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The Effect of Social Influence on Perception of Tornado Warnings

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by

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(Under the Direction of Lawrence Locker)

ABSTRACT

Tornado activity annually results in many deaths throughout the U.S. As a result, the emergency alert system (including tornado warnings) has made considerable advancements throughout the past few decades. However, continued improvements could be made to warning content that aid to facilitate adaptive decision-making by increasing individuals' motivation to respond. One method that could increase adaptive responses to warnings is by including the modality of descriptive social information within the warning. Research suggests that normative social influence acts as a powerful motivator for individuals to conform toward the witnessed or perceived behaviors of others. The current study examined the impact of descriptive social normative information in the context of tornado warnings. National Weather Service tornado warnings were modified to display social information concerning the percent of people taking shelter in a localized area. We examined the effect of social influence and tornado severity on perceptions of (1) susceptibility to the threat, (2) response-efficacy, and (3) self-efficacy, as well as comprehension of the auditory and visual variables of the warning content. Results confirmed previous findings for perceived susceptibility (i.e., F4 category tornadoes were perceived as more severe the F2 category) and comprehension of warning information (i.e., comprehension was significantly worse for the F4 category compared to the F2 category warnings). A boomerang effect was observed for the effect social influence within the F2 category condition with regard to the response-efficacy outcome measure. Further results and implications are discussed.

INDEX WORDS: Risk perception, Normative social influence, Motivation, Efficacy

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CHAPTER 1

INTRODUCTION

The *Glossary of Meteorology* defines a tornado as a "narrow, violently rotating column of air that extends from the base of a thunderstorm to the ground" (AMS, 2000). The United States experiences a higher frequency of tornado events than any other geographic area, averaging 1200 tornado events per year (NOAA.org, 2009). For comparison, Canada follows the United States as the country that experiences the second most frequent tornado events, averaging around 100 per year (NOAA.org, 2011). Tornadoes therefore severely affect many U.S. communities. For example, between years 1995 and 2015, tornadoes caused 1710 fatalities, nearly 30,000 injuries, and over $200 billion of property damage (NOAA.org, 2013). These two decades of U.S. tornado statistics provide a clear illustration of an individual's susceptibility to loss of life or property due to tornados. In 2011, a series of tornadic events in Alabama and Missouri contributed to two of the largest death tolls in the United States' history of natural disasters (NOAA.org, 2013). Throughout that year, tornadoes contributed to 553 deaths. However, 549 (99.28%) of the tornado deaths that occurred in 2011 were in areas that had been formally issued a severe thunderstorm or tornado *watch*, not a tornado *warning* (Simmons & Sutter, 2012). This lack of warning calls into question the number of lives that may have been saved if these communities had been issued the proper emergency alert.

Multiple studies suggest, however, that individuals consistently fail to respond to tornado warnings even when they receive the correct warning with a sufficient amount of lead time (Liu, et al., 1996; Balluz, Schieve, Holmes, Kiezak, & Malilay, 2000; Sherman-Morris, 2005; Simmons & Sutter, 2011). For example, on March 27, 1994 only 53.6% of people responded to a warning of a tornado event in Alabama that ultimately resulted in 55 fatalities (Liu et al., 1996;

NOAA.org, 2013). Five years later, on March 1, 1999 only 45.7% of people in Arkansas responded to an issued tornado warning by taking shelter (Balluz el al., 2000). Consequently, research suggests that both insufficient warning systems and warning content, and lack of responsiveness to proper warnings may be leading contributors to the number of casualties that result from disaster events such as tornadoes (Balluz, Schieve, Holmes, Kiezak, & Malilay, 2010; Simmons & Sutter, 2007). Although weather-warning systems have made considerable progress since the 1950s (Sorensen, 2000), further research is still needed to identify factors that may improve warnings with regard to individuals' motivation to comply with the safety information in the warning and engage in life-saving behavior such as taking shelter (Vermeulen, 2014; Brotzge & Donner, 2013; Sorensen, 2000).

History of Weather Warnings

The development of the modern tornado warning system began after the release of a 50-year federal ban on public tornado emergency alerts. The ban existed in response to the misbelief that alerting the public of impending disasters would result in negative social behaviors. The ban effectively ended in 1948 as a result of two U.S. Air Force scientists successfully predicting the expected damage and length of an impending tornado event. It was concluded that the forecasting allowed for sufficient time for adequate preparation that prevented major loss of life and property (for a comprehensive history see Coleman, Knupp, Spann, Elliot, & Peters, 2011).

Since lifting the ban, and in the wake of the technological revolution, the overall sophistication of the emergency alert system (EAS) has substantially improved. The EAS is comprised of a complex chain of different interacting technologies that ultimately contribute to the publicized alert. The multiple technologies of the EAS may be largely categorized within four technological mediums: prediction technology (e.g., Doppler radar); dissemination technology (e.g., Integrated Public Alert and Warning System); network technology, (e.g., cable, satellite, or mobile providers); and the transmission technology, (e.g., customer premise equipment, such as television, radio, or cellular devices) (Patent US7592912). Recently, federal interventions have been implemented to regulate the emergency alert system process in order to ensure a continuity of quality of both the technological process and the information content of the EAS.

