure of proneness to reactance. Because of the strong reliability and validity of Dillard and Shen's model, applying it to measure the reactance experienced towards certain messages would be a good approach. However, the exact model may be outside the scope of the study given the numerous variables and relationships that would need to be addressed. In turn, the study will not utilize the intertwined process model due to the complexity of creating effective and reliable measures given the limitations of time and resources. Moreover, there was not consistent method of studying perceived effectiveness and acceptance, which would have required

further investigation. Thus, a simpler model investigating the relationships between message forcefulness, reactance proneness, and the psychological reactance experienced is proposed as depicted by Figure 3.

Figure 3. Model of relationship(s) between message, proneness, and reactance



METHODS OF INVESTIGATION FOR REACTANCE AND MESSAGING

MethodologyParticipants & Sample

Participants were recruited using Qualtrics. The screening criteria used for the Qualtrics distribution asked about participant age, whether they had a driver's license, and if they drive. If their age was under 17 or over 66, then they were not selected for the sample. If they did not have a driver's license, then they were excluded. They were also excluded from the study if they did not drive at all during the week. A quota-based sample was used to force a range of total proneness values: 150 low prone female, 150 low prone male, 150 high prone female, and 150 high prone male participants. Using GPower, the sample size needed was estimated, finding a sample of 606 to be sufficient with high power (0.99). The final sample was $N = 675$ with complete response data and had high power (0.99).

Location

Montana State University & Qualtrics online distribution

Approval

All surveys utilized in the study have obtained Montana State University IRB approval prior to being sent to Qualtrics for distribution.

Purpose

The current study looked at the effects of message threat and reflection upon the psychological reactance experienced, as well as how reactance proneness may influence

that relationship. The strength of the relationship between message threat and reaction might be influenced by whether someone has a low or high proneness of experiencing reactance. The reactance experienced is made up of three measures that serve as dependent variables: reactance attitude, emotional reactance, and perceived threat to freedom. All participants viewed the same messages as they were not split into groups as was the method in the pilot study. The pilot study was used to select the best message set (*see Appendix E for pilot study methods and message selection*). Instead, there was only one message set for each of the two driving behaviors, and they completed the same questionnaires. A screening for proneness was used in order to sort participants by high or low proneness prior to any questionnaires.

Hypotheses

The following hypotheses were tested in the study:

H1: We expect low threat messages will have less psychological reactance than high threat messages.

H2: We expect reflective messages to have less psychological reactance than non-reflective messages.

H3: We expect the low threat and reflective messages to have less psychological reactance than the high threat and non-reflective messages.

H4: We expect a significant relationship between individual reactance proneness and psychological reactance such that as proneness increases, so does the resulting reactance.

Procedure

Participants completed a background questionnaire consisting of demographics and self-reported driving record and provide consent prior to beginning the study (*see Appendix A*). They initially completed a short proneness scale to ensure the sample is equally distributed. Next, participants completed the Hong Psychological Reactance Scale (HPRS) questionnaire (*see Appendix B*). Participants were then instructed to proceed to the second portion of the experiment. They were randomly assigned which message set is presented first, either Seat Belt or Distracted Driving. Within each set, messages are ordered from lowest to highest reactance condition as to avoid eliciting reactance from the first question, which could have skewed results of the remaining questions. Participants were presented with a message and instructed to read the message and evaluate it. Participants evaluated the message using a short questionnaire for the three dependent measures (Reactance Attitude, Emotional Reactance, Threat to Freedom). This process was repeated until all messages have been evaluated.

Methods/Measures

Questionnaires. The majority of the questionnaires utilize a Likert scale that provides a quantifiable value for data gathered. This is applicable to the questionnaires for the measures of Reactance Attitude (6 items, 7-point semantic differential scale), Reactance Experienced (4 items, 5-point Likert scale), and Threat to Freedom (4 items, 5-point Likert scale).

Reactance Proneness. The dependent variable in the experiment is reactance proneness which was measured through the HPRS questionnaire. The Hong Psychological Reactance Scale has been found to be reliable and a strong indication of

reactance proneness as a whole on a unidimensional level (Dillard and Shen, 2005a).

There are four factors with 11 items total, and each one will be quantified by a 5-point Likert scale from 1 – strongly disagree, to 5 strongly agree. The mean level of reactance proneness was computed by averaging the responses to the questionnaire. This allows for a quantifiable way to define reactance proneness based on a single rating.

Message Threat/Reflection. Message threat/reflection is an independent variable that is made up of two conditions: message threat and message reflection. Messages are formatted as either high or low threat, and reflective or non-reflective (*see Appendix C for message breakdown*). High threat messages utilize controlling language – should, ought, must, need, you do this, you do that. The messages are commanding/demanding actions out of the target audience. For high threat messages, we also implemented an aspect used in Chen’s (2013) study, where exclamations are used to make the message more commanding. Low threat messages utilize noncontrolling language – consider, can, could, may. The messages are offering potential actions for the target audience to consider. Reflective messages propose a question of what another might experience and allows a deeper, reflective process where individuals can evaluate the impacts their actions have upon others. This involves prompting the target audience to adopt the view of others, especially close friends and family. Nonreflective messages do not attempt to induce reflection as the individual is not prompted to consider the impact of their actions upon others. This involves simply removing the question/reflection portion of the message. The message threat/reflection format also depicted whether small changes in

messaging can influence the reaction that occurs depending on whether one is more or less prone to experiencing reactance.

Psychological Reactance Experienced. The reaction that people have to the message is referred to as the psychological reactance experienced and consists of three primary factors. The questionnaire uses Likert-type scales to quantify responses for Reactance Attitude, Emotional Reactance Experienced, and Threat to Freedom (*see Appendix D*). The Reactance Attitude measure reports supportive/positive beliefs or opposing/negative beliefs about a message. The Emotional Reactance measure reports emotional reactions towards a message. The Perceived Threat to Freedom measure reports the level of threat to personal freedom.

Analysis Plan

Repeated Measures ANCOVA (2 Message Threat x 2 Message Reflection, covariate = Total Proneness). The model evaluates the reactance experienced (participants reactions), which consists of three dependent variables of Reactance Attitude, Emotional Reactance Experienced, and Threat to Freedom. The covariate compares individual reactance proneness with the reactance experienced.

ANALYSIS OF MESSAGE THREAT/REFLECTION, REACTANCE, AND PRONENESS

Results

Sample Size and Demographics

The sample was collected through a Qualtrics survey distribution which gathered 1,000 responses (refer to methodology for sample quota description). 675 of those responses were complete data which was used for the analysis of the study. The sample age range was 18 to 65 years old. 49.5% of participants identified as female and 49.5% as male. On average, participants reported driving 5.6 days per week. 81% of participants reported always wearing a seat belt while driving.

Reliability

The internal reliability (Cronbach Alpha) of all scales for each message type is presented in Table 1. Assuming an acceptable level of reliability set at 0.80 (Taber, 2018), all scales can be considered highly reliable (> 0.90).

Table 1. Scale Reliabilities

Scale	Cronbach's Alpha	N of Items
HPRS – Total Proneness Score	0.93	11
Seat Belt Reactance Attitude LR	0.93	6
Seat Belt Reactance Attitude LN	0.93	6
Seat Belt Reactance Attitude HR	0.95	6
Seat Belt Reactance Attitude HN	0.95	6
Seat Belt Emotional Reactance LR	0.96	4
Seat Belt Emotional Reactance LN	0.97	4
Seat Belt Emotional Reactance HR	0.96	4
Seat Belt Emotional Reactance HN	0.97	4
Seat Belt Threat to Freedom LR	0.93	4
Seat Belt Threat to Freedom LN	0.94	4
Seat Belt Threat to Freedom HR	0.93	4
Seat Belt Threat to Freedom HN	0.94	4
Distracted Driving Reactance Attitude LR	0.93	6
Distracted Driving Reactance Attitude LN	0.92	6
Distracted Driving Reactance Attitude HR	0.94	6
Distracted Driving Reactance Attitude HN	0.94	6
Distracted Driving Emotional Reactance LR	0.96	4
Distracted Driving Emotional Reactance LN	0.97	4
Distracted Driving Emotional Reactance HR	0.96	4
Distracted Driving Emotional Reactance HN	0.96	4
Distracted Driving Threat to Freedom LR	0.92	4
Distracted Driving Threat to Freedom LN	0.94	4
Distracted Driving Threat to Freedom HR	0.93	4
Distracted Driving Threat to Freedom HN	0.93	4

Correlates of Proneness

A correlation (r) represents the relationship between two variables; that is, evidence that the variation in one variable can be explained by another variable. In this sense, r can also be considered a measure of effect size. Evans (1996) proposes the following ranges of r reflect different degrees of effect size (relationship strength): 0 to $0.19 =$ very weak, 0.2 to $0.39 =$ weak, 0.40 to $0.59 =$ moderate, 0.6 to $0.79 =$ strong, 0.8 to $1 =$ very strong.

