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Zika Message Analysis

Alexandria Phipps

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ZIKA MESSAGE ANALYSIS

by

Alexandria L Phipps

A Thesis

Submitted to the Graduate School,
the College of Arts and Sciences
and the School of Communication
at The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Master of Arts

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ABSTRACT

The following study employs the Extended Parallel Processing Model and Theory of Planned Behavior to understand how to create health messages with the greatest influence on individuals' behavioral intent to adopt mosquito-borne virus protection behaviors. The study employs a 2 (susceptibility) x 2 (self-efficacy) factorial design, evenly distributing the participants between four messages (N=186). Although the self-efficacy manipulation was ultimately unsuccessful, the findings highlighted the significance of perceived susceptibility on one's intent to adopt protective behaviors. The results exemplify the importance of the theoretical critical point of the EPPM, where danger control shifts to fear control, and the importance of balance between perceived susceptibility and efficacy. Other determining factors of behavioral intention included descriptive and injunctive norms, or the perceptions of others' beliefs and behaviors toward a recommended health behavior. Conclusions from the current study aid in further understanding how to create influential and effective behavior-change health messages.

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DEDICATION

This thesis is dedicated to my family and friends. First, thank you to my family, specifically my incredible parents for teaching me what hard work looked like. You taught me to fight for my dreams, reach for my goals, and always try my hardest. You always supported me and take pride in my accomplishments. For that, I could never thank you enough. I strive to make you proud, and I thank you for raising me to be as strong, and stubborn as I am today. To my sister, thank you for always being willing to edit, and give moral support. Your strength truly inspires me. Thank you to my granny for being my role model as I grew up. I would not be the woman I am today without you to show me the way, you are my hero.

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LIST OF ABBREVIATIONS

<i>EPPM</i>	Extended Parallel Processing Model
<i>TPB</i>	Theory of Planned Behavior

CHAPTER I - INTRODUCTION

Mosquito-borne viruses are quite detrimental to the health of individuals and are becoming more and more prominent with viruses such as West Nile, Chikungunya, Dengue fever, and malaria spreading at an increasing rate (CDC, 2016). In January of 2016, the Zika virus was first discovered in the United States. A resident in Virginia and one in Arkansas had recently returned home from traveling to countries affected by the virus (Fellner, 2016). On January 22, 2016, CDC's Emergency Operations Center was activated for Zika, and elevated to its highest alert level just 17 days later (CDC, 2016). By February 19th, the American Council on Science and Health declared that "Zika is possibly the scariest virus since HIV" (Bloom, 2016). Panic rose through the nation, though no cases had been verified transmissible within the United States. However, in June of 2016, the first locally transmitted Zika virus was identified in Wynwood, Florida (Marini, et. al. 2017). Tom Frieden, the CDC director, was quoted by the Washington Post stating, "These are the first cases of locally transmitted Zika virus in the continental United States. As we have anticipated, Zika is now here." (Sun & Dennis, 2016). Over the next three months, three counties began to show multiple cases of Zika (Marini, et. al. 2017). These outbreaks marked the beginning of an epidemic that would lead to 37,270 symptomatic Zika cases reported in the United States territories as of September 5, 2018 (CDC, 2018).

While originating from the bite of a Zika-carrying *Aedes aegypti* mosquito, individuals can transmit the virus to their sexual partners, and pregnant women can transfer the virus to their unborn baby (Cha & Sun, 2016). First discovered in 1947 in a Rhesus monkey in the Ugandan Zika forest, only 14 human cases had been documented

preceding the outbreak on Yap Island, Micronesia in 2007 (Duffy, et al., 2009).

According to the World Health Organization, an association between the virus and birth defects, such as microcephaly and Guillain-Barré syndrome, was not discovered until 2016 (World Health Organization, 2017). As many as 13% of women infected with Zika during their pregnancy could potentially give birth to a baby with microcephaly (Johansson, Mier-y-Teran-Romero, Reefhuis, Gilboa, & Hills, 2016). These birth defects are severe, often causing an underdeveloped brain and other abnormalities. Mortality rates of microcephaly could reach all the way to 10.5% (Cunha, et. al., 2017).

Once Zika became a national priority in 2016, there seemed to be some uncertainty concerning the virus as the public scrambled for answers and responses. Questions about transmission, effects and symptoms, and protection was constantly discussed. Many individuals looked to the public health responses from governments and health agencies in an effort to gain more information (Lee & Basnyat, 2013). Although there are no vaccinations available at the present, there are steps individuals can and should take to protect themselves and others from the Zika virus.

According to the World Health Organization (2016) pregnant women and women who could become pregnant are urged to take precautions from being bitten by mosquitos. These precautions include covering one's arms and legs, sleeping under a bed net, and wearing mosquito repellent. For these actions to be adopted, public health communicators must advocate and persuade the audience that these actions are necessary to protect themselves. The current study employs health behavior change theories, including the Extended Parallel Processing Model and the Theory of Planned Behavior,

to better understand how to persuade individuals to take precautions to prevent Zika infection.

CHAPTER II – LITERATURE REVIEW

In better understanding individuals' motivations in protecting themselves against mosquito-borne illnesses such as Zika, a thorough literature review is necessary to understand antecedents to behavior change. To that end, the following sections will discuss the theoretical framework of the Extended Parallel Processing Model (Witte, 1992) and the Theory of Planned Behavior (Ajzen, 1991). These theories have guided a wealth of research in moving individuals toward behavior change through better understanding their perceptions of severity and susceptibility to a threat, as well as understanding their attitudes, knowledge, and perceptions of the normative beliefs of others.