In 2006, the U.S. federal government established a policy (Executive Order 13407) to streamline the national Emergency Alert System. As a response, the Federal Emergency Management Agency (FEMA) collaborated with OASIS, a nonprofit consortium, to develop standards by which all emergency alert systems are required to comply. In 2010, FEMA and OASIS published the Common Alerting Protocol (CAP) that delineates four sub-elements that each emergency alert must include in the published broadcast: the alert title, warning information, resource (e.g., an image or audio file), and the target area (FEMA, 2014). Current tornado warnings issued by the National Weather Service (NWS) comply with CAP standards by providing content from each sub-element, such as tornado characteristics (e.g., severity) and geographic area of tornado impact. In addition, NWS tornado warnings provide call-to-action messages to advise individuals of the recommended response to prevent bodily harm, such as "If no underground shelter is available, go to the interior room on the lowest floor." (Troutman, Richard, & Mark, n.d.). Although the study of tornado warnings has a presence in the literature, there is limited experimental research in regard to the psychosocial factors that may be involved during and after exposure to a tornado warning, and how those factors relate to behavior.

Tornado Warning Structure

Dissemination of tornado warnings can be subdivided into two categories: warning source and warning content. Warning source may be defined as the technological medium by which the tornado warning is transmitted to the population (Balluz et al., 2000). Common warning sources are outdoor sirens, AM/FM radio, and television (Simmons & Sutter, 2011). Less reported warning sources are NOAA weather radios, GPS weather trackers, text message notifications, and internet-based social media. The existing body of literature indicates that television is the most commonly cited source of warning reported by individuals surveyed after experiencing a tornado event (Liu et al., 1996; Balluz et al., 2000; Sherman-Morris, 2010; Simmons & Sutter, 2011). Therefore, research is typically focused on television as the warning source. However, it is worth noting that the primacy of television as a warning source may change as generations trend away from multichannel pay television (Skot, 2014).

The content of tornado warnings, specifically regarding television warnings, is comprised of the visual format and the message. Warning format may be described as the visual properties of the warning such as text, supporting visual designs (e.g., graphs or pictures), color, and content location (Ash, Schumann III, & Bowser, 2013). There is limited research that examines how the visual format of warning content, specifically regarding weather, may affect such factors as perception, comprehension or responding; although research has been conducted in other domains (i.e., earthquakes) involving risk (Mulilis & Lipa, 1990).

Recent research by Evans (2015) examined the effects of embedding pictorials within the format of a typical text-and-voice tornado warning. In the first study, participants were assigned to one of three tornado-warning conditions: text-and-voice warnings with an embedded picture of tornado damage or no picture. Following the tornado warning, participants completed four outcome measures assessing comprehension, and perceptions of susceptibility, response efficacy, and self-efficacy. Their results revealed that pictures of damage as well as a more severe warning was associated with higher perceptions of risk. Additionally, there was an interaction such that perceived risk was highest for a severe warning with a picture of damage. A second experiment examined two levels of severity of the warning tornado (F2 vs F4) with either pictures of damage, pictures of preparation (i.e., call to action) or no picture. In the second experiment, a more severe category was associated with higher levels of susceptibility. However, there was no effect of pictures of damage as was observed in the first study. There was an effect of picture on response efficacy such that efficacy was higher for both picture conditions relative to no picture regardless of tornado category. Comprehension was found to be lower for an F4 warning than F2. Finally, there was a trend toward greater self-efficacy for the more severe warning.

There is literature that suggests a need for further exploration of the relationship between social influences and perception of warning content (Golden & Adams, 2000). That is, although warnings have advanced considerably in the aforementioned sub-elements of warning content and structure, further research concerning the efficacy of warnings, such as improving adaptive decision-making to the threat, may benefit considerably through an investigation of social influences that may increase individuals' motivation to respond. The current study will also provide further insight into the effect of social influence within the context of judgements made based on perception of risk (i.e., weather warnings).

Motivation and Decision-Making in Risk and Threat

There is not a single hypothesis to explain risk and threat. Any environment has the potential for risk of varying consequence. Indeed, the modern human manages risk every day; from operating a vehicle (Cai, Wang, Chen, & Lu, 2016) to selecting a source of nutrition (Tonkin et al., 2016). However, what of risk scenarios that pose a high threat to survival, or potential threats that are less probable, but environmentally devastating? Woody and Szechtman

(2011) state that improbable, rare events assume a higher cost-of-error, as they naturally allow for less frequent opportunities for learning. For example, whereas the consequence of food consumption could result in death (i.e., poisonous berries), nutritional risk is more commonly available to learn and manage than a rare event such as a disease or natural disaster. From the perspective of evolutionary psychology, managing these potential catastrophic environmental threats aided in shaping our evolutionary development (Woody & Szechtman, 2011). Moreover, the risk of "rare, high-consequence events" contributed to specific psychopathological adaptive qualities that are now innate in the modern human (Hinds et al., 2010). A growing body of evidence suggests the security monitoring system as an independent module in the brain that scans for improbable, high-risk environmental stimuli (Woody & Szechtman, 2011; Hinds et al., 2010). The security monitoring system is comprised of four interacting components: Appraisal of Potential Danger, Security Motivation, Security-Related Programs, and Motor and Visceral Output. The major components of the system function by sending excitatory signals in a linear, bottom-up progression to the following components in the chain.

The Appraisal of Potential Danger component functions much like a radar that continuously scans the current environment for stimuli of potential threat. The appraisal component is rather complex. In a non-aroused state, the appraisal process is nonconscious, and constantly evaluates multiple modalities of sensory information in conjunction with the individuals previous learning history. Upon the detection of a potential danger, the appraisal component sends an excitatory signal that activates the second component, Security Motivation. In this process, the potential threat comes into conscious awareness which activates the limbic system resulting in a fear or anxiety response. Error Management Theory (EMT) and Protection

Motivation Theory (PMT) naturally fit well within Woody and Szechtman's (2011) neural security motivation system.