The correlations for the Seat Belt Use Messages in Table 2 reveal that there was a significant and moderate correlation between Emotional Reactance and Total Proneness within all four types of seat belt messages. There was also significant and moderate correlation between Threat to Freedom and Total Proneness within all four types of seat belt messages. There was no significant correlation between Reactance Attitude and Total Proneness for any seat belt message.

Table 2. Seat Belt Use Message Correlations

N = 675 Significant at $\alpha = 0.01$		Reactance Attitude Low threat, Reflective	Reactance Attitude Low threat, Non-reflective	Reactance Attitude High threat, Reflective	Reactance Attitude High threat, Non-reflective	Emotional Reactance Low threat, Reflective	Emotional Reactance Low threat, Non-reflective	Emotional Reactance High threat, Reflective	Emotional Reactance High threat, Non-reflective	Threat to Freedom Low threat, Reflective	Threat to Freedom Low threat, Non-reflective	Threat to Freedom High threat, Reflective	Threat to Freedom High threat, Non-reflective	HPRS Total Proneness Score
Reactance Attitude Low threat, Reflective	Pearson Correlation Sig. (2-tailed)	1	.839*	.822*	.752*	-.175*	-.162*	-.209*	-.216*	-.175*	-.164*	-.213*	-.188*	-0.002
Reactance Attitude Low threat, Non-reflective	Pearson Correlation Sig. (2-tailed)	.839*	1	.770*	.778*	-.177*	-.197*	-.216*	-.251*	-.166*	-.182*	-.212*	-.205*	-0.046
Reactance Attitude High threat, Reflective	Pearson Correlation Sig. (2-tailed)	.822*	.770*	1	.820*	-.167*	-.169*	-.242*	-.225*	-.193*	-.181*	-.264*	-.222*	-0.038
Reactance Attitude High threat, Non-reflective	Pearson Correlation Sig. (2-tailed)	.752*	.778*	.820*	1	-.173*	-.181*	-.207*	-.235*	-.174*	-.185*	-.195*	-.233*	-0.054
Emotional Reactance Low threat, Reflective	Pearson Correlation Sig. (2-tailed)	-.175*	-.177*	-.167*	-.173*	1	.858*	.846*	.816*	.710*	.712*	.621*	.608*	.430**
Emotional Reactance Low threat, Non-reflective	Pearson Correlation Sig. (2-tailed)	-.162*	-.197*	-.169*	-.181*	.858*	1	.888*	.872*	.694*	.755*	.629*	.654*	.408**
Emotional Reactance High threat, Reflective	Pearson Correlation Sig. (2-tailed)	-.209*	-.216*	-.242*	-.207*	.846*	.888*	1	.899*	.694*	.732*	.699*	.680*	.424**
Emotional Reactance High threat, Non-reflective	Pearson Correlation Sig. (2-tailed)	-.216*	-.251*	-.225*	-.235*	.816*	.872*	.899*	1	.646*	.710*	.656*	.723*	.407**
Threat to Freedom Low threat, Reflective	Pearson Correlation Sig. (2-tailed)	-.175*	-.168*	-.193*	-.174*	.710*	.684*	.694*	.646*	1	.888*	.804*	.789*	.508**
Threat to Freedom Low threat, Non-reflective	Pearson Correlation Sig. (2-tailed)	-.164*	-.182*	-.181*	-.185*	.712*	.755*	.732*	.710*	.888*	1	.828*	.843*	.520**
Threat to Freedom High threat, Reflective	Pearson Correlation Sig. (2-tailed)	-.213*	-.212*	-.264*	-.195*	.621*	.629*	.699*	.656*	.804*	.828*	1	.878*	.495**
Threat to Freedom High threat, Non-reflective	Pearson Correlation Sig. (2-tailed)	-.188*	-.205*	-.222*	-.233*	.608*	.654*	.680*	.723*	.789*	.843*	.878*	1	.494**
HPRS Total Proneness Score	Pearson Correlation Sig. (2-tailed)	-.002	-0.046	-0.038	-0.054	.430**	.408**	.424**	.407**	.508**	.520**	.495**	.494**	1

The correlations for the Distracted Driving Messages in Table 3 reveal that there is a significant moderate correlation between Emotional Reactance and Total Proneness within all four types of seat belt messages. There was also significant and moderate correlation between Threat to Freedom and Total Proneness for within all four types of seat belt messages. There was no significant correlation between Reactance Attitude and Total Proneness for any seat belt message.

Table 3. Distracted Driving Message Correlations

		Reactance Attitude Low threat, Reflective	Reactance Attitude Low threat, Non-reflective	Reactance Attitude High threat, Reflective	Reactance Attitude High threat, Non-reflective	Emotional Reactance Low threat, Reflective	Emotional Reactance Low threat, Non-reflective	Emotional Reactance High threat, Reflective	Emotional Reactance High threat, Non-reflective	Threat to Freedom Low threat, Reflective	Threat to Freedom Low threat, Non-reflective	Threat to Freedom High threat, Reflective	Threat to Freedom High threat, Non-reflective	HPRS Total Proneness Score
N = 675 Significant α = 0.01														
Reactance Attitude Low threat, Reflective	Pearson Correlation Sig. (2-tailed)	1	.791*	.642*	.572*	-.188*	-.132*	-.158*	-.101*	-.197*	-.130*	-.139*	-.114*	-0.004
Reactance Attitude Low threat, Non-reflective	Pearson Correlation Sig. (2-tailed)	.791*	1	.662*	.631*	-.171*	-.195*	-.150*	-.135*	-.183*	-.185*	-.138*	-.155*	-0.029
Reactance Attitude High threat, Reflective	Pearson Correlation Sig. (2-tailed)	.642*	.662*	1	.822*	-.117*	-.107*	-.268*	-.237*	-.188*	-.143*	-.307*	-.253*	-0.050
Reactance Attitude High threat, Non-reflective	Pearson Correlation Sig. (2-tailed)	.572*	.631*	.822*	1	-.085*	-.105*	-.237*	-.279*	-.162*	-.137*	-.273*	-.290*	-0.034
Emotional Reactance Low threat, Reflective	Pearson Correlation Sig. (2-tailed)	-.188*	-.171*	-.117*	-.085*	1	.870**	.749*	.704**	.662**	.666**	.463**	.476**	.409**
Emotional Reactance Low threat, Non-reflective	Pearson Correlation Sig. (2-tailed)	-.132*	-.195*	-.107*	-.105*	.870**	1	.793**	.758**	.650**	.733**	.484**	.517**	.433**
Emotional Reactance High threat, Reflective	Pearson Correlation Sig. (2-tailed)	-.158*	-.150*	-.268*	-.237*	.749*	.793**	1	.871**	.616**	.635**	.669**	.639**	.405**
Emotional Reactance High threat, Non-reflective	Pearson Correlation Sig. (2-tailed)	-.101*	-.135*	-.237*	-.279*	.704**	.758**	.871**	1	.615**	.639**	.653**	.717**	.417**
Threat to Freedom Low threat, Reflective	Pearson Correlation Sig. (2-tailed)	-.197*	-.183*	-.188*	-.162*	.662**	.650**	.616**	.615**	1	.850**	.716**	.704**	.539**
Threat to Freedom Low threat, Non-reflective	Pearson Correlation Sig. (2-tailed)	-.130*	-.185*	-.143*	-.137*	.666**	.733**	.639**	.639**	.850**	1	.699**	.701**	.534**
Threat to Freedom High threat, Reflective	Pearson Correlation Sig. (2-tailed)	-.139*	-.138*	-.307*	-.273*	.463**	.484**	.669**	.653**	.716**	.699**	1	.879**	.437**
Threat to Freedom High threat, Non-reflective	Pearson Correlation Sig. (2-tailed)	-.114*	-.155*	-.253*	-.290*	.476**	.517**	.639**	.717**	.704**	.701**	.879**	1	.438**
HPRS Total Proneness Score	Pearson Correlation Sig. (2-tailed)	-0.004	-0.029	-0.050	-0.034	.409**	.433**	.405**	.417**	.539**	.534**	.437**	.438**	1

Analysis of Message Factors (ANCOVA): Seat Belt Use

Reactance Attitude

The descriptive statistics for reactance attitude are shown in Table 4. The mean value for each condition was close to 6, and the scale is a 7-point measure. This indicates a ceiling effect for the scores.