Extended Parallel Processing Model

Rogers and Mewborn (1976) first explored the notion that fear influences how the public processes a message. The scholars revealed that fear appeals with high levels of perceived threat and high levels of efficacy should prompt the audience to more readily accept the message contents (Rogers & Mewborn, 1976). Following this literature, Witte (1992) proposed the theoretical framework called the Extended Parallel Process Model (EPPM) to aid in creating messages that encourage behavior change through fear appeals (McMahan, Witte, & Meyer, 1998). The EPPM reveals that an individual appraises a threat or risk that the message produces, and this initial appraisal is termed the primary appraisal (McMahan et al., 1998). If the audience considers the perceived threat to be high during the "primary appraisal," they will move to the "secondary appraisal" and evaluate the efficacy of the recommended response (Witte & Allen, 2000). When the threat is perceived to be low, individuals typically lack the motivation to further process

the message or take any further action (Dutta-Bergman, 2005). When exposed to the message, the audience either controls the danger by considering the recommendations of the message, or “controls the fear through defensive avoidance or denial, not adopting the recommended action” within the message (Dutta-Bergman, 2005). The latter is an undesired response of the individual to a fear appeal, while the former is the hope of the health communication scholar. The EPPM can help predict whether or not individuals will control their danger response or fear response based on their levels of perceived severity, perceived susceptibility, response efficacy, and self-efficacy (Health Communication Capacity Collaborative, 2014).

Perceived severity. When an individual is faced with a potential threat, two concepts are used to assess and then evaluate the posed threat: severity and susceptibility (Witte and Allen, 2000). Severity refers to how strongly each person within the target audience assesses the outcomes associated with the threat (Dutta-Bergman, 2005). Severity has been described as “the potential for causing physical harm and interfering with social functioning” (DiMatteo, Haskard, & Williams, 2007, p. 521). The perceived seriousness of a disease can be influenced both by the emotions created by the thoughts of the disease and what difficulties the individual believes the threat could inflict upon him/her (Rosenstock, 1974). These emotions inflicted by the perceived seriousness of the illness can have a significant impact upon an individual’s motivation to take a health message seriously. It has been suggested by researchers that greater severity will result in a greater behavioral adherence (DiMatteo, Haskard, & Williams, 2007). If individuals do not feel vulnerable, but they detect a severe threat, it is assumed that they will put forth effort to process the contents of the message to receive more information for the matter at

hand (De Hoog, Stoebe, & De Wit, 2007). It is important for individuals to be motivated to act upon the message, rather than simply absorb the information. One such way to accomplish this is to heighten perceived susceptibility.

Perceived susceptibility. When assessing a threat, the second factor that individuals consider is their susceptibility towards that threat. According to Rosenstock, “Susceptibility refers to the subjective risks of contracting a condition” (Rosenstock, 1974). In other words, individuals will assess the risks of the threat and determine the likelihood that they will be directly impacted by those threats (Dutta-Bergman, 2005). Perceived susceptibility predicts behavior better for prevention as opposed to treatment (Carpenter, 2010), so measuring perceived susceptibility is better used in preventative public health messages rather than messages to treat a health issue. If an individual exposed to the message considers the susceptibility to be minimal, there is a lack of motivation to process the message further and the content of the message will be ignored; on the other hand, when individuals are concerned about being susceptible to a serious threat they move towards the second appraisal of EPPM and evaluate the efficacy of the response recommended (Witte & Allen, 2000). The extended parallel process model argues that both severity as well as susceptibility are influenced by the individual’s self-efficacy (Carpenter, 2010).

Self-efficacy. Perceived efficacy, which consists of self-efficacy as well as response efficacy, is a determining factor of whether individuals are motivated to control the danger of the threat, or to control the fear surrounding the threat at hand (Witte & Allen, 2000). Self-efficacy is the perceived ability that the individual can actually the response that has been recommended by the message (Witte & Allen, 2000). This

variable shows how confident the individuals are in their ability to perform the recommended action, and “positively predicts the adoption of the preventative behavior” (Dutta-Bergman, 2005, p. 105). Individuals must feel trained and capable to accomplish the behavior advocated in the message in order for the message to have a significant impact upon the audience (Casey, Timmermann, Allen, Krahn, & Turkiewicz, 2009). “The challenge is making sure that fear messages that provide both response-efficacy and self-efficacy information work to persuade a person to change attitude/intention/behavior” (Casey et al., 2009, p. 58). Creating higher self-efficacy tends to be associated with providing information to the audience concerning the ease of a new action and how easy it is to implement the new action, empowering the audience, and encouraging the suggested behavior (Keller, 2006). Research has shown that even without the perceived exposure of danger (susceptibility), individuals could be persuaded to partake in the behavior due to high expectation of response’s effectiveness, and their own personal ability to implement the behavior into their lives (Maddux & Rogers, 1983). If individuals felt susceptible to a threat, they would still perform the suggested behavior if they believed that they could, no matter if they believe if the response would be successful in preventing the threat (Maddux & Rogers, 1983). This proves the noteworthy influence that self-efficacy has upon making the decision to implement the behavior received from a health message.

The belief that enacting a specific behavior will result in preventing a specific consequence is response efficacy (Rimal & Real, 2003). The probability of goal achievement should alter how likely the individual is motivated to act (Lam, 2006). Mosquito repellants are the only known product that will protect against infection from

mosquito bites. Thus, applying mosquito repellent is the response efficacy. Previous literature suggests that “the second appraisal, self-efficacy, is more closely associated with intentions to perform a new health behavior than the first appraisal, response efficacy” (Keller, 2006, p. 109; Milne, Sheeran, and Orbell, 2000; Maddux & Rogers, 1983).

Stephenson and Witte (1998) discuss that for a fear appeal to be successful, the audience must feel able to avert the threat by performing the recommended action. Loss-framed messages have been found to evoke a greater sense of threat than gain-framed messages (Shen & Dillard, 2007). If recipients have low self-efficacy levels, however, this greater sense of threat may result in less message acceptance due to the defensive avoidance and message derogation processes (Witte, 1992). This explains why, in some cases, loss-framed messages are more persuasive than gain-framed messages. (Riet, Ruiter, Verrij, & De Vries, 2010).

Theory of Planned Behavior

In addition to the use of the EPPM model to describe the fear appeals behind motivating an individual to perform a suggested action, the Theory of Planned Behavior aids better understanding behavioral intentions. Theory of Planned Behavior (TPB) focuses on the motivation behind individuals performing a suggested behavior. It has been suggested that behavior is shaped by attitudes and personality traits (Ajzen, 1991). Behaviors are located on a continuum that involves control over a situation, this is where the theory extends, and moves away from the original Theory of Reasoned Action. (Godin & Kok, 1996). The ultimate outcome variable for the theory is behavioral intentions. The intention of action is formed by three considerations: behavioral beliefs

(knowledge of the behavior), normative beliefs (expectations from others), and control beliefs (factors that may hinder performance of belief) (Ajzen, 2002). Perceived behavioral control relates to the EPPM's variable self-efficacy, as they are both concerned with the perceived capabilities of performing the suggested behavior (Ajzen, 2002). Individuals will be unable to carry out the recommended actions unless they feel as though they are indeed capable of doing so (Ajzen, 1985).