Similar to the above described neural Security Motivation System, Error Management Theory (EMT) assumes that humans and other non-human animals have evolutionarily conferred adaptive cognitive biases that act to motivate efficacious responses when judgements are made under uncertainty (Johnson, Blumstein, Fowler, & Haselton, 2013). Therefore, EMT largely focuses on cost-of-error judgements (see Haselton, Nettle, & Murray, 2015). A type I error is a false-positive judgement error, and is categorized as incorrectly perceiving the threat to exist when the threat does not exist. A type II error, the false-negative judgement error, is categorized as incorrectly perceiving a non-threat when the threat does exist. According to EMT, the cost of committing a type II error often provides for disproportionate negative consequences as compared to committing a type I error. A variety of cognitive biases are attributed to error management, which are often sorted into three categories: judgements of threat, interpersonal evaluation (e.g., sexual overperception bias), and self-evaluation (e.g., optimistic bias) (Haselton & Nettle, 2006). Regarding threat, EMT assumes that under situations of uncertainty, decision-making and behaviors tend to default toward judging (or assuming) the potential threat as real, and responding accordingly.

Protection Motivation Theory (PMT) of persuasive communication was originally presented by Rogers (1975) to explain the effect of fear appeals on motivation to comply with recommended health promoting behaviors. PMT continues to offer a cognitive model to test the effect of fear appeals on attitude change (Floyd, Prentice-Dunn, & Rogers, 2000). Unlike EMT, which primarily accounts for threat responses that are elicited as ecologically adaptive nonconscious biases and heuristics, PMT extends the earlier theory by incorporating the conscious, goal-directed appraisal of potential threats. Rogers' PMT model is mediational, such that fear appeal (i.e., communication that announces and describes a threat) is mediated through cognitive processes (i.e., threat and coping appraisal) that either leads to an adaptive, protective response to avoid or mitigate the potential negative consequences posed by the threat, or a maladaptive non-response (see Floyd et al., 2000). Unique to PMT, fear appeal is categorized into three separate components: a) the perceived magnitude and/or severity of danger from the threat, b) the probability of the threat's occurrence (i.e., susceptibility), and c) the efficacy of responding. The fear appeal communication is mediated by two cognitive appraisal processes: threat appraisal, and coping appraisal. Threat appraisal processing is characterized by evaluations of threat severity, and personal susceptibility to the threat. Furthermore, the coping appraisal process acts as a cost-benefit analysis, where an individual evaluates the efficacy of responding (i.e., the effectiveness of the communication's recommended responses), and their self-efficacy (i.e., confidence in performing or executing the recommended response). Although PMT was initially posited around health promoting behaviors (e.g., smoking habits), it has been extended to many other research domains including severe weather preparation and weather warnings (Evans, 2015; Mulilis & Lippa, 1990).

The current study is an extension of Evans (2015), who integrated the three main components of PMT (i.e., susceptibility, response efficacy, and self-efficacy) as outcome measures. Evans noted that the effects on the response efficacy and self-efficacy measures in his second experiment may have been due to the inclusion of pictures directing attention to preparation information, whereas in the first study, information focused only on risk information (i.e., only including pictures of damage). As noted above, as the preparation pictures included people engaged in actions, it is possible that responding was influenced by the social component of the pictures that may have led to greater emphasis on efficacy than risk (Evans, 2015).

Social Influence

Human behavior and decision-making is complex, and is highly influenced by our perceptions of the social environment (Asch, 1951; Cialdini & Godstein, 2004; Galef & Heyes, 2004; Perkins, Goldstein, Cialdini, & Griskevicus, 2007; Craig, & Perkins, 2011). Even though we are motivated to conserve values of individuality (Aronson, 2003), social influence is powerful, and often contributes to the modification of personal behaviors and beliefs (e.g., conformity). The reasons and circumstances as to when and why a person would conform under social pressure are diverse, as the process of conformity is driven by two interacting components: the social force that inspires conformity, and the individual that is being influenced to conform – both of which are shaped by environmental context (Giles-Corti & Donovan, 2002) and personal disposition (Nezlek & Smith, 2016), which ultimately increases or decreases the likelihood and depth of conformity (Tetlock, Skitka, & Boettger, 1989).

A principal component in the process of conformity is the external social force, which provides both a) the reason to conform (e.g., the cognitive dissonance that occurs when the desire to be socially accepted is at odds with one's individuality), and b) the perspective by which to model one's conformity (Millar & Dollard, 1941; Bandura, 1962; Galef & Heyes, 2004). For example, two attributes of an external social force that increase social pressure, and thus increase the likelihood of conformity, are group unanimity and group pressure (Asch, 1951). The classic Solomon Asch (1951) study provided clear evidence that individuals tend to conform to that of the majority. As a critique to Sherrif's (1935) original claims on conformity, Asch designed a laboratory experiment to test the process of conformity using a line judgment task. In the study, a naïve participant was placed in a room with seven confederates. The experimenter indicated the purpose of the study as a vision test measured by a line judgment task. For the line judgment task, the experimenter would reveal two different cards: one card that had three vertical lines differing in length (labeled A, B, and C), and the other card with only one line. The instructions were to compare the lines, and make a judgment as to which line on the labeled card matched the single line of the other card. The trials required participants to voice their answer aloud to the group. Unknown to the naïve participant, the confederates had been previously instructed to select a specific incorrect answer on the task. Within the 18 trials that were conducted in the Asch experiment, nearly 75% of all participants conformed to that of the majority at least once, with 32% of participants conforming to the majority throughout all trials. Later research also revealed that group pressure increases conformity when the group consists of experts or authority figures (Bushman, 1988), and when the group is comprised of peers similar to the individual (Perkins et al., 2011).