Table 4. Descriptive Statistics – Seat Belt Reactance Attitude

Measure Condition	Mean	Std. Dev.	Std. Error	N
Low threat, Reflective	5.95	1.34	0.05	675
Low threat, Non-reflective	5.97	1.31	0.05	675
High threat, Reflective	5.95	1.37	0.05	675
High threat, Non-reflective	5.98	1.36	0.05	675

The repeated measures ANCOVA (2 Message Threat x 2 Message Reflection, covariate = Total Proneness score) revealed that for Reactance Attitude, there was no main effect of threat or reflection. There was also no significant interaction effect. Thus,

we cannot support H1, H2, or H3 for Reactance Attitude. The covariate analysis did not indicate a significant relationship between Reactance Attitude and Total Proneness. Thus, we cannot support H4.

Emotional Reactance Experienced

The descriptive statistics for emotional reactance are shown in Table 5. The mean scores were slightly under 2 out of a 4-point scale, and do not indicate any scale issues.

Table 5. Descriptive Statistics – Seat Belt Emotional Reactance

Measure Condition	Mean	Std. Dev.	Std. Error	N
Low threat, Reflective	1.81	1.25	0.04	675
Low threat, Non-reflective	1.77	1.25	0.05	675
High threat, Reflective	1.83	1.24	0.04	675
High threat, Non-reflective	1.79	1.23	0.04	675

The repeated measures ANCOVA revealed that for Emotional Reactance Experienced, there was no significant main effect of threat or reflection. There was also no significant interaction effect. Thus, we cannot support H1, H2, or H3 for Emotional Reactance.

The covariate analysis indicated that Total Proneness correlated significantly with Emotional Reactance [$F(1,673) = 161.83, p < 0.0001, \eta_p^2 = 0.194$]. The effect size indicates a large effect of Emotional Reactance on Total Proneness. As shown in Table 6, the amount of reported Emotional Reactance in response to each type of message was greater as Total Proneness increased. Such evidence supports H4.

Table 6. Parameter Estimates – Seat Belt Emotional Reactance

Dependent Variable	Parameter	B	Std Error	<i>t</i>	Sig.	Partial Eta Squared	Observed Power
Emotional Reactance LR	Total Proneness	0.55	0.04	12.36	0.00	0.19	1.00
Emotional Reactance LN	Total Proneness	0.52	0.05	11.60	0.00	0.17	1.00
Emotional Reactance HR	Total Proneness	0.54	0.04	12.13	0.00	0.18	1.00
Emotional Reactance HN	Total Proneness	0.51	0.04	11.54	0.00	0.17	1.00

Threat to Freedom

The descriptive statistics for Threat to Freedom are shown in Table 7. The mean values are slightly above 2 out of a 4-point scale rating, and do not appear to show a floor or ceiling effect.

Table 7. Descriptive Statistics – Seat Belt Threat to Freedom

Measure Condition	Mean	Std. Dev.	Std. Error	N
Low threat, Reflective	2.22	1.25	0.04	675
Low threat, Non-reflective	2.11	1.24	0.04	675
High threat, Reflective	2.30	1.28	0.04	675
High threat, Non-reflective	2.20	1.26	0.04	675

The repeated measures ANCOVA revealed that for Threat to Freedom, there was no significant main effect of threat or reflection. There was also no significant interaction effect. Thus, we cannot support H1, H2 or H3 for Threat to Freedom.

The covariate analysis indicated that Total Proneness correlated significantly with Threat to Freedom [$F(1,673) = 271.64, p < 0.0001, \eta_p^2 = 0.289$]. The effect size indicates a large effect of Threat to Freedom on Total Proneness. As shown in Table 8, the amount

of reported Threat to Freedom in response to each type of message was greater as Total Proneness increased. Such evidence supports H4.

Table 8. Parameter Estimates – Seat Belt Threat to Freedom

Dependent Variable	Parameter	B	Std Error	<i>t</i>	Sig.	Partial Eta Squared	Observed Power
Threat to Freedom LR	Total Proneness	0.65	0.04	15.28	0.00	0.26	1.00
Threat to Freedom LN	Total Proneness	0.66	0.04	15.78	0.00	0.27	1.00
Threat to Freedom HR	Total Proneness	0.65	0.04	14.77	0.00	0.25	1.00
Threat to Freedom HN	Total Proneness	0.64	0.04	14.73	0.00	0.24	1.00

Analysis of Message Factors (ANCOVA): Distracted Driving

Reactance Attitude

The descriptive statistics for Reactance Attitude are shown in Table 9. The mean scores for each condition are just below 6 out of a total 7-point scale.

Table 9. Descriptive Statistics – Distracted Driving Reactance Attitude

Measure Condition	Mean	Std. Dev.	Std Error	N
Low threat, Reflective	5.85	1.34	0.05	675
Low threat, Non-reflective	5.87	1.31	0.05	675
High threat, Reflective	5.75	1.43	0.06	675
High threat, Non-reflective	5.74	1.49	0.06	675

The repeated measures ANCOVA (2 Message Threat x 2 Message Reflection, covariate = Total Proneness score) revealed that for Reactance Attitude, there was no main effect of threat or reflection. There was also no significant interaction effect. Thus, we cannot support H1, H2, or H3 for Reactance Attitude. The covariate analysis did not

indicate a significant relationship between Reactance Attitude and Total Proneness. Thus, we cannot support H4.

Emotional Reactance Experienced

The descriptive statistics for emotional reactance are shown in Table 10. The mean values for the low threat conditions were slightly under 2 whereas those for the high threat conditions were just over 2, on a 4-point scale. The mean scores do not indicate any issues with the scale.

Table 10. Descriptive Statistics – Distracted Driving Emotional Reactance

Measure Condition	Mean	Std. Dev.	Std Error	N
Low threat, Reflective	1.83	1.24	0.04	675
Low threat, Non-reflective	1.78	1.23	0.04	675
High threat, Reflective	2.07	1.28	0.05	675
High threat, Non-reflective	2.03	1.27	0.05	675

The repeated measures ANCOVA revealed that for Emotional Reactance there was a significant main effect of threat [$F(1,673) = 5.54, p < 0.05, \eta_p^2 = 0.008$]. Participants' mean Emotional Reactance experienced for the low threat messages ($M = 1.81, SE = 0.04$) was significantly less than that of the high threat messages ($M = 2.05, SE = 0.04$). There was not a significant main effect of reflection. There was also no significant interaction effect. Thus, we can support H1, but not H2 or H3 for Emotional Reactance.

The covariate analysis indicated that Total Proneness correlated significantly with Emotional Reactance [$F(1,673) = 173.72, p < 0.0001, \eta_p^2 = 0.205$]. The effect size indicates a large effect of Emotional Reactance on Total Proneness. As shown in Table

11, the amount of reported Emotional Reactance in response to each type of message was greater as Total Proneness increased. Such evidence supports H4.

Table 11. Parameter Estimates – Distracted Driving Emotional Reactance

Dependent Variable	Parameter	B	Std Error	<i>t</i>	Sig.	Partial Eta Squared	Observed Power
Emotional Reactance LR	Total Proneness	0.52	0.04	11.62	0.00	0.17	1.00
Emotional Reactance LN	Total Proneness	0.54	0.04	12.47	0.00	0.19	1.00
Emotional Reactance HR	Total Proneness	0.53	0.05	11.50	0.00	0.16	1.00
Emotional Reactance HN	Total Proneness	0.54	0.05	11.90	0.00	0.17	1.00

Threat to Freedom

The descriptive statistics for Threat to Freedom are shown in Table 12. The mean score values for the low threat message conditions are slightly over 2 whereas the high threat conditions are just over 2.5, both on a 4-point scale. The mean values do not indicate any issues with the scale.

Table 12. Descriptive Statistics – Distracted Driving Treat to Freedom

Measure Condition	Mean	Std. Dev.	Std Error	N
Low threat, Reflective	2.21	1.22	0.04	675
Low threat, Non-reflective	2.12	1.23	0.04	675
High threat, Reflective	2.65	1.34	0.05	675
High threat, Non-reflective	2.61	1.34	0.05	675

The repeated measures ANCOVA revealed that for Threat to Freedom there was a significant main effect of threat [$F(1,673) = 38.17, p < 0.0001, \eta_p^2 = 0.054$]. Participants' mean threat to freedom for the low threat messages ($M = 2.17, SE = 0.04$) was

significantly less than that of the high threat messages ($M = 2.63$, $SE = 0.05$). There was not a significant main effect of reflection. There was also no significant interaction effect. Thus, we can support H1, but not H2 or H3 for Threat to Freedom despite having high power (1.00).