One of the most prominent aspects of the TPB is the focus on perceived normative beliefs. Personal and societal norms are important to measure as they contribute to an individual's behavioral intention (Park & Smith, 2007). Personal norms are those that influence the audience's actions within their individual life, while societal norms are those that the individual sees within their surroundings (Ajzen, 1985). Personal and societal norms can be broken into descriptive or injunctive norms. Injunctive norms refer to a person's perception of other individuals' opinions of behaviors. For instance, when trying to encourage people to stop using tobacco products, injunctive norms would include caring what others think about cigarettes, and specifically whether they approve of this behavior. Injunctive norms have been especially helpful in encouraging individuals to stop binge drinking (Bosari & Carey, 2003), smoking cessation (Blanton, Koblitz, & Mccaul, 2008), and other behaviors for which they believe their friends and family disapprove. Injunctive norms aid individuals in determining what is a socially acceptable behavior and what is not (Bosari & Carey, 2003). However, there are problems associated with intervention strategies focusing solely on injunctive norms (Blanton, Koblitz, & Mccaul, & 2008). Pluralistic ignorance is when an individual believes that his or her opinions concerning a behavior differs from others, and yet the

individual still participates in that behavior despite differing in opinion (Prentice & Miller, 1993). While the individuals are being influenced by peer pressure, they assume that the behavior of others is due to the other individual's beliefs and feelings upon the behavior.

Alternatively, descriptive norms refer to what an individual perceives other people would do in a specific situation (Park & Smith, 2007). For instance, regarding organ donation, if people perceive that their friends and family member are more likely than not to become an organ donor, these descriptive norms will positively influence their intention to become an organ donor. However, the alternative is also true. If, for instance, in a hurricane evacuation, people are much less likely to evacuate if they do not believe that their friends and family would be willing to do so. The individuals participate in what researchers call a "warning confirmation process," where they seek other individual's interpretation of the event, and observe other individual's behaviors (Riad & Norris, 1998). Thus, understanding the role of injunctive and descriptive norms is incredibly important when understanding behavior and in assisting health communication scholars attempting to enact change.

From Theory to Application

Behavioral theories play a major part of explaining and understanding communication processes through description of aspects within communication, prediction of outcomes, explanation of relationships, and prescription of effective interventions (Maibach & Parrott, 1995). These theories play an integral part in creating effective and influential health messages to enact a behavioral change. Because individuals make decisions mostly based upon their emotions rather than logic, these

theories provide research on how emotional and persuasive messages are created (Witte, Meyer, & Martell, 2001). The use of theory to develop persuasive messages, or messages trying to enact a behavioral change is useful due to the lack of trial and errors while creating the messages (Witte, Meyer, & Martell, 2001). It has been suggested that when individuals are motivated and have the appropriate opportunities, they will be more thoughtful and deliberative while making a decision about their behavior; however, when motivation and opportunity are nonexistent, actions will be guided by previously existing attitudes that are retrieved from previous experiences and memory (Rimer & Kreuter, 2006). For these reasons, it is important to assess an individual's motivations (susceptibility and severity), opportunities (self-efficacy and response efficacy), as well as the norms surrounding the behavior (descriptive and injunctive norms), while creating an effective health message.

According to the EPPM and the TPB, perceived severity, perceived susceptibility, efficacy, and social norms all influence whether an individual will report a behavioral intent to adopt a suggested behavior within a public health message. These variables are necessary to create an effective message and can alter the message based upon the strength of each variable within the given message. As the public awaits a Zika vaccination to be implemented, there are still precautions that are instrumental in limiting the spread of the virus. These theories and constructs were used to create messages in hopes of enacting a behavioral change within members of the general public. Based on the literature review, the following hypothesis was suggested:

H1: Higher levels of perceived severity of the Zika virus will result in higher levels of behavioral intentions to use mosquito repellent for individuals receiving the high susceptibility message.

H2: Higher levels of perceived susceptibility will result in statistically higher behavioral intentions to use mosquito repellent for individuals receiving the high susceptibility message.

H3: Higher levels of perceived self-efficacy will result in a statistically higher behavioral intention to use mosquito repellent for individuals receiving the high susceptibility message.

RQ1: What is the relationship between injunctive norms, susceptibility, severity, and self-efficacy upon behavioral intention?

RQ2: What is the relationship between descriptive norms, susceptibility, severity, and self-efficacy upon behavioral intentions?

CHAPTER III – METHODS

To conduct this study, four messages regarding the Zika virus were created to manipulate the variables susceptibility and self-efficacy. A 2 (susceptibility) x 2 (self-efficacy) factorial design guided the study. The factorial design employed high/low perceived susceptibility and high/low perceived self-efficacy to better understand message attributes with the greatest influence on behavioral intent to adopt mosquito-borne virus protection behaviors.

Participants

Overall, a total of 186 individuals were recruited through Amazon Mechanical Turk (MTurk). Although 207 participants completed the survey, the researcher narrowed the sample to 186 participants due to incomplete questionnaire responses. The sample consisted of 91 male participants (49%) and 95 female participants (51%). Of the female participants, 25 participants (26.3%) were either pregnant or planned to become pregnant within the next year. All participants reside in the United States, and every single state was represented by at least one participant.

MTurk has been shown to provide data that meets or exceeds published research psychometric standards. (Buhrmester, Kwang, & Gosling, 2011). Because MTurk allows for random sampling among potential participants and random assignment to experimental conditions (Sheehan, 2017), MTurk samples are diverse and generalizable. In the current study, participants were given \$0.25 for completing the survey. Although Mturk has been criticized for excluding participants who cannot access the internet (Coppock, 2018), the current study focuses on health-related messages individuals encounter online. Thus, MTurk is ideal for the current study.