The second component in the process of conformity is the individual. Individuals are motivated to seek reward and avoid punishment. Cialdini and Godstein (2004) discuss the capacity of the individuals' role in the conformity process by indicating that individuals conform to an external social environment due to the motivation to fulfill the internal social goals that are "fundamental to rewarding human functioning" (pg. 591). The goals described by Cialdini and Godstein (2004) are accuracy, affiliation, and maintaining a positive self-concept. Additionally, prior actions and personal attributes of the individual are also factors that are related to conformity to social pressures (e.g., self-esteem; Gergen & Baurer, 1967; Cialdini & Goldstien, 2004). Cultural influences also contribute to the likelihood of conforming to social pressure.

Individuals from collectivist societies, for example, are more likely to conform than those from individualistic societies (Milgram, 1961; Bond & Smith, 1996).

Generally, conformity is pervasive under situations that may lead to social exclusion (Asch, 1951). Indeed, humans are socially motivated to fulfill their need to belong to such an extent that situations of social exclusion have been shown to provoke non-conscious modifications of the self-concept with the intention of increasing the likelihood of interpersonal connection (Fiske, 2005; Richman, Slotter, Gardner, & DeWall, 2015). In the case of the Asch (1951) study, participants who conformed to the group consensus likely did so to avoid social exclusion and peer rejection, as well as to satisfy the need to belong by gaining social acceptance. Therefore, one potential explanation of conforming behavior is that people conform to social pressure as a proactive measure in order to avoid a future need to modify the self-concept after experiencing social exclusion (Fiske, 2005).

In addition to the tendency to seek social acceptance, Schachter and Singer (1962) demonstrated that people are also motivated to conform in order to gain contextual information on how to behave under situations of uncertainty. Consequently, witnessing the actions of others in ambiguous social situations influences our own decisions and behaviors. However, research indicates that conformity is not limited to physically witnessing the actions of others (Goldstein et al., 2007). As individuals gain information from their environment, they also tend to conform to the perceived actions and beliefs of others (e.g., normative social influence).

Normative Social Influence

Normative influence may be broadly described as the external social sources that motivate human behavior (Cialdini, Reno, & Kallgren, 1990). Normative social influence theory posits that social norms promote compliance to perceived behaviors, which often leads to conformity (Goldstein et al., 2007; Nolan, Schultz, Cialdini, Goldstein, and Griskevicius 2008). Social norms are pervasive in every society, and act as unspoken social rules that scaffold human behavior. These rules manifest from the commonly accepted, or most frequently presented behaviors and beliefs of a social group (Aronson, 2003). Social norms are often separated into two categories: injunctive norms (i.e., behaviors that are perceived as approved by the majority), and descriptive norms (i.e., perceptions of how most people behave within certain situations; Agerström et al., 2014). Put differently, injunctive norms *prescribe* behaviors that are accepted by the group majority, whereas descriptive norms *describe* how people are actually behaving within a specific social context. For example, upon entering a library, one will likely behave according to the injunctive norm of speaking below the average volume level (e.g., whispering). However, if in this library everyone is speaking above the average volume, the descriptive behavior of the present social environment will likely result in one conforming to the above-average speaking volume.

Recent studies indicate the strength of normative social influence by demonstrating that people do not have to physically witness descriptive behaviors to be influenced to conform (Goldstein, Cialdini, & Griskevicius, 2007; Nolan et al., 2008; Zaki, Schirmer, & Mitchell, 2011). Nolan and colleagues (2008) conducted a two-part study to investigate the impact of normative social influence on participants' beliefs and behaviors regarding energy conservation. Study 1 established a baseline of the a priori beliefs that community members held as their "perceived reasons for conservation" (p. 915). Their results revealed that although the most highly self-reported reasons for conserving energy were "environmental protection" and "benefits to society," the greatest predictor of the conservation behavior was descriptive normative beliefs (i.e., the extent to which it was perceived that others were doing so). Put differently, the majority of participants conserved energy as a result of social influence, even though the influence was not consciously detected as a factor of their decision-making.

Nolan and colleagues (2008) performed a second study in order to directly test the influence of descriptive norms on energy-conserving behaviors. To do so, the experimenters disseminated door hangers with energy-conserving information to a community of 509 participating households. Each household received a single doorhanger that included one of five energy-conserving messages: descriptive norm, self-interest, environment, social responsibility, or information-only control. Motivational information was inserted into each condition excluding the control. For the descriptive norm condition, a descriptive normative statistic was used as the motivational information, (e.g., “77% of San Marcos residents often use fans instead of air conditioning to keep cool in the summer,” or “99% of people in your community reported turning off unnecessary lights to save energy.”) Each doorhanger also included a graphic that illustrated the “call-to-action-like” behavior that was promoted within the message (e.g., “Use fans instead of air conditioning!”). Results indicated that normative social influence (i.e., descriptive normative messages) significantly affected participants’ increased behaviors of energy conservation compared to all other conditions (Nolan et al., 2008). The current study will further explore descriptive norms as a means of normative social influence by offering statistical information that describes context-specific behaviors related to weather warnings.