The covariate analysis indicated that Total Proneness correlated significantly with Threat to Freedom [$F(1,673) = 270.94$, $p < 0.0001$, $\eta_p^2 = 0.287$]. The effect size indicates there is a large effect of Threat to Freedom on Total Proneness. As shown in Table 13, the amount of reported Threat to Freedom in response to each type of message was greater as Total Proneness increased. Such evidence supports H4.

Table 13. Parameter Estimates – Distracted Driving Threat to Freedom

Dependent Variable	Parameter	B	Std Error	<i>t</i>	Sig.	Partial Eta Squared	Observed Power
Threat to Freedom LR	Total Proneness	0.67	0.04	16.61	0.00	0.29	1.00
Threat to Freedom LN	Total Proneness	0.67	0.04	16.40	0.00	0.29	1.00
Threat to Freedom HR	Total Proneness	0.60	0.05	12.61	0.00	0.19	1.00
Threat to Freedom HN	Total Proneness	0.60	0.05	12.64	0.00	0.19	1.00

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Discussion

Reactance Attitude

Reactance Attitude was a weak measure for psychological reactance for both Seat Belt Use and Distracted Driving, as there was no support for any of the hypotheses. One possibility is a potential ceiling effect being present which further limits the conclusions that can be made regarding reactance attitude (Howe, 2018a, 2018b). There was hardly a difference between Seat Belt Use mean scores across message conditions, with values falling between 5.95 and 5.98 out of a 7-point scale. Moreover, this was similar for the mean scores of the Distracted Driving message conditions, with mean values falling between 5.74 and 5.87. This depicts that for both driving behaviors, most of the scores were skewed towards the top of the scale, hence the possible ceiling effect. Thus, it becomes difficult to expect the independent variable (threat/reflection condition) to result in a change in attitude because there is not much room for change as most participants scored near the top of the scale (Howe, 2018a, 2018b). To avoid a ceiling effect, it is recommended that the proper questions are chosen, as if the questions are not measuring what they were intended to, the measure loses its reliability (Howe, 2018a, 2018b). We could also look at whether there was a larger number of outliers such that the response data for Reactance Attitude is skewed, shifting the means towards the ceiling of the scale. The next section will discuss why there might be an issue with the Reactance Attitude in our study, which could play a role in why a ceiling effect could have occurred as well.

It is also possible reactance attitude may not be a meaningful measure for gauging reactance towards driver safety messages. Dillard and Shen (2005b) used a similar attitude measure of a semantic differential scale, but the messages in their study were shorter paragraphs, whereas our study used 1-2 brief sentences for each message. Thus, it is better to compare these results with studies that utilized similar messaging. Chen (2013) used the same questionnaire implemented in this study for measuring attitudes towards messages and reported a mean attitude value of 4.45 for the low-threat group and 4.39 for the high-threat group. However, there was no significant difference found. This is similar to our study in that Reactance Attitude did not appear to change as the message conditions were varied, and no significant conclusions could be made. Another reason attitude may have been weak is the scale uses 6 items with each rated on a 7-point semantic differential scale. There is a possibility that the scale format was confusing as participants know the extreme ends of each item (foolish:wise, wrong:right, unimportant:important, etc.) but it is not clear what the 5 points in between correspond to. This might have factored into the higher mean response scores for the Seat Belt messages when measuring reactance attitude. In turn, the insignificant results for the attitude measure of the main study and Chen's study could suggest the measure may be flawed in accurately measuring the attitude an individual has towards a message. However, this may only be true for studies involving traffic safety as both our study and Chen's investigated traffic safety messages.

When looking at the Reactance Attitude questionnaire, it is possible that the scale may be measuring their opinion about the merit of the message, rather than what their

emotional reactance to it. Thus, someone might believe the message is important and sensible (positive attitude, but they could just be evaluating the message itself and not their own reaction to it. This issue provides additional insight to a ceiling effect occurring with the Reactance Attitude scale as if the questionnaire is not measuring what it is intended to measure, it is likely people might be evaluating the message itself. In turn, it may be more likely for a ceiling effect to occur as the scale is skewed.

Emotional Reactance

For the Seat Belt Use and Distracted Driving messages, there was support for the hypothesis that reactance proneness increases psychological reactance (H4) in the form of emotional reactance, as shown by the covariate analysis. For the Seat Belt Use messages, the Partial Eta of 0.194 indicates a large effect of Emotional Reactance on Total Proneness with a sample size providing ample power (1.00). In turn, this provides stronger support for the statistical significance of H4.

For the Distracted Driving messages, there was support for the hypothesis that we expect a significant relationship between individual reactance proneness and psychological reactance (H4) as shown by the covariate analysis. Additionally, the Partial Eta of 0.21 indicates a large effect of Emotional Reactance on Total Proneness, with the sample size providing ample power (1.00). In turn, the overall support for H4 is stronger due to the large effect size and sample power. These results suggest that the amount of Emotional Reactance experienced was greater as proneness to reactance (Total Proneness) increased.

For the Distracted Driving messages, there was a significant main effect of message threat where participants experienced less emotional reactance for the low threat messages compared to the high threat messages (H1). However, the significance of the main effect may be more limited due to effect size and sample power. The Partial Eta of 0.01 indicate a small effect of message threat on Emotional Reactance with a sample size providing moderate power (0.65). Thus, we can only be confident that the statistical significance relates to small practical effects and the moderate power of the sample. These results suggest that the amount of Emotional Reactance experienced was greater as proneness to reactance (Total Proneness) increased. Furthermore, the results show that the trait of reactance proneness can increase the Emotional Reactance experienced in low threat messages. With that said, high threat messages tend to produce stronger Emotional Reactance that is independent of reactance proneness.

The results of our study are comparable with that of Chen (2013), but it should be noted that Chen's study split participants into high/low threat message groups, whereas our study presents all message conditions to each individual. Chen (2013) defined strength of reactance as the measure of the feelings that occurred when reading a message. We referred to this as emotional reactance as it was strictly dealing with the feelings that occurred after reading a message and participants were asked to report their emotional reaction. Chen (2013) found that the mean strength of reactance was higher for the high threat condition than the low threat condition. Thus, there was a similar pattern of high threat messages eliciting more psychological reactance. This supports the idea

that low threat messages might lead to less reactance experienced, which is especially important for effective traffic safety messaging.

Threat to Freedom

For the Seat Belt Use and Distracted Driving messages, there was support for the hypothesis that reactance proneness increases psychological reactance (H4) in the form of perceived Threat to Freedom, as shown by the covariate analysis. For the Seat Belt Use messages, the Partial Eta of 0.29 indicates a large effect of Threat to Freedom on Total Proneness with a sample size providing ample power (1.00). In turn, this provides stronger support for the statistical significance of H4.

For the Distracted Driving messages, there was a significant main effect of message threat where participants experienced less threat to freedom for the low threat messages compared to the high threat messages (H1). In addition to the significant main effect, it should be noted that although the effect size is small, the large sample ensured more power for the effect. The Partial Eta of 0.054 indicated a small effect of message threat on Threat to Freedom with a sample size providing ample power (1.00). Thus, we can say the statistical significance relates to small practical effects.

There was support for the hypothesis that we expect a significant relationship between individual reactance proneness and psychological reactance (H4) as shown by the covariate analysis. Additionally, the Partial Eta of 0.29 indicates a large effect of Threat to Freedom on Total proneness, with the sample size providing ample power (1.00). In turn, the overall support for H4 is stronger due to the large effect size and sample power. These results suggest that the amount of Threat to Freedom experienced

was greater as proneness to reactance (Total Proneness) increased. This also suggests that proneness – as an internal trait – can increase reactance (Threat to Freedom) in low threat messages. However, high threat messages may impose an external influence on everyone, regardless of their proneness to reactance.

Comparing our results to other studies, Chen (2013) found a significant effect where the high threat messages were perceived as a greater threat to freedom than the low threat messages. Dillard and Shen (2005b) also found the high threat condition participants experienced a greater threat to freedom than low threat condition participants. With that said, it is important to remember that these studies did not expose everyone to each message. Instead, there was a high threat and low threat group. Consequently, it is further evident that threat to freedom is the more sensitive measure of the reactance components in this study and that low threat messages could be promising in reducing reactance towards driver safety messages.