Measurements

All survey instruments were modeled directly from existing and reliable instruments and were modified to focus on Zika-related perceptions and behavioral intentions.

Self-efficacy. Wolf and colleagues' (2005) self-efficacy scale specific to cancer patients was modified to measure participants' self-efficacy of Zika virus preventative actions. The scale included items such as, "It is easy for me to ask my doctor questions concerning Zika virus" and "It is easy for me to get information about the Zika virus. The original Wolf et al. (2005) scale measured three sub-scales, including understand and participate in care, maintain positive attitude, and seek and obtain information. Wolf et al. reported a reliability of 0.76. In the current study, the modified scale revealed high reliability with a Cronbach's alpha of $\alpha = 0.785$.

Perceived susceptibility. A three-item scale from McGlone et al. (2013) was modified to measure perceived susceptibility. The scale included items such as, "I am at risk for becoming infected with Zika virus," "It is possible I will be infected with Zika virus," and "I believe that I could be infected with Zika virus." The scale was reported to have a high reliability of $\alpha = 0.81$ (McGlone et al., 2013). In the current study, the modified scale yielded a 0.909 reliability.

Perceived severity. To measure participants' perceived severity of a potential Zika infection, the Revised Illness Perception Questionnaire (RIPQ) was modified (Moss-Morris et al., 2002). The 6-item instrument, initially created to measure the perceived consequences of an illness, was altered to measure the perceived consequences of the Zika virus. The instrument included the following statements: "Zika would be a serious

condition if I contracted it” and “Zika would have a major consequence on my life” that measure the participants’ perceived severity of the virus. The authors reported a Cronbach’s alpha of .84 (Moss-Morris et al., 2002). For the current study, the scale yielded a reliability of $\alpha = 0.894$.

Descriptive and injunctive norms. A scale created by Park and Smith (2007), originally created to measure norms around organ donation, was altered to reflect the norms surrounding the Zika virus. Questions such as “Most people who are important to me have talked with their family about the Zika virus,” and “Most people whose opinion I value have talked with their family about the Zika virus,” measure descriptive norms. Injunctive norms were measured through questions such as “Most people whose opinion I value would approve of my talking with my family about the Zika virus,” and “Most people who are important to me would support that I express to my family my opinions about the Zika virus.” The authors reported Cronbach’s alpha of .84 for personal descriptive norms, and .81 for personal injunctive norms. For the current study, the scale for personal descriptive norms yielded a reliability of 0.918, while the scale for personal injunctive norms yielded a reliability of $\alpha = 0.891$.

Behavioral intention. A three-item instrument was employed to measure participants’ behavioral intentions for adopting mosquito repellent to prevent Zika virus infection. These questions measure the behavioral intent to accept the message and act upon the suggested responses. Items include “I plan to integrate the Zika protection technique such as wearing long sleeves/pants into my daily life,” “I plan to integrate the Zika protection technique such as putting screens on windows and doors into my daily

life,” and “I plan to integrate the Zika protection technique such as mosquito repellents into my daily life.” Reported Cronbach’s alpha for these questions stood at $\alpha = 0.82$.

Data Collection

After receiving Institutional Review Board approval, participants were recruited through Amazon’s MTurk. Participants were randomly assigned to one of the four message combinations through Qualtrics, including high/low perceived susceptibility and high/low perceived self-efficacy. After viewing the randomly assigned message, participants were guided to complete the survey questionnaire within Qualtrics concerning perceptions of mosquito-borne illnesses and participants’ behavioral intention. Manipulation checks ensuring that the participants thoroughly read the message were included within the questionnaire. Any participants that did not follow the directions were removed from the results during data cleaning.

Data Analysis

Factorial designs are widely considered more effective than a classical treatment/control group design when testing multiple factors that influence behavior (Jackson, 1992). For the current study, descriptive analysis was conducted using SPSS version 25 to analyze participant demographics. Once early analyses were conducted, it became evident that perceived self-efficacy was not statistically different across the four messages. However, perceptions of susceptibility varied in significance across the four messages. Because of the lack of significance of self-efficacy in the four message groups, the researcher collapsed the four groups of two manipulated variables to two groups manipulating high and low perceived susceptibility.

Behavioral intention of individuals participating in mosquito borne virus protection, such as mosquito repellent, based upon perceived efficacy and susceptibility were analyzed through a structural equation model (SEM) with AMOS 24.0 to test model fit. Within health communication scholarship, SEM model-testing can aid in identifying intricate relationships among variables (Stephenson, Holbert, & Zimmerman, 2006). SEM was used to identify the theoretical relationships between variables, and regression models between variables with a p-value greater than 0.05 within both groups were deleted to maintain statistical significance. After regressions without statistical significance were deleted from the model, chi-squared differentiation tests were used to determine if there were any statistical differences between the groups.

CHAPTER IV – RESULTS

The intended purpose of this study is to examine the relationship between perceived susceptibility, perceived self-efficacy, and descriptive and injunctive norms on an individual's behavioral intention. While the literature review describes previous literature, and the proposed hypothesis, the methods section explores the methods and statistical tests used to conduct the study. This section reveals the results from the statistical analysis in following sections.

Of the 186 participants, 90 individuals received the low susceptibility message while 96 individuals received the high susceptibility message. The researcher included several indices to describe the goodness-of-fit of the model to the data. For example, the Comparative Fit Index (CFI) was 0.99, and the Root Mean Square of Error Approximation (RMSEA) was 0.03. Based on the goodness-of-fit indices, the model fit the data well.