Questions regarding the effect of social influence and conformity have also recently been directed towards the neurological implications of decision-making during exposure to social norms (Zaki, Schrimer, & Mitchell, 2011). Zaki et al. (2011) assessed participants’ neural activity using functional magnetic resonance imaging (fMRI) while participants rated a set of faces on attractiveness. After the first round of scoring, participants scored the same set of faces again, although the second round included with each face a fabricated statistic of their peer's "average rating" of that face. Participants changed their rating based on the fictitious average, but had no conscious awareness of the change. Put differently, participants conformed to the descriptive information of their peers (i.e., fabricated statistics) and non-consciously changed their scores to align with the majority.

Other studies have investigated the effects of descriptive norms on self-efficacy, specifically focused on health-promoting behaviors of food consumption (Stok, Verkooijen, de Ridder, de Wit, & de Vet, 2014; Stok, de Ridder, de Vet, & de Wit, 2014). Stok et al. (2014a) demonstrated that descriptive normative influence had a significant effect on implementing increased vegetable consumption in young adults. A separate study by Stok et al., (2014b) tested descriptive versus injunctive normative influence on fruit consumption in adolescents. Results revealed an increase in health-promoting behaviors in the descriptive norm condition and a decrease in the injunctive norm condition. The descriptive norm condition reported eating more fruit in the days following the intervention, whereas the injunctive norm condition reported eating less fruit (Stok et al., 2014b). Therefore, context-driven information about other's behaviors can influence and provide significant motivation to change one's own behavior to that of the perceived norm although this study indicates that the influence may depend upon the nature of the norm (i.e., descriptive vs injunctive).

Current Study

The purpose of the study was to extend research concerning perception of tornado warnings by examining the effect of normative social influence statistics (Nolan et al., 2008) on individuals' threat evaluation and perceived motivation to respond to warning content. As discussed above, Evans (2015) found that pictures of preparation embedded within the NWS tornado warning impacted response-efficacy, such that individuals who viewed the warning with pictures of preparation rated the recommended actions (e.g., response-efficacy) as more effective, compared to no pictures. Put differently, pictures of preparing for the tornado event increased perception of efficacy related to "call-to-action" behavior, which may suggest that the pictures of preparation, which had images of people, possibly included an under-detected social component in addition to drawing attention to response-related information. One way to investigate the impact of social influence on perceptions of weather warnings is to examine the impact of social norms on measures such as response-efficacy. Descriptive social norms provide information as to how people are actually behaving within a certain context, and as discussed above, such norms can lead to conformity. The current NWS tornado warning structure lacks social contextual information and therefore the current study will examine the extent to which social contextual information affects responses in the context of tornado warnings including perceptions of risk, self-efficacy, response-efficacy, and comprehension of warning content.

Hypotheses

Political Conservatism Covariate: Controlling for the effect of political conservatism will reveal a clearer effect of tornado category and normative social influence on each dependent variable.

H1: There will be significant main effects of tornado category on susceptibility and response efficacy such that it is expected that participants will report higher susceptibility for the more severe category replicating Evans (2015) findings. It is also possible that higher efficacy may be observed for the less severe category.

H2: There will be significant main effects of normative social influence statistics on susceptibility and response efficacy such that participants will report higher susceptibility and response efficacy for the PNSI statistic as compared to the other two groups.

H3: A significant interaction effect will be observed between tornado category and normative social influence statistics for susceptibility and response efficacy. Within the F4 tornado category group, there will be a significant effect of normative social influence, such that individuals who see the positive NSI statistic will score the highest on susceptibility, response efficacy, and self-efficacy as compared to the other groups. It is also possible that negative normative social influence statistics will elicit a moderate effect as compared to the no statistic group.

Comprehension: The comprehension outcome will be exploratory in nature, as there is no theoretical foundation that suggests a connection between social norms and comprehension. Comprehension will therefore be assessed to determine the potential interplay between influence of normative social influence on comprehension of threatening information.

CHAPTER 2

METHOD

Participants

Two hundred and seven undergraduate students from a mid-sized southeastern university participated in the study. Three participants were not able to complete the study due to technical problems with the software. Five participants were excluded from the analyses because of missing data. Overall, 199 participants' data were used for analysis. Participants were recruited through the psychology department's sample pool via an online experiment management system (SONA). The sample included 129 females and 69 males with a mean age of 20 (*SD* = 5.63). Two participants did not complete the demographics questionnaire.

Design and Materials

The study was a 2 (tornado category: F2 vs. F4) x 3 (normative social influence statistic: Positive statistics vs. Negative statistic vs. No statistic) between-subjects design. Participants were randomly assigned to one of the six conditions. The format of the F2 and F4 tornado warnings were identical in color (white text against a black background), font, text size, word count, and were designed to match the general format of NWS tornado warning. The information in the text and voice features of the message content complied with the required structure of a CAP alert message (OASIS, 2010), such as tornado category (F2 or F4), areas predicted to receive the tornado impact (i.e., Bulloch County), and the expected time of impact. The layout consisted of static and dynamic text. Static text included the alert header, normative social influence statistic, and the tornado category. Dynamic text was located below the header, and scrolled horizontally from the right to the left side of the screen. Included in the dynamic text was the tornado category, expected areas of impact, and expected time of the tornado event. In addition to the set of information mentioned in the dynamic text, the voice feature of the message also offered information concerning wind speeds, predicted structural damage, and a call-to-action message instructing the viewer of the appropriate response to take. The call-to-action message was adopted from Troutman, Richard, and Mark (n.d.) on the NOAA website, and the visual and audible stimuli of the warning were adopted from Evans (2015). The normative social influence statistic conditions consisted of a simple statistic in the form of a single sentence that was added to the NWS tornado warning. In summary, participants viewed either F2 or F4 warnings that include either a positive normative social influence (PNSI) statistic, a negative social influence (NNSI) statistic, or no social statistic. The PNSI statistic warning was a statement indicating that "87% of people in your community take shelter after seeing a tornado warning." The negative social statistic included, "13% of people in your community do not take shelter after seeing a tornado warning." The no statistic warning was a standard NWS tornado warning. Participant responses were recorded as a spreadsheet by Qualtrics software.