Issues with the Seat Belt Messages

From this analysis, it is apparent that the message condition (threat / reflection) did not seem to affect reactance as hypothesized for the Seat Belt messages. Emotional Reactance and Threat to Freedom were only significantly influenced by message threat level for the Distracted Driving messages. We can look at the pilot study and the main study to compare any differences and why they might have occurred. The pilot study found that the largest difference between the highest condition (high threat/non-reflective) and lowest condition (low threat/reflective) occurred in the Threat to Freedom measure. However, a similar effect did not occur in the main study. The pilot study found

that the largest difference between the highest condition (high threat/non-reflective) and lowest condition (low threat/reflective) occurred in the Emotional Reactance and Threat to Freedom measures. The Emotional Reactance measure for the Seat Belt messages had a difference of 0.35 whereas the Distracted Driving messages had a difference of 0.71. The Threat to Freedom measure for the Seat Belt Use messages had a difference of 0.71 and the Distracted Driving messages had a difference of 0.65. This could be attributed to a much smaller sample size of 25 participants compared to 675 in the main study. Additionally, the pilot study sample was all college students from an Industrial Engineering course, with males being the majority. On the other hand, the main study was comprised of multiple age groups and 49.5% of participants identified as male and 49.5% identified as female. The Seat Belt Messages may have appeared to work for the pilot study because of the small sample size, unlike the larger sample of the main study.

Another possible reason there was no reactance with the seatbelt messages may be more people were used to seatbelt messages than distraction messages. Campaigns promoting seat belt use have been around for a long time and there was a possibility that many people are just too familiar with them for there to be an effect. In this case, they may have already accepted these messages such that there was no longer any reactance. Similarly, most of the participants (81%) said they always wear a seat belt, which means they may have deemed the seatbelt messages to not be relevant to them. More investigation into seat belt use campaigns and the general familiarity the public has with them may highlight why there was an issue in this study. Additionally, it could provide

insight that identifies better ways to develop effective traffic safety messaging pertaining to seat belt use.

Message Threat Manipulation

For the Distracted Driving messages, threat manipulation seemed to be effective as the low threat messages consistently resulted in less psychological reactance. Threat was manipulated by using controlling vs. non-controlling language, as mentioned in the methodology. There were similarities between our study and Chen (2013), even though their messages were short paragraph format and ours were 1 – 2 short sentences, the threat manipulation was significant in each study, again showing that low threat messages were more effective at reducing reactance. Dillard and Shen (2005b) used a similar message format and found significant effects with message threat and the perceived threat to freedom. This further supports our findings as Threat to Freedom appeared to be the stronger measure of reactance, especially when looking at the differences between low and high threat conditions. Our messages may have been much shorter in length, but this did not seem to diminish the effect of message threat.

Message Reflection Manipulation

For both driving behaviors, the message reflection manipulation was ineffective. One issue may be that the reflective message conditions were unsuccessful in effectively eliciting a reflective reactance process. The reflective reactance process is more likely to occur when threats occur at the end of a messages rather than the beginning. However, with such short messages in our study, it is difficult to see whether the reflection worked or not. Moreover, in order to propose a question where an individual considers another

person's point of view towards the message, the question only made sense by placing it as the second sentence in the safety messages. In turn, the reflective reactance element may have made the messages awkward or may not be applicable to the context of driver safety messaging. The messages became longer in length when adding the reflective component in the form of a question, but it may not have been enough to elicit a reflective process. Again, the potential threat occurs prior to the reflective question and this makes it difficult to measure how well the process was working. Participants may not have reflected about their choice regarding the message as intended, which might explain the lack of significance for reflection. Overall, the study found that a reflective reactance process may not be applicable to driver safety messaging involving Seat Belt Use messages. Furthermore, the lack of significant findings could be due to message design errors or the driving behavior being addressed. It is possible that some individuals simply do not respond as well to the Seat Belt messages.

Future Research Considerations and Improvements

There are numerous considerations to account for when proposing future research on this topic. One way the study could be improved is to try including more items out of Dillard and Shen's intertwined model. It measures additional factors that pertain to psychological reactance that might help expand the analysis and offer more insight into effects. This would require more time and resources than were feasible for the study at hand, which is why the exact model was not replicated, but rather some of the most important measures. Additionally, attitude seems to be a problematic measure given that our study and Chen (2013) were not able to find significant differences. Thus,

reexamining the measure of attitude is crucial, whether it may be that it is not needed in the model or if there is a better way to measure it. More research is necessary to evaluate attitude, and perhaps a similar study focusing on different ways of measuring attitude would reveal a better assessment to be used.

The most problematic issued to be addressed in future research is the measure of attitude, with no significant effects, and a potential ceiling effect being responsible. As mentioned previously, the way the question was presented and structure of the scale may have been confusing. The semantic differential scale could be altered such that the opposing adjective pairings alternate for each item. Instead of having the negative adjective on the left, and the positive adjective on the right of the scale, they would be swapped and alternate between scale items. Thus, participants would have to more consciously consider the ratings of each item, as it is not just good ratings on the right, bad ratings on the left of the scale. Another proposal would be to alter the format to shift from a semantic scale to a Likert type scale. Instead of opposing adjectives like (Unimportant:Important), a 4-point scale could be designed around importance, such as: 1) Not at all important, 2) Somewhat important, 3) Important, 4) Very important. This might be clearer for participants to see the difference in the ratings. Further pilot testing of this measure could help clear up some inconsistencies that were observed and hopefully mitigate any ceiling effect.

A larger pilot study sample for the card sorting activity in which message selection occurred may be beneficial to selecting the best messages. A sample of $N = 6$ was small, and it was not feasible to gather more participants during the limited time this

data was collected. Even though the card sorting results seemed to hold true for the pilot test of the survey, using a sample of $N = 25$, the sample size could be increased to have greater significance and to more accurately reflect the larger population size.

An alternative proposal would be to look at message threat manipulation without the additional variable of reflection. Dropping reflection could reveal more about the relationship of message threat to psychological reactance measures. Or, one could look at other ways to create a more effective and reliable measure for manipulating message reflection. Reflection did not have significant effects and may have caused issues in the reactance measures by making the messages more confusing or taking away from the effect that threat was having. This could be attributed to the process of inducing a reflective reactance process possibly not being appropriate for driver safety messaging. The purpose was to influence people to think about their choices and actions regarding a message, how they might affect others, and what opinions family/friends would have of the choice they make. Creating reflective messages extended the length of the message compared to the non-reflective condition, which could have impacted the readability. In turn, message reflection did not end up being relevant for the study and it may need more research to determine what the root issue is.

Our study exposed everyone to all the messages rather than splitting them into high-threat and low-threat groups. Instead of splitting the groups, we exposed participants to two different message sets, one for each driving behavior. Thus, the method we used has not been studied before. Additionally, Chen implemented more measures proposed by Dillard and Shen's intertwined process model. Our study was limited to a simplified

model, and it was only feasible to look at attitude, emotional reactance, and threat to freedom. We determined survey fatigue could become a factor with how long the survey already was, which is why negative cognitions and behavioral intention were not measured. This may have unforeseen effects on the results and conclusions as we cannot look at the negative cognitions and behavioral intentions of participants to see how those measures relate to attitude, emotional reactance, and threat to freedom.

Conclusions and Recommendations

Contributions to Existing Field of Research

The study provided significant contributions to the field of research regarding reactance and traffic safety messaging. In summary, the study:

- Demonstrated effect of threat on short messages
- Showed relationship of proneness to reactance with short traffic safety messages
- Attempted to explore ways to vary reflective reactance
- Confirmed previous research that attitude may not be good measure of reactance

The study showed that message threat has a significant effect on short traffic safety messages such that low threat messages can effectively reduce perceived threat to freedom. It also depicts the relationship of proneness to reactance in short traffic safety messages, whereas proneness to reactance increases, so does the resulting reactance experienced. The study explored ways to vary message reflection which showed that it

may not be effective with short traffic safety messages – at least using the method of creating reactance used in this study. Additionally, the study confirmed previous research findings that show attitude may not be a good measure of reactance.

Recommendations and Research Synopsis

Despite some differences in study design, Dillard and Shen (2005b) found a significant correlation between reactance proneness and the reactance experienced. With our findings supporting this as well, it can be recommended that the relationship between proneness and reactance not be overlooked and instead must be considered when designing messages. Moreover, from the results of our study and the comparisons to similar studies, message threat is a sensitive measure that can influence how a message is perceived. The following recommendations can be made regarding how to design traffic safety messages that are less threatening and that can help reduce the psychological reactance experienced:

1. Messages should use non-controlling language (*consider, can, could, may, try*) over controlling language (*should, ought, must, need*)
2. Messages should aim to be suggesting (*try to do this*), rather than commanding (*you MUST do this!*)
3. Avoid creating messages that might be perceived as highly threatening

Additionally, the goal of a message should be to elicit a reaction where an individual considers their own safety to reduce dangerous driving behavior. We reaffirm the position taken by Dillard and Shen (2005b) in that high threat messages should be

avoided. Messages that come across as too persuasive or forceful will only increase the likelihood that people do not follow the messages, especially if an individual has a higher proneness of experiencing reactance. With that being said, it will be important to evaluate messages and different manipulations with high proneness individuals, as those are the people who are at a higher risk of engaging in such behaviors based on reactance (Rains, 2013).