Table 1 *Goodness-Of-Fit of Model*

Measure of fit	Coefficient
CMIN/DF	1.13*
GFI	0.98
AGFI	0.92
CFI	0.99
IFI	0.99
RMSEA	0.03

*Note: * Not significant .*

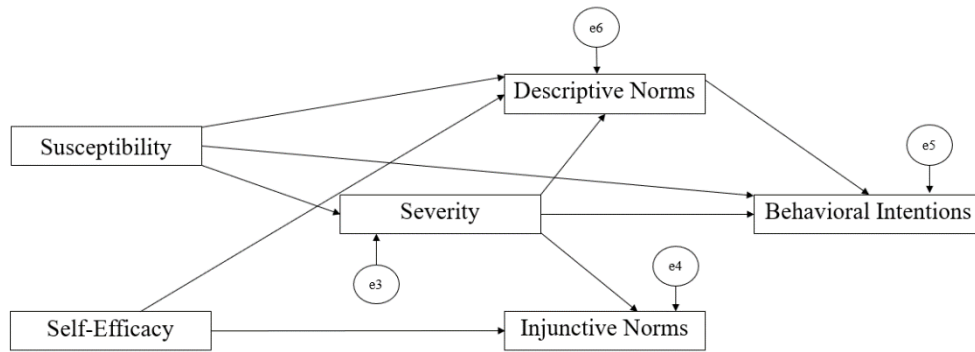


Figure 1. High/Low Susceptibility Model

As a preliminary check, perceived self-efficacy was tested to determine if it was statistically different for the four groups. The literature suggests that the high and low susceptibility groups should be different in their perception of self-efficacy. However, no statistical difference existed for this sample; self-efficacy remained high for both the low and high susceptibility groups ($F[3]=0.68, p=0.56$). Mean and standard deviation for each message is depicted in Table 2. As a result, the groups were narrowed down from four groups of two manipulated variables, to two groups of high and low perceived susceptibility. In other words, self-efficacy was reinterpreted as not dependent on the message condition (because, in this case, it was not). Respondents appeared to perceive that they could protect themselves from Zika, regardless of the message exposure.

Table 2 Participant Message Distribution

Group	Mean	SD
High Efficacy/High Susceptibility	4.91	0.64
High Efficacy/Low Susceptibility	4.91	0.75
Low Efficacy/ High Susceptibility	4.73	0.78
Low Efficacy/ Low Susceptibility	4.80	0.72

Based on the results listed in Table 5, three model paths were statistically different between the low susceptibility group and the high susceptibility group ($\chi^2=12.85$, $p<.05$). First, there was a statistical difference between low and high susceptibility groups on injunctive norms ($\chi^2=13.507$, $p<.05$). For respondents in the higher susceptibility group, they reported a statistically higher perception of injunctive norms, or the belief that other individuals think Zika presents a threat ($b =0.162$, $p=0.017$). Respondents in the lower susceptibility group did not yield a statistically significant relationship ($b =-.042$, $p=0.529$). Thus, people who perceived higher susceptibility believe that others also perceive that Zika is a health threat.

A second statistically significant difference between the two groups focuses on the model path between self-efficacy and descriptive norms ($\chi^2=14.125$, $p<0.05$). For the low susceptibility group, the participants reported a statistically higher perception of descriptive norms, or the belief that individuals will discuss the Zika threat ($b =0.579$, $p<0.001$). No significant relationship existed for those in the high susceptibility group ($b =-0.009$, $p<0.963$).

A third statistically significant difference between the high and low susceptibility groups was uncovered when considering the influence of severity upon behavioral intention ($\chi^2=13.566$, $p <.05$). For the low susceptibility group, the participants reported a higher behavioral intention ($b =0.292$, $p <0.002$). The high susceptibility group reported no significant change in behavior intention ($b =-0.005$, $p <0.964$).

Exposure to the high susceptibility message was predicted in the first hypothesis to have a positive influence upon behavioral intention. However, the pathway did not

hold statistical significance, falling short of reaching the 95 percent confidence interval ($\chi^2=12.85$). The pathway was moving towards significance ($\chi^2=11.189$).

Table 3 *Regression Weights of Paths Along Observed Model for Low Susceptibility*

Antecedent variable		Sequent variable	β	S.E.	p
Susceptibility	--->	Severity	.146	.078	0.062
Susceptibility	--->	Descriptive Norms	.403	.094	<0.001
Self-Efficacy	--->	Descriptive Norms	.579	.180	0.001
Severity	--->	Descriptive Norms	.242	.119	0.042
Self-Efficacy	--->	Injunctive Norms	.450	.129	<0.001
Severity	--->	Behavioral Intention	.292	.094	0.002
Susceptibility	--->	Behavioral Intention	.007	.076	.922
Descriptive Norms	--->	Behavioral Intention	.189	.075	.012
Susceptibility	--->	Injunctive Norms	-.042	.067	.529
Severity	--->	Injunctive Norms	.140	.085	.100

Table 4 *Regression Weights of Paths Along Observed Model for High Susceptibility*

Antecedent variable		Sequent variable	β	S.E.	p
Susceptibility	--->	Severity	.216	.094	.021
Susceptibility	--->	Descriptive Norms	.389	.106	<0.001
Self-Efficacy	--->	Descriptive Norms	-.009	.182	.963
Severity	--->	Descriptive Norms	.388	.115	<0.001
Self-Efficacy	--->	Injunctive Norms	.423	.117	<0.001
Severity	--->	Behavioral Intention	-.005	.100	.964
Susceptibility	--->	Behavioral Intention	.185	.092	.046
Descriptive Norms	--->	Behavioral Intention	.309	.087	<0.001
Susceptibility	--->	Injunctive Norms	.162	.068	.017
Severity	--->	Injunctive Norms	.141	.074	.056

Table 5 *Chi-Squared Difference Between Group*

Antecedent variable		Sequent variable	Path	χ^2	Difference (95% CI)
Susceptibility	--->	Descriptive Norms	A	9.014	No
Susceptibility	--->	Behavioral Intention	B	11.189	No
Susceptibility	--->	Severity	C	9.335	No
Susceptibility	--->	Injunctive Norms	D	13.507	Yes
Self-Efficacy	--->	Descriptive Norms	E	14.125	Yes
Self-Efficacy	--->	Injunctive Norms	F	9.027	No
Severity	--->	Descriptive Norms	G	9.763	No
Severity	--->	Injunctive Norms	H	9.004	No
Severity	--->	Behavioral Intention	I	13.566	Yes
Descriptive Norms	--->	Behavioral Intention	J	10.098	No

Note. 95% Confidence Interval = 12.85.