Measures

After viewing the tornado warning, participants completed the outcome measures, political conservatism scale, and demographic questions. Each participant first completed three "disaster perception" scales adopted from the Evans (2015) study: the participant's perceived likelihood that he or she will experience the tornado (i.e., susceptibility, see Appendix B), the perceived ability to prepare for the impending tornado (i.e., self-efficacy, see Appendix C), and response-efficacy (Appendices D & E). The previously mentioned scales were originally adapted from early research on disaster preparedness within Vested Interest Theory (Miller, Adame, & Moore, 2013). Then, participants completed a series of comprehension questions designed to test memory recall of both quantitative and qualitative information within the warning: tornado category, normative social influence statistic, expected damage, and wind speeds (Appendix F). Participants also completed Everett's (2013) political conservatism scale (Appendix G). Various research indicates that individuals who orient toward conservative political ideologies exhibit more salient existential motives; that is, conservatives display a greater tendency to avoid and minimize threat (Jost, Federico, & Napier, 2009). Research also indicates political conservatism as positively associated with attributes such as a) death anxiety, b) system instability, and c) fear of threat and loss (Jost et al., 2009). Therefore, this measure was included to serve as a covariate. Lastly, participants completed a standard demographics questionnaire (Appendix H).

Procedures

This study was conducted in a laboratory setting with up to four participants participating in 30-minute time intervals. Participants completed the experimental procedure using Qualtrics survey software on a stationary computer with a 15-inch, Lenovo, liquid-color-display (LCD) monitor. Participants interacted with the software with only a computer mouse and keyboard. To begin, participants read the informed consent. The experimenter used a script to explain the informed consent by highlighting the participant's rights in the study. At the conclusion of the informed consent, participants agreed (by selecting "yes") or disagreed (by selecting "no") to continue the study. Participants who agreed to continue the study advanced to view the weather warning. No participants declined to participate or withdrew from the study at any time. After participants consented to participate, they were instructed that the study involved viewing a video and responding to questions about the video. Participants wore headphones (Sony A-40) for the audio function of the weather warning, with a controlled volume level of 37%. After viewing the tornado warning, participants completed the outcome measures and demographic questions. To avoid order effect, the presentation sequence of the outcome measures were randomized[1], as well as the items within each measure, as to avoid order effects.

[1] A computer error caused the F4 no statistic category to be unevenly weighted in the randomization process. Nine participants were distributed into the F4 no statistic group at a greater frequency in the second half of data collection. Independent samples t-test were conducted to test for significance between the means of the first and second half of the data collection process. No significant difference was found.

CHAPTER 3

ANALYSIS AND RESULTS[2]

Susceptibility

A 2 (tornado category: F2 vs. F4) x 3 (normative social influence statistic) Analyses of Variance (ANOVA) was conducted to access the individual effects of the independent variables on susceptibility. The analysis was based on case-wise composite scores of the susceptibility measure (see Appendix B). One participant was excluded as a result of incomplete data (i.e., not completing an item within the measure), and therefore the analysis included N=198. Susceptibility was hypothesized to present a significant main effect on tornado category, such that the F-4 tornado category group would respond with higher perceived susceptibility to the threat of tornado consequences than the F-2 category group. This hypothesis was supported, confirming previous findings from Evans (2015). The univariate test revealed a significate main effect of tornado category type, F (1, 192) = 14.71, p = .0001, η_p^2 = .071 (see Figure 1). A main effect for susceptibility was also predicted for the normative social influence independent variable, such that the positive normative social influence group would report higher levels of perceived susceptibility to the tornado threat than the negative social influence group and the no social influence group. This prediction was not supported, F (2, 192) = .145, p = .865, η_p^2 = .002. There was no difference among the no statistic (Mean = 5.12, *SEM* = .137), positive (Mean = 5.13, *SEM* = 1.29), or negative (Mean = 5.20, *SEM* = .131) conditions. Additionally, there was not a significant interaction effect of tornado category and social influence on susceptibility, F

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[2] Political orientation was measured as a potential covariate. However, there were no significant correlations among political conservatism and the outcome variables, and therefore was not included as a covariate in the analyses.

(2, 192) = .739, $p = .479$, $\eta_p^2 = .008$.

Response Efficacy and Self-Efficacy

A 2 (tornado category: F2 vs. F4) x 3 (normative social influence statistic) Multivariate Analysis of Variance (MANOVA) was conducted on the response efficacy measures and self-efficacy. The analysis was based on case-wise composite scores of the individual efficacy measures (see Appendices C, D, & E). Two participants were excluded as a result of incomplete data, and therefore the analysis included (N = 197). It was predicted that category type would have an effect on efficacy, such that efficacy would be higher for a less severe warning. however no main effect was observed, Wilks' $\Lambda = .997$, $F(2, 191) = .195$, $p = .90$, $\eta_p^2 = .003$. It was predicted that individuals who viewed normative social influence tornado warnings (i.e., positive and negative) would overall score higher across the efficacy outcome measures as comparted to the group that viewed the warnings with no social influence statistic, with the positive influence group scoring the highest. According to the hypothesis, the normative social influence groups would rate the response preparedness kit (i.e., response efficacy kit), the recommended actions to take (i.e., response efficacy action), and their ability to respond (i.e., self-efficacy) higher than the no social influence group. This hypothesis was not supported; there were no significant differences among the social influence groups across the three efficacy outcome measures, Wilks' $\Lambda = .953$, $F(2, 191) = 1.52$, $p = .17$, $\eta_p^2 = .024$ (see Tables 1 & 2).