Designing traffic safety messages is a sensitive process and the factors of message manipulation need to be selected carefully. Although the results from the Seat Belt Use messages were disappointing, there was still evidence of a positive relationship between reactance proneness and the psychological reactance measures Emotional Reactance and Threat to Freedom. For messages pertaining to Distracted Driving, it is evident that message threat could have a significant impact on the threat to freedom that individual's experience after being exposed to the message. Furthermore, the significance of message threat in our study reflects Steindl et al. (2015), as both studies found that designing messages with non-controlling language, the low-threat condition, will lead to less threatening reactions. These studies highlight the importance of psychological reactance and why we must understand it, account for it, and work towards reducing negative reactance in traffic safety messaging.

Overall, the hypothesis that reactance proneness is a trait that exacerbates psychological reactance was supported for both the Seat Belt Use and Distracted Driving messages, but only with Emotional Reactance and Threat to Freedom. Still, there is enough evidence to conclude that for these measures of reactance, individuals with a

higher reactance proneness often had an increased response. Moreover, the use of the HPRS as a unidimensional measure of individual reactance proneness proved to be a successful and reliable way to measure reactance proneness. The relationship between reactance proneness and psychological reactance for the Emotional Reactance and Threat to Freedom measures will be important to consider when designing driver safety messages. With evidence depicting that as proneness increases, the Emotional Reactance and Threat to Freedom experienced by an individual also increased, we must consider the sensitivity of individual proneness. In turn, it is evident that designing messages by implementing a low-threat format would be beneficial in reducing the psychological reactance experienced.

REFERENCES CITED

- Brehm, J. W. (1966). *A theory of psychological reactance*. New York, NY: Academic Press.
- Chen, Y. (2013). The effect of psychological reactance on acceptance of campaign message: A case of "stop texting while driving" campaign in college students. *Graduate Theses and Dissertations*. <https://doi.org/10.31274/etd-180810-3528>
- Cho, H., & Sands, L. (2011). Gain- and loss-frame sun safety messages and psychological reactance of adolescents. *Communication Research Reports*, 28, 308–317. doi: 10.1080/08824096.2011.616242
- Dillard, J. P., & Shen, L. (2005a). Psychometric properties of the Hong psychological reactance scale. *Journal of Personality Assessment*, 85, 74-81. doi: 10.1207/s15327752jpa8501_07.
- Dillard, J. P., & Shen, L. (2005b). On the nature of reactance and its role in persuasive health communication. *Communication Monographs*, 72, 144–168. doi: 10.1080/03637750500111815
- Dillard, J. P., & Shen, L. (2006). Reactance Proneness Assessment. *Electronic Surveys and Measurements*. 323-329. doi: 10.4018/978-1-59140-792-8.ch043.
- Gardner, E., & Leshner, G. (2015). The Role of Narrative and Other-Referencing in Attenuating Psychological Reactance to Diabetes Self-Care Messages. *Health communication*. 31. 1-14. 10.1080/10410236.2014.993498.
- Hong, S. M., & Faedda, S. (1996). Refinement of the Hong psychological reactance scale. *Educational and Psychological Measurement*, 56(1), 173-182. Web.
- Howe, A. (2018a). *Ceiling and Floor Effects*. Retrieved April 20, 2020 from <https://www.cs.colostate.edu/~howe/EMAI/ch3/node7.html>.
- Howe, A. (2018b). *How to Detect Ceiling and Floor Effects*. Retrieved April 20, 2020 from <https://www.cs.colostate.edu/~howe/EMAI/ch3/node8.html>.
- Jonason, P. K., & Knowles, H. M. (2006). A unidimensional measure of Hong's psychological reactance scale. *Psychological reports*, 98(2), 569-579. Web.
- Kinnear, N., & Stevens, A. (2015). The battle for attention: Driver distraction – a review of recent research and knowledge. *TRL: IAM Driver Distraction Report*. <https://trl.co.uk/sites/default/files/PPR746%20-%20The%20battle%20for%20attention%20Driver%20distraction%20%E2%80%93%20a%20review%20of%20recent%20research%20and%20knowledge.pdf>
- Li, R., & Pickrell, T. M. (2018). *Seat belt use in 2017—overall results*. (Traffic Safety Facts Research Note. Report No. DOT HS 812 465). Washington, DC: National Highway Traffic Safety Administration.

- Mallon, K. F. (1992). A scale for assessing psychological reactance proneness: Reliability and validity. *ETD collection for University of Nebraska - Lincoln*. <http://digitalcommons.unl.edu/dissertations/AAI9225482>
- National Cooperative Highway Research Program. (2004). *Guidance for implementation of the AASHTO strategic highway safety plan: A guide for increasing seatbelt use* (NCHRP Report 500/Volume 11/Project G17-18(3)). Washington, DC: The National Academies Press.
- National Cooperative Highway Research Program. (2005b). *Guidance for implementation of the AASHTO strategic highway safety plan: A guide for reducing collisions involving drowsy and distracted drivers* (NCHRP Report 500/Volume 14/Project 17-18(3)). Washington, DC: The National Academies Press.
- National Highway Traffic Safety Administration. (2018a). Risky Driving. <https://www.nhtsa.gov/risky-driving>
- Quick, B. L. (2012). What is the best measure of psychological reactance? An empirical test of two measures. *Health Communication*, 27(1), 1–9. <http://dx.doi.org/10.1080/10410236.2011.567446>
- Rains, S. A. (2013). The Nature of Psychological Reactance Revisited: a Meta-Analytic Review. *Human Communication Research*, 39(1), 47-73. <https://srains.web.arizona.edu/sites/srains.web.arizona.edu/files/Rains2013HCR.pdf>
- Steindl, C. S., Jonas, E., Sittenthaler, S., Traut-Mattausch, E., Greenberg, J. (2015). Understanding psychological reactance. *Zeitschrift für Psychologie*, 223(4), 205–214. doi:10.1027/2151-2604/a000222
- Taber, K. S. (2018). The Use of Cronbach’s Alpha When Developing and Reporting Research Instruments in Science Education. *Research in Science Education*, 48, 1273–1296. <https://doi.org/10.1007/s11165-016-9602-2>
- Toward Zero Deaths Steering Committee. (2014). Toward zero deaths: a national strategy on highway safety – 2014. http://www.towardzerodeaths.org/wpcontent/uploads/TZD_Strategy_12_1_2014.pdf

APPENDICES

APPENDIX A

DEMOGRAPHIC QUESTIONNAIRE – ADAPTED FROM DULA (2003)

Q1.1 SUBJECT CONSENT FORM FOR PARTICIPATION IN HUMAN RESEARCH
AT MONTANA STATE UNIVERSITY

Title of Project: Reactance and Effects on Driver Safety Messaging

Investigator: Asher Townsend

Introduction: You are being asked to participate in a research study that is testing driver safety messaging and the effectiveness of messages. This may help us obtain a better understanding of why drivers behave in certain ways and how safety messages could be used to help drivers exhibit safer behaviors.

Procedure: We are interested in understanding different slogans and messages used in driver safety campaigns. The study should take you around 30 minutes to complete. Your participation in this research is voluntary. You have the right to withdraw at any point during the study, for any reason, and without any prejudice. If you agree to participate you will be presented with information relevant to driver safety campaigns and asked to answer some questions about it. You will also be instructed to evaluate messages. This will require you to answer questions regarding your feelings towards the messages and what your thoughts were about them.

Confidentiality: Please be assured that your responses will be kept completely confidential. If you would like to contact the Principal Investigator, Asher Townsend, in the study to discuss this research, please e-mail [asher.townsend@montana.edu].

If you have additional questions about the rights of human subjects, you can contact the Chair of the Institutional Review Board for Montana State University, Mark Quinn, at (406) 994-4707 [mquinn@montana.edu].

By clicking the button below, you acknowledge that your participation in the study is voluntary, you are 18 years of age, and that you are aware that you may choose to terminate your participation in the study at any time and for any reason. Please note that this survey will be best displayed on a laptop or desktop computer. Some features may be less compatible for use on a mobile device.

- I consent, begin the study (1)
- I do not consent, I do not wish to participate (2)

Q2.1 What is your age (in years)?