The previous section describes results that provide an interesting perspective upon public health message creation, intersecting the application side of the health communication field with constructs from common behavioral theories. While statistical significance was not found in EPPM constructs towards behavioral intention to support the hypotheses, there are still significant findings worth examining. The presence of severity upon behavioral intention, despite being held as a constant, as well as the influence of norms upon EPPM constructs give insightful findings that could prove useful in future research studies. The following section will describe in detail the discussion and implications of the study, the limitations, future directions, and the conclusion.

CHAPTER V – DISCUSSION AND IMPLICATIONS

The current study has attempted to understand how to develop more effective public health messages in persuading people to adopt behaviors that prevent mosquito-borne illnesses. Specifically, this study seeks to understand the impact of manipulating susceptibility and self-efficacy on behavioral intentions in a public health message. The study hypothesized that when in the presence of a high susceptibility message, high levels of perceived severity, perceived susceptibility, and perceived self-efficacy would result in a higher behavioral intention to engage in behavior change. Each hypothesis and the concluding results from the model and chi-squared test will be discussed along with the implications of each conclusion. Within this section, implications of the findings will be drawn followed by limitations and areas of potential future research along. A concluding summary will review the purpose, results, and contributions of the current study to the message design and health communication literature.

Hypothesis one and the “critical point.” For individuals receiving the high susceptibility message, a higher perceived severity of the Zika virus was predicted to result in higher levels of behavioral intentions to use mosquito repellent than for participants receiving the low susceptibility message. Although there was a statistically significant difference in perceived severity between participants receiving the high susceptibility message and the low susceptibility message, the results revealed that the hypothesized relationship did not hold true ($\chi^2=13.566$). Instead, individuals in the high susceptibility group who perceived the severity of the Zika virus to be high reported a significantly lower behavioral intention to adopt protective behaviors ($\beta = -0.005$, $p < 0.964$). Alternatively, those who received the low susceptibility message and who

perceived the severity of the Zika virus to be high maintained a higher behavioral intention to adopt protective behaviors like mosquito repellent ($\beta = 0.292$, $p < 0.002$).

While these findings appear to be counter-intuitive, this may reveal more about the critical point of perception discussed in the EPPM scholarship. According to EPPM, the critical point occurs when perceptions of threat begin to outweigh perceptions of efficacy, and the imbalance causes individuals to shift from danger control to fear control (Witte, Meyer, & Martell, 2001). In other words, there is a difficult balance that fear appeals must strike; the messages must create enough fear in people to cause them to feel susceptible and vulnerable to a threat. However, fear appeals must also provide individuals tangible approaches to manage the perceived threat through messages of self-efficacy. If individuals encounter messages that leave them feeling completely susceptible and at risk without providing any self-efficacy, the EPPM posits that individuals will attempt to control their fear rather than the danger of the health threat itself. Engaging in fear control may entail individuals to rationalizations, justifications, and fatalistic thinking to minimize the vulnerable feeling (Ruiter, Verplanken, De Cremer, & Kok, 2004). This fear control response is likely to prevent them from engaging in the recommended behavior.

The critical point helps explain the unexpected findings in the first hypothesis. Concerning the Zika virus, the messages were likely not efficacious enough for the participants who received the high susceptibility message. Therefore, the unanticipated results in hypothesis one can be explained by participants experiencing fear beyond the critical point and thereby engaging in fear control rather than danger control. Any other

studies with health concerns as potentially threatening as Zika may require far more levels of self-efficacy than were included in the tested messages.

Hypothesis two. For individuals receiving the higher susceptibility message, higher levels of reported perceived susceptibility were predicted to result in statistically higher behavioral intention to use mosquito repellent. However, levels of perceived susceptibility were not statistically significant between the two groups at increasing behavioral intentions to adopt protective behaviors. Susceptibility to behavioral intention ($\chi^2=11.189$), was short of reaching significance ($\chi^2=12.85$) at a 95 percent confidence interval. Due to self-efficacy remaining high between groups, it could be argued that the combined high levels of susceptibility and self-efficacy resulted in the participants to move to the critical point, moving from danger control to fear control. This resulted in a lack of adherence to behavioral intention.

Hypothesis three. For hypothesis three, higher levels of perceived self-efficacy were predicted to result in a statistically higher behavioral intention to use mosquito repellent for individuals receiving the high susceptibility message. This hypothesis was not supported as there was no significant difference in perception of self-efficacy on behavioral intentions between the two groups ($F[3]=0.68$, $p=0.56$). This unsupported hypothesis could have resulted from an inherent difficulty in manipulating the variable of self-efficacy for an infectious disease. For the messages deemed “low self-efficacy” by the researcher, it was recommended that participants try to manage the symptoms of Zika (e.g., staying hydrated, taking medications for pain) rather than engage in behaviors that might prevent the spread or contraction of the virus (e.g., using mosquito repellent). However, even the minimal recommendations given within the messages deemed “low

self-efficacy” for managing the symptoms of Zika could still be considered efficacious because a recommended course of action was suggested to participants. Thus, a significant difference did not likely emerge between the groups because all individuals received messages with some level of instruction for an act concerning the Zika virus.

Further, as health messages should be designed according to the highest ethical standards, (Guttman and Salmon, 2004; Cho & Salmon, 2006), it is difficult to create messages marked by low-levels of self-efficacy in health communication campaigns. Messages should provide participants with only accurate and ethical information concerning their health. As revealed in the current study, it may prove to be difficult to successfully and ethically manipulate the levels of self-efficacy in studies dealing with perceptions of disease. This idea will be discussed more thoroughly in the limitations section.

Research question one. The first research question inquired about the relationship between injunctive norms, susceptibility, severity, and self-efficacy, and the influence upon behavioral intention. Susceptibility did have an influence upon injunctive norms ($\chi^2=13.57$). The participants within the high susceptibility group reported higher injunctive norms ($b = 0.162$, $p < 0.017$), while the participants in the low susceptibility group reported lower injunctive norms ($b = -.042$, $p < 0.529$). This means that individuals who were exposed to the high susceptibility group, and thought they were susceptible to the Zika virus, believed that other individuals would be concerned about the Zika virus as well. Meanwhile, the individuals within the low susceptibility group were deterred in adopting protective behaviors when they did not perceive that the individuals around them would be concerned with the Zika virus.