Additionally, an interaction between tornado category type and normative social influence was predicted. There was a significant multivariate interaction, Wilks' $\Lambda = .932$, $F(2, 191) = 2.25$, $p = .038$, $\eta_p^2 = .035$. Post hoc univariate, two-way ANOVA's revealed a significant effect for response efficacy action, $F(2, 191) = 3.85$, $p = .023$, $\eta_p^2 = .039$. Simple effect one-way ANOVA's were conducted examining social influence at each level of tornado category. Within F2 there was an effect, F (2, 191) = 4.86, p = .01, η_p^2 = .090. LSD post hoc tests revealed that no statistic lead to perceptions of higher response efficacy action (Mean = 3.94, *SEM* = .168) than the positive statistic (Mean = 3.39, *SEM* = .168) and the negative statistic (Mean = 3.25, *SEM* =.163). There was no difference among the positive and negative conditions (see Figure 2). Within F4 there was no difference among the social influence conditions, positive statistic (Mean = 3.56, *SEM* = .178), negative statistic (Mean = 3.46, *SEM* = .183), or no statistic (Mean = 3.28, *SEM* = .195), F < 1.

The post hoc univariate two-way ANOVA for response efficacy kit trended but did not reach significance F (2, 191) = 2.69, p = .062, η_p^2 = .029. The post hoc univariate ANOVA for self-efficacy did not reach significance, F (2, 191) = 2.24, p = .098 , η_p^2 = .024.

Comprehension

A 2 (tornado category: F2 vs. F4) x 3 (normative social influence statistic) Analyses of Variance (ANOVA) was conducted to assess the individual effects of the independent variables on comprehension, N = 197. Scores were computed by summing the number of correct responses out of five questions. There was a significant main effect of tornado category on comprehension, F (1, 195) = 7.13, p = .008, η_p^2 = .035, such that the F-2 category scored significantly higher (Mean = 3.31, *SEM* = .119) than the F-4 category (Mean = 2.85, *SEM* = .122) (see Figure 3). There was no effect of social influence on comprehension, F (2, 195) = .109, p = .897, η_p^2 = .001. There were no differences between the no statistic (Mean = 3.14, *SEM* = .153), positive (Mean = 3.07, *SEM* = .144), or negative (Mean = 3.04, *SEM* = .145) conditions. Additionally, there was no interaction effect of tornado category and social influence on comprehension, F (2,

195) = .319, $p = .727$, $\eta_p^2 = .003$.

CHAPTER 4

DISCUSSION

Results revealed that participants who viewed the F4 warnings reported higher perceived susceptibility to the tornado threat compared to those who viewed the F2 warnings. These results replicate Evans' (2015) findings. This provides evidence that individuals accurately perceive risk to tornado threat relative to the information presented in the warning, such that the category of tornado (e.g., F2 and F4) and the information included in the voice over call-to-action (e.g., the damaging effect that the tornado can have on a building structure) effectively communicate a stratification of risk.

However, participants who viewed the F4 warnings had significantly lower comprehension recall of the risk information of the warning content compared to those who viewed the F2 warnings. These results also replicate Evans' (2015) findings. Evans found evidence of greater comprehension for the F2 warning than F4 in the second experiment of his study and, accounting for his results in the context of EMT, suggested that the extent to which attention is devoted directly to warning content may vary as a function of perceived severity. Error management theory (EMT) may also account for the allocation of attentional resources toward recommended action information and decision-making (Evans, 2015) in conditions where risk is perceived as high. EMT posits that adaptive cognitive biases and heuristics act to minimize risk under situations of uncertainty. That is, within certain contexts, people are more likely to judge a perceived threat to exist, and react (or take action) to the threat, in order to reduce the error of not responding when the threat is real. For example, humans and non-human primates are more likely to perceive a stick as a snake (false-positive judgment error) than to see a snake as a stick (false-negative judgment error) (Johnson, Blumstein, Fowler, & Haselton, 2013). According to the stick and snake example, the deliberate appraisal of risk information (e.g., does the object have a head, is the object moving toward me) would be deleterious in terms of directing cognitive resources toward risk information (i.e., attention) rather than taking action to mitigate the threat (e.g., quickly running away). Similar to Evans' (2015) interpretation of his results, in the current study the F4 category warning may have elicited greater perceived susceptibility to the threat, which may account for defaulting cognitive resources toward potential efficacious actions and decision-making over deliberate appraisal of risk information. Alternatively, the relative lower risk of the F2 warning may have led to greater appraisal of the information as would be predicted within a PMT framework. That is, when the potential threat provides for lower perceived susceptibility, cognitive resources can be allocated to appraise the risk information and potential responses, which allows for a deeper level of processing (i.e., cost-benefit analysis) of whether taking action and/or responding to the threat is valuable or appropriate.