- 18 - 24 (1)
- 25 - 34 (2)
- 35 - 44 (3)
- 45 - 64 (4)

Q2.2 Gender:

- Male (1)
- Female (2)
- Non-binary/third gender (3)
- Prefer to self-describe (4)
- Prefer not to say (5)

Q2.3 In what year did you receive your driver's license?

Q2.4 On average, how many days per week do you drive?

- One (1)
- Two (2)
- Three (3)
- Four (4)
- Five (5)
- Six (6)
- Seven (7)

Q2.5 How many speeding tickets have you been given over the past 12 months?

- None (1)
- 1 (2)
- 2 (3)
- 3 (4)
- 4 (5)
- 5 (6)
- More than 5 (7)

Q2.6 How often do you wear a seat belt while driving?

- Never (1)
- Rarely (2)
- Sometimes (3)
- Often (4)
- Always (5)

Q2.7 In the past 12 months, how many vehicle crashes (even minor ones) have you been in where you were at fault?

Q3.1 Please answer questions as honestly as possible. Please read each item carefully and then click the circle of the answer you believe is most accurate. If none of the choices seem to be your ideal answer, then select the answer that comes closest. THERE ARE NO RIGHT OR WRONG ANSWERS. Select your answers quickly and do not spend too much time analyzing your answers.

APPENDIX B

HONG PSYCHOLOGICAL REACTANCE SCALE

Hong Psychological Reactance Scale (HPRS)

Factors: Emotional response, reactance to compliance, resisting influence from others, reactance to advice/recommendations (* item excluded in the 11-item model to be used)

5-point Likert scale: 1 – strongly disagree to 5 – strongly agree

Emotional response toward restricted choice

- 4*. The thought of being dependent on others aggravates me.
- 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.

Reactance to compliance

- 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.”
- 14*. It disappoints me to see others submitting to society’s standards and rules.

Resisting influence from others

- 10*. I am contented 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.

Reactance to advice and recommendations

- 5. I consider advice from others to be an intrusion.
- 9. Advice and recommendations usually induce me to do just the opposite.

APPENDIX C

SEAT BELT AND DISTRACTED DRIVING MESSAGE SETS

Seat Belt Use Messages	
High Threat/Reflective	High Threat/Not Reflective
Buckle Up! Every Trip. Every Time. It's a simple click, and it will save your life. Would your family want you to make that simple click?	Buckle up! Every trip. Every time. It's a simple click, and it will save your life.

Seat Belt Use Messages	
Low Threat/Reflective	Low Threat/Not Reflective
Try to buckle up for every trip, every time. A simple click may save your life. Would your family want you to make that simple click?	Try to buckle up for every trip, every time. A simple click may save your life.

Distracted Driving Messages	
High Threat/Reflective	High Threat/Not Reflective
Put your phone down NOW! Control your fate and NEVER drive distracted!	Put your phone down NOW. Control your fate and NEVER drive distracted! What would your family and friends tell you to do?

Distracted Driving Messages	
Low Threat/Reflective	Low Threat/Not Reflective
Consider putting your phone down: try not to drive distracted and you can control your fate. What would your family and friends want you to do?	Consider putting your phone down. Try not to drive distracted and you can control your fate.

APPENDIX D

PSYCHOLOGICAL REACTANCE MEASURES QUESTIONNAIRE

Attitude

Please indicate the extent to which these adjectives accurately describe your opinion about the message.

I believe the message is:

Not at all convincing	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Very convincing
Not at all persuasive	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Very persuasive
Not sensible	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Sensible
Unimportant	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Important
Foolish	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Wise
Wrong	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Right

Emotional Reactance Experienced

Using the following emotions, rate your emotional reaction to the message.

After reading the message, to what extent do you feel:

	None of this feeling	A little bit of this feeling	Some of this feeling	Much of this feeling	A great deal of this feeling
Irritated	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Angry	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Annoyed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aggravated	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Threat to Freedom

Based on the message, please indicate your responses to the following statements:

	Strongly disagree	Disagree	Neutral / I don't know	Agree	Strongly agree
The message threatened my freedom to choose.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The message tried to make a decision for me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The message tried to manipulate me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The message tried to pressure me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX E

PILOT STUDY

Participants

Participants will be recruited from a course taught by Montana State University professor Dr. David Claudio. There may be fewer participants for the card sorting portion, due to the limited access of a sample over the summer session.

Location Montana State University & Qualtrics online survey

Approval

All surveys and methods utilized in the study have obtained Montana State University IRB approval.

Purpose

The goal of the first pilot study (PS-A) is to test four groups of message sets for each of the driving behaviors (*see Appendix D*). A card sorting study was initially completed in order to verify that the messages would be categorized properly. This is important as if a message is perceived differently to what is intended, then the message may not provide a reliable measure. In turn, participants will help identify which questions are sorted the most accurately. A separate pilot test (PS-B) of the initial survey is completed in order to further verify and select effective and reliable messages. This will also help test the survey for inconsistencies or any unforeseen issues with the HPRS, DDDI, and reactance scales used. By using data from both pilot studies, the final message set can be converged upon.

Procedure

PS-A: Participants are told that they will be sorting messages into different categories and that it is based solely from their own reactions and opinions of the messages. All participants will sort 4 different message sets for each of the three driving behaviors: seat belt use, speeding, and distracted driving. They are informed of which behavior they will be sorting messages for each time. Participants are then told that after they read a card, they can place it into one of four groups based on how threatening they feel the message is and whether the message tries to persuade them to account for another's point of view, referred to as reflective reactance.

PS-B: Participants will complete pre-test questionnaires for dangerous driving behavior, reactance proneness, and pre-existing attitude toward driving behaviors. Participants are split into four groups (A,B,C,D) to test a variety of messages. After each message, participants complete a short questionnaire for three measures: attitude, emotional reactance experienced, and threat to freedom. Participants will repeat the process of reading a message and evaluating it until they have answered all messages in their respective group.

Methods/Measures

Driving Behavior Messages

Messages were created based off of common driving safety campaigns. The messages were then altered across various conditions determined by the factors of message threat and reflective reactance (*see Message Forcefulness section for further explanation*).

Pilot Study A: Card Sorting Activity

The message accuracy is based on correct placement by high or low threat, as well as reflective or non-reflective. This means someone could place a message in the correct threat condition, but incorrectly place it in the wrong reflectance condition. Each group has a different set of messages and is presented with four questions for each of the three driving behaviors. The four messages are each at a different level of message forcefulness based on message threat and reflective reactance. Example: All conditions have 4 message groups, which were sorted by 6 different people, thus for the Seat Belt Messages, and looking at the #3 condition, a total of 24 correct placements is possible (4 for each participant).

Pilot Study B: Survey

With the results of the survey, a mean response comparison will be used to look for the highest difference (HN – LR) between the most reactive (HN) and least reactive (LR) message conditions. The goal is to converge on the best group of messages based on this difference and the importance of the behavior measures: Reactance > Threat >> Attitude. Attitude is not as important because reactance and threat are hypothesized to be much more significant variables and result in stronger relationships. Moreover, this difference may result in attitude being much weaker, having less impact on other measures.

PS-A Results

A total of 6 participants sorted all the messages. The sample size was small for the sorting activity, which will be accounted for when drawing any conclusions based off the

data. The sorting of the seat belts messages found Group D was most accurately sorted with 79% of sorted correctly. For the speeding messages, Groups A, B, and D all had 75% of their messages sorted correctly. For the distracted driving messages, 83% of Group A messages were sorted correctly. *Figure 4* depicts the message placement accuracy of the card sorting study.

Figure 4. Card Sorting for Message Placement Accuracy

Seat Belt Msgs								24
1a	4	2a	4	3a	3	4a	5	0.666667
1b	2	2b	5	3b	3	4b	4	0.583333
1c	1	2c	2	3c	6	4c	3	0.5
1d	5	2d	3	3d	6	4d	5	0.791667
Speeding Msgs								24
1a	5	2a	4	3a	4	4a	5	0.75
1b	5	2b	6	3b	4	4b	3	0.75
1c	3	2c	3	3c	6	4c	5	0.708333
1d	4	2d	3	3d	6	4d	5	0.75
Distracted Msgs								24
1a	3	2a	5	3a	6	4a	6	0.833333
1b	4	2b	5	3b	4	4b	2	0.625
1c	2	2c	5	3c	5	4c	3	0.625
1d	2	2d	4	3d	6	4d	5	0.708333

PS-B Results

A total of 25 participants completed the survey for the pilot test. The best message sets for each behavior are split by the primary dependent variables of attitude, reactance experienced, and threat to freedom. For the Speeding messages, sets B, C, and D were identified as feasible. For Seat Belt messages, B and D were feasible. For the Distracted

Driving messages, sets A and C were feasible. The strength of the mean response and how many times a set appears were the factors in converging on the final message sets. The best message sets based on mean response are: Speeding – Group B, Seat Belt – Group D, Distracted – Group A; see *Figure 5 – 8*.