The role of injunctive norms on perceived behavioral intention is an important finding. As articulated within the Theory of Planned Behavior, injunctive norms are an important predictor of behavioral intentions (Ajzen, 1991). Particularly for those individuals who perceived themselves to be susceptible to the threat, they believed that those around them that they cared about would also likely be concerned about the threat of Zika. In other words, not only do people need to personally perceive that they are susceptible to the threat, but they also need to believe that those around them care about the virus in order to be motivated to adopt protective behaviors. Thus, future messages concerning the Zika virus should enhance the perception that people's friends and family members are also concerned about the potential spread of the virus.

Research question two. The second research question inquired about the relationship between descriptive norms, susceptibility, severity, and self-efficacy, and the influence on behavioral intentions. In comparing the two groups, there was a statistically significant difference between self-efficacy and descriptive norms. Self-efficacy displayed a significant difference between the low and high susceptibility groups towards descriptive norms ($\chi^2=14.125$). Participants within the low susceptibility group maintained a higher perception of self-efficacy in acting to protect themselves against Zika, while also perceiving that other individuals around them would take measures to protect themselves against the Zika virus ($\beta =0.579$, $p<0.001$). Alternatively, individuals who received the high susceptibility message reported lower levels of self-efficacy, which resulted in lower perceptions of descriptive norms concerning the Zika virus ($\beta =-0.009$, $p=0.963$).

In referencing the critical point, high levels of susceptibility with lower perceived descriptive norms alludes to the notion that participants engaged in “fear control” rather than “danger control” (Witte, 1992). Alternatively, those who received the messages marked by lower levels of susceptibility, marked by higher levels of self-efficacy were likely engaging in “danger control,” and believed they had the capacity to protect themselves from the spread of the Zika virus.

Future Directions and Limitations

The results of this study are aimed to contribute to the health communication field while aiding in the creation of public health messages. While the study seeks to contribute to health communication literature, limitations need to be addressed, and future research proposed to address and overcome the stated limitation.

A potential limitation is present in that perceived self-efficacy lacked statistical significance between groups, remaining high throughout manipulation. Two responses to the limitation provide potential future research within the field of public health message design. First, previous research suggests multiple potential scales for narrow fields of self-efficacy as the variable is directly related to health behavior, as well as indirectly through its impact upon the goals suggested within the message (Scharzer & Luszczynska, 2007). It could be concluded that this study did not use the most specific possible scale to measure this specific version of self-efficacy. Secondly, it could be concluded that the manipulated low perceived self-efficacy, was taken as efficacious and still considered as high self-efficacy. However, as the study was incapable of manipulating severity due to ethical considerations of a creating a “low severity” message, ethical considerations were also a factor in giving a minimal efficacious

message. Ethical ramifications are a serious stipulation to consider whilst creating health messages (Guttman and Salmon, 2004; Cho & Salmon, 2006). The minimal efficacy given within the messages for symptom treatment could be considered efficacious due to potential action given towards the threat (Zika virus). Future research could use a more narrow and specific scale to test specific types of self-efficacy to determine which type of self-efficacy is more important within public health messages.

Conclusion

The findings and implications of this study reveal the importance of design for health communication messages that encourage individuals to adopt specific behaviors. Specifically, the current study attempted to apply health behavior change theories to aid in the creation of a more effective behavior change message encouraging individuals to adopt protective health behaviors concerning the Zika virus. Exploring the relationships between EPPM constructs (susceptibility, severity, and self-efficacy) and personal norms when influencing behavioral intention is important to create more effective and influential health messages.

To create effective public health messages, health communication scholars must continue to use theory as a driving force in message development. The Theory of Planned Behavior (Ajzen, 1991) and the EPPM (Witte, 1992) provide much insight concerning the importance of balancing fear appeals with self-efficacy while also accounting for the perceptions of people around us. This current study has employed those theoretical frameworks to create messages that encourage the adoption of behaviors that protect individuals from becoming infected with and spreading the Zika virus.

Self-efficacy proved to be a vital component in determining whether an individual adopts a behavioral intention or not. Although self-efficacy has been revealed to be a strong predictor of behavioral intentions, if self-efficacy appeals are not strong enough within messages intended to convey threat, individuals may engage in fear control instead of danger control when confronted with something as threatening as Zika messages (Witte, Meyer, & Martell, 2001). This excess of perceived susceptibility and the lack of perceived self-efficacy in health messages is a dangerous combination that may push people past the theorized “critical point” in EPPM literature (Witte, 1994). When the messages pushed participants beyond the critical point, the lack of self-efficacy resulted in participants engaging in fear control. This fear control resulted in the undesirable behavioral response of participants reporting that they were not likely to adopt the recommended behaviors. Ultimately, future scholarship should continue to investigate the role of self-efficacy on striking a perfect balance with perceptions of threat.

APPENDIX A – ZIKA QUESTIONNAIRE/ MESSAGES

These questions will be answered before message:

Sex, Age, Geographic Regions,

1. How old are you?
Under the age of 18
19-24
26-
2. What sex do you identify with?
Male, Female, Transgender, Other
3. What state do you reside in?
4. Although Zika is a mosquito borne virus it can be spread between humans through sexual infection.

(Strongly Disagree) - (Strongly Agree)
5. Because Zika is a mosquito borne virus it cannot be spread between humans through sexual infection.

(Strongly Disagree) - (Strongly Agree)
6. Zika is a mosquito borne virus and therefore there is little that humans can do to limit the spread of infection.

(Strongly Disagree) - (Strongly Agree)
7. Although Zika is a mosquito borne virus it can be passed from a pregnant woman to a fetus.

(Strongly Disagree) - (Strongly Agree)

The following questions will be answered after the message is presented.