Figure 5. Mean Response Comparison

Behavior	Attitude	Reactance Experienced	Threat to Freedom	Message Set to Use
Speeding	B	C,D	B	B
Seat Belt	B	D	D	D
Distracted	A,C	A	A,C	A

Figure 6. Mean Response Comparison for Speeding Messages

	Speed_Attitude_HN	Speed_Attitude_HR	Speed_Attitude_LN	Speed_Attitude_LR	HN - LR
A	4.083333333	4	4.638888889	4.083333333	0
B	4.5	5.5	5.583333333	5.416666667	-0.916666667
C	6.033333333	4.666666667	5.366666667	6.333333333	-0.3
D	5.238095238	5.357142857	5.142857143	5.238095238	0
					Group B

	Speed_ReactanceExp_HN	Speed_ReactanceExp_HR	Speed_ReactanceExp_LN	Speed_ReactanceExp_LR	HN - LR
A	2.17	1.92	2.21	2.04	0.125
B	2.63	3.19	2.63	2.50	0.125
C	1.25	1.70	1.05	1.00	0.25
D	2.11	2.00	1.68	1.89	0.21
					Group C/D

	Speed_Threat_HN	Speed_Threat_HR	Speed_Threat_LN	Speed_Threat_LR	HN - LR
A	2.5	2.333333333	2.5	2.5	0
B	2.8125	2.8125	2.5	2.4375	0.375
C	1.55	1.8	1.75	1.5	0.05
D	2.392857143	2.607142857	2.321428571	2.678571429	-0.285714286
					Group B

Figure 7. Mean Response Comparison for Seat Belt Messages

	SeatBelt_Attitude_HN	SeatBelt_Attitude_HR	SeatBelt_Attitude_LN	SeatBelt_Attitude_LR	HN - LR
A	4.805555556	4.055555556	4.722222222	4.972222222	-0.166666667
B	5.25	4.166666667	5.916666667	5.5	-0.25
C	6.133333333	6.166666667	5.266666667	5.766666667	0.366666667
D	5.761904762	5.642857143	5.357142857	5.452380952	0.30952381
					Group B

	SeatBelt_ReactanceEx p_HN	SeatBelt_ReactanceEx p_HR	SeatBelt_ReactanceEx p_LN	SeatBelt_ReactanceEx p_LR	HN - LR
A	2.00	2.00	1.88	2.04	-0.041666667
B	2.44	2.88	2.94	3.00	-0.5625
C	1.20	1.35	1.10	1.10	0.1
D	1.86	2.21	1.75	1.50	0.357142857
					Group D

	SeatBelt_Threat_HN	SeatBelt_Threat_HR	SeatBelt_Threat_LN	SeatBelt_Threat_LR	HN - LR
A	2.375	2.416666667	2.208333333	2.25	0.125
B	2.8125	2.625	2.875	2.5625	0.25
C	1.45	1.4	1.35	1.4	0.05
D	2.857142857	2.928571429	2.5	2.142857143	0.714285714
					Group D

Figure 8. Mean Response Comparison for Distracted Driving Messages

	Distracted_Attitude_H N	Distracted_Attitude_H R	Distracted_Attitude_L N	Distracted_Attitude_L R	HN - LR
A	4.388888889	5	4.944444444	5.166666667	-0.777777778
B	5.333333333	5.291666667	5.541666667	5.541666667	-0.208333333
C	5.433333333	5.4	6.1	6.066666667	-0.633333333
D	5.595238095	5.357142857	5.119047619	5	0.595238095
					Group A/C

	Distracted_ReactanceE xp_HN	Distracted_ReactanceE xp_HR	Distracted_ReactanceE xp_LN	Distracted_ReactanceE xp_LR	HN - LR
A	2.63	2.00	1.88	1.92	0.708333333
B	2.44	2.00	2.00	2.00	0.4375
C	1.55	1.30	1.05	1.00	0.55
D	1.61	1.43	1.96	1.43	0.178571429
					Group A

	Distracted_Threat_HN	Distracted_Threat_HR	Distracted_Threat_LN	Distracted_Threat_LR	HN - LR
A	2.75	2.083333333	2.208333333	2.166666667	0.583333333
B	2.5	2.5	2.5625	2.625	-0.125
C	1.95	1.5	1.15	1.3	0.65
D	2.642857143	2.428571429	2.535714286	2.178571429	0.464285714
					Group A/C

Summarizing Pilot Study

Based on the card sorting data, the following conclusions can be made regarding the best message sets: Group A, B, and D are all viable sets for Speeding, Group D is viable for Seat Belt, and Group A is viable for Distracted Driving. Messages that were poorly sorted may indicate they did not work as intended and did not prompt the correct response i.e.: a message that is written as High Threat and Non-reflective, but the participant places the message in the Low Threat and non-reflective. This highlights the importance of selecting and converging on a set of messages. If poorly sorted messages were used, it would negatively impact the data gathered, rendering it useless for testing the hypotheses sufficiently. The most important conclusion of the pilot study is that the card sorting activity and mean response analysis both converged toward the same message sets: B, D, and A. This relationship further verifies that the messages selected for the final study are the most effective and reliable. Regarding the driving behaviors addressed in the study, the Speeding behavior is dropped for the final survey in order to reduce the completion time and limit any survey fatigue. Going forward, mention of the driving behaviors instead refers to just Distracted Driving and Seat Belt Use.

APPENDIX F

DULA DANGEROUS DRIVING INDEX (©1999, DULA, C.S.)

Dula Dangerous Driving Index (DDDI)
DDDI Dangerous Driving Total Score = Add all items
NCE = Negative Cognitive/Emotional Driving Subscale = Add NCE items
AD = Aggressive Driving Subscale = Add AD items
RD = Risky Driving Subscale = Add RD items.

Notes: Subscale items are denoted as follows: Aggressive Driving = AD; Negative Emotions While Driving = NE; Risky Driving = RD. Participants responded to the items with the following Likert scale: A. Never, B. Rarely, C. Sometimes, D. Often, and E. Always. Participants received the following written directions:

Please answer each of the following items as honestly as possible. Please read each item carefully and then fill in the bubble/circle of the answer you choose on the form. If none of the choices seem to be your ideal answer, then select the answer that comes closest. THERE ARE NO RIGHT OR WRONG ANSWERS. Select your answers quickly and do not spend too much time analyzing your answers. You may change any answer(s) at any time before completing this form. If you do change an answer please erase the previous mark(s) entirely.

NCE: 1. I drive when I am angry or upset.

NCE: 2. I lose my temper when driving.

NCE: 3. I consider the actions of other drivers to be inappropriate or “stupid.”

AD: 4. I flash my headlights when I am annoyed by another driver.

AD: 5. I make rude gestures (e.g., giving “the finger”; yelling curse words) toward drivers who annoy me.

AD: 6. I verbally insult drivers who annoy me.

AD: 7. I deliberately use my car/truck to block drivers who tailgate me.

AD: 8. I would tailgate a driver who annoys me.

RD: 9. I “drag race” other drivers at stop lights to get out front.

RD: 10. I will illegally pass a car/truck that is going too slowly.

AD: 11. I feel it is my right to strike back in some way, if I feel another driver has been aggressive toward me.

NCE: 12. When I get stuck in a traffic jam I get very irritated.

RD: 13. I will race a slow moving train to a railroad crossing.

RD: 14. I will weave in and out of slower traffic.

RD: 15. I will drive if I am only mildly intoxicated or buzzed.

AD: 16. When someone cuts me off, I feel I should punish him/her.

NCE: 17. I get impatient and/or upset when I fall behind schedule when I am driving.

NCE: 18. Passengers in my car/truck tell me to calm down.

NCE: 19. I get irritated when a car/truck in front of me slows down for no reason.

RD: 20. I will cross double yellow lines to see if I can pass a slow moving car/truck.

RD: 21. I feel it is my right to get where I need to go as quickly as possible.

NCE: 22. I feel that passive drivers should learn how to drive or stay home.

RD: 23. I will drive in the shoulder lane or median to get around a traffic jam.

RD: 24. When passing a car/truck on a 2-lane road, I will barely miss on-coming cars.

RD: 25. I will drive when I am drunk.

NCE: 26. I feel that I may lose my temper if I have to confront another driver.

RD: 27. I consider myself to be a risk-taker.

RD: 28. I feel that most traffic “laws” could be considered as suggestions