8. The message I read provided adequate information on the Zika virus.
(Strongly Disagree) – (Strongly Agree)
9. Microcephaly is a major risk that comes with Zika infection.
(Strongly Disagree) – (Strongly Agree)
10. I am at risk for becoming infected with Zika virus.
(Strongly Disagree) - (Strongly Agree)
11. It is possible I will be infected with Zika virus.
(Strongly Disagree) - (Strongly Agree)
12. I believe that I could be infected with Zika virus. (Sus)
(Strongly Disagree) - (Strongly Agree)
13. If I become infected with the Zika virus, I know how to handle it.
(Strongly Disagree) - (Strongly Agree)
14. I am confident in my ability to understand the CDC's instructions concerning the Zika virus.
(Strongly Disagree) - (Strongly Agree)
15. It is easy for me to ask my doctor questions concerning Zika virus.
(Strongly Disagree) - (Strongly Agree)
16. I am confident in my ability to understand my doctor's instructions concerning the Zika virus.
(Strongly Disagree) - (Strongly Agree)
17. If I don't understand something, it is easy for me to ask for help.
(Strongly Disagree) - (Strongly Agree)

18. It is easy for me to get information about Zika virus.
(Strongly Disagree) - (Strongly Agree)
19. I am confident that I am able to deal with any unexpected health problems.
(Wolf)
(Strongly Disagree) - (Strongly Agree)
20. I believe that most people who are important to me have talked with their family about the Zika virus. (DN)
(Strongly Disagree) - (Strongly Agree)
21. I believe that most people whose opinion I value have talked with their family about the Zika virus. (DN)
(Strongly Disagree) - (Strongly Agree)
22. Most people whose opinion I value would approve of me talking with my family about the Zika virus. (IN)
(Strongly Disagree) - (Strongly Agree)
23. Most people who are important to me would support that I express to my family my opinions about the Zika virus. (IN)
(Strongly Disagree) - (Strongly Agree)
24. If I were to contract the virus, Zika infection would be a serious condition for me.
(Strongly Disagree) - (Strongly Agree)
25. If I were to contract the virus, Zika infection would have a major consequence on my life.
(Strongly Disagree) - (Strongly Agree)

26. If I were to contract the Zika virus, it could have serious financial consequences on my life.
(Strongly Disagree) - (Strongly Agree)
27. If I were to contract the virus, Zika infection would cause difficulties for those who are close to me.
(Strongly Disagree) - (Strongly Agree)
28. If I were to contract the virus, Zika infection would strongly affect the way others see me.
(Strongly Disagree) - (Strongly Agree)
29. If I were to contract the virus, Zika infection would not have much of an effect on my life. (r)
(Strongly Disagree) - (Strongly Agree)
30. I plan to integrate the Zika protection technique such as mosquito repellants, into my daily life.
(Strongly Disagree) –(Strongly Agree)
31. I plan to integrate the Zika protection technique such as wearing long sleeves/pants into my daily life.
(Strongly Disagree) – (Strongly Agree)
32. I plan to integrate the Zika protection technique such as putting screens on windows and doors.
(Strongly Disagree) – (Strongly Agree)

Manipulated High/Low Susceptibility and Self-Efficacy Messages:

Zika
can be passed from a pregnant woman to her fetus resulting in very serious birth defects such as

Microcephaly
a serious condition where a baby's head is much smaller than expected.

This can cause problems that can range from mild to severe and are often lifelong, and potentially life threatening.

World Map of Areas with Risk of Zika

Map Legend
 Area with risk of Zika infection (below 6,500 feet)
 Area with low likelihood of Zika infection (above 6,500 feet)
 Areas with no known risk of Zika infection

Before 2016 the Zika virus posed little threat to the United States. However, that has changed dramatically over the last few years as more and more cases of Zika have been reported within American borders, particularly from those traveling abroad.

Prevention:
 You can prevent infection:
 It is very important to use mosquito repellent
 Also wear treated long sleeves and pants
 Use screens on windows and doors and use air conditioning

Head Size Comparison:
 Baby with Typical Head Size | Baby with Microcephaly | Baby with Severe Microcephaly

Logos: Department of Health & Human Services, CDC

Zika
can be passed from a pregnant woman to her fetus resulting in very serious birth defects such as

Microcephaly
a serious condition where a baby's head is much smaller than expected.

This can cause problems that can range from mild to severe and are often lifelong, and potentially life threatening.

World Map of Areas with Risk of Zika

Map Legend
 Area with risk of Zika infection (below 6,500 feet)
 Area with low likelihood of Zika infection (above 6,500 feet)
 Areas with no known risk of Zika infection

As of 2018, no local mosquito-borne Zika virus transmission has been reported in the continental United States. Thus no cases originating in the United States has been documented.

Prevention:
 You can prevent infection:
 It is very important to use mosquito repellent
 Also wear treated long sleeves and pants
 Use screens on windows and doors and use air conditioning

Head Size Comparison:
 Baby with Typical Head Size | Baby with Microcephaly | Baby with Severe Microcephaly

Logos: Department of Health & Human Services, CDC



Although there is **no vaccine to cure**, or medicine to treat Zika, symptoms can be treated through:

- Getting plenty of rest
- Drinking fluids to prevent dehydration
- Taking medicine such as acetaminophen (Tylenol) to reduce fever and pain

Zika

can be passed from a pregnant woman to her fetus resulting in very serious birth defects such as

Microcephaly

a serious condition where a baby's head is much smaller than expected.

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Zika

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This can cause problems that can range from mild to severe and are often lifelong, and potentially life threatening.



As of 2018, no local mosquito-borne Zika virus transmission has been reported in the continental United States. Thus no cases originating in the United States has been documented.



APPENDIX B – IRB Approval Letter

Office of
Research Integrity



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NOTICE OF INSTITUTIONAL REVIEW BOARD ACTION

The project below has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services regulations (45 CFR Part 46), and University Policy to ensure:

- The risks to subjects are minimized and reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered involving risks to subjects must be reported immediately. Problems should be reported to ORI via the Incident template on Cayuse IRB.
- The period of approval is twelve months. An application for renewal must be submitted for projects exceeding twelve months.

PROTOCOL NUMBER: IRB-19-43

PROJECT TITLE: Zika Message Analysis

SCHOOL/PROGRAM: School of COMM

RESEARCHER(S): Alexandria Phipps, Kathryn Anthony

IRB COMMITTEE ACTION: Exempt

CATEGORY: Exempt

Category 2. Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

APPROVED STARTING:

A handwritten signature in cursive script that reads "Donald Sacco".

Donald Sacco, Ph.D.

Institutional Review Board Chairperson

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