The notation that allocation of attention may vary as a function of risk versus action information has been supported by other studies. For example, Magat, Viscusi, and Huber (1988) investigated consumer's precautionary decision-making and memory recall in relation to hazard warnings on different product labels. They found that consumers implemented a cognitive "tradeoff" while processing the different types of information on the product label (i.e., risk information and usage information). According to Magat and colleagues (1988), consumers substituted "greater recall of risk information for recall of usage information" (p.201). Similarly, as perceived susceptibility to the threat increases, attentional resources for risk information (e.g., wind speeds) may be substituted for recommended action information (e.g., take shelter in the lowest floor of your home). Further research is needed to empirically investigate the impact of perceived susceptibility on memory recall of risk versus action information, as well as the extent to which this is related to actual response to a weather warning. However, the current study found no significant difference between category type in terms of perceived efficacy.

An interaction of tornado category and social influence was observed in the current study, but the pattern was opposite to that of the original predictions. As noted above, it was predicted that social influence would have an effect in the context of greater severity (F4) and that social information would lead to higher outcomes in terms of efficacy and risk. However, participants who viewed the F2 warnings that included normative social information perceived the warnings' recommended response actions as less efficacious than the group who viewed the warning without social information. There was no significant effect of social influence in the context of the more severe warning. One possible explanation for the pattern of results is that participants in the F2 group processed the susceptibility of the threat and the normative social influence information as incongruent. Put differently, participants' appraisal of the risk information within the warning resulted in low perceptions of susceptibility, but the social information provided within the warning indicated that the large majority of other individuals would take shelter. This information incongruence may have contributed to decreased motivations to comply with the recommended actions of the warning, thus resulting in a *boomerang effect* (Byrne & Hart, 2009). Byrne and Hart (2009) describe a boomerang effect as "a strategic message [that] generates the opposite attitude or behavior than was originally intended" (p.4). Accordingly, such effects have been observed throughout the literature, including areas such as perceived susceptibility, fear appeals, and social norms, such that strategic messages designed to increase health promoting behaviors instead elicited opposite results (see Byrne & Hart, 2009 for a review of the literature). In the current study, the boomerang effect may be explained by cognitive dissonancy and schema theory. A schema can be defined as a higher-level cognitive framework of organized congruent information (McNeil & Alibali, 2002). Research suggests that schema-incongruent stimuli or information attracts more attention than schema-congruent information, and is therefore processed at a deeper level, which often contributes to greater memory recall. However, literature also suggests that schemas are resistant to change, and without the appropriate time for schema-incongruent information to be assimilated, the incongruent information will be dismissed (see Coker, Fisk & Taylor, 1984). Foti (1986) coined this the *perseverance effect.* Therefore, the F2 warning may have primed a pre-existing attitudinal schema with regard to the level of perceived susceptibility and the appropriate response behaviors. The social information provided within the warning acted as schema-incongruent information, was processed more deeply, but rejected. That participants may have processed the information more deeply within the F2 warning is supported by the finding that comprehension was higher relative to the F4, but perceived risk lower.

A boomerang effect was not observed for the F4 condition. Although not statistically significant, examination of the means for social influence within the F4 reveals that mean differences trended in the opposite direction than within the F2 condition. This might be explained in that participants' higher perception of susceptibility was processed as congruent with the provided social information regarding how others will respond to the threat, and therefore did not have a negative effect as in the F2 condition, although there was no statistical benefit either. It is possible that the absence of a robust effect within the F4 condition may be attributable to saliency of information. As noted, the pattern of means did not indicate that there was necessarily a negative impact of social information, but the effect size was not sufficient to be observed statistically. If the pattern in the comprehension data is attributable to attentional allocation, with fewer resources devoted to risk content, then the addition of a statistic may not have been sufficiently salient if the level of processing of the risk information within the warning content is relatively shallow. It may be that if the information were made more salient or were included in a real-life weather warning, some benefit may be observed. This is indirectly supported to a degree by the findings in Evans' (2015) second experiment in which pictorial effects were observed in both the lower and higher-severity conditions. The inclusion of pictures in the Evan's study was motivated by a substantial body of work demonstrating the cognitive benefits in terms of ease of processing and comprehension of pictures versus text (see Evans, 2015 for a review of pictorial effects in both experimental and applied domains). Presumably, pictures are sufficiently salient and easily processed, thus providing a positive benefit, whereas it is possible that social information provided only in text is not, and therefore having no effect. Importantly, that the inclusion of social information in the form of a statistic had a negative impact for the F2 category suggests that future research should further evaluate social information as a function of warning severity. For example, within a more severe context, a benefit of social information might be observed by increasing the saliency of the information (e.g, combining the statistic with pictorial information) whereas in a less severe context, no social information in the form of a statistic may be more beneficial.

Overall, these findings provide evidence that individuals' motivation to respond may be diminished when communicating risk through social norms within less-severe weather warnings. An important implication of this study in regard to social influence is that, in real-world applications, an emphasis on how others are responding should be used with caution when warnings are not sufficiently severe. Further research is needed to determine if there would be actual benefits in severe contexts and how this information might be presented as to be sufficiently salient.

Limitations

A limitation to the study is that the sample population, university college students, is not representative of the national U.S. population. However, this may allow for a more in-depth understanding of how college-age individuals would respond under separate warning conditions. Additionally, it is possible that the laboratory environment may not elicit that same affective responses that other environmental factors, such as noise from increased wind speeds and/or heavy rain, may elicit. For example, it is possible that social information presented in the form of a statistic may be more salient in an actual severe warning as opposed to the artificial environment of the laboratory. However, the laboratory does allow for the isolation of the effects of specific variables by creating an environment that controls for external confounds. Most importantly, during the current study's five-month span of data collection, three major storm warnings (one hurricane and two tornado warnings) were disseminated at the regional and university level. Each of these three warnings prompted the university to close for a minimum of one day. This may have resulted in a ceiling effect for participants' perceptions of efficacy.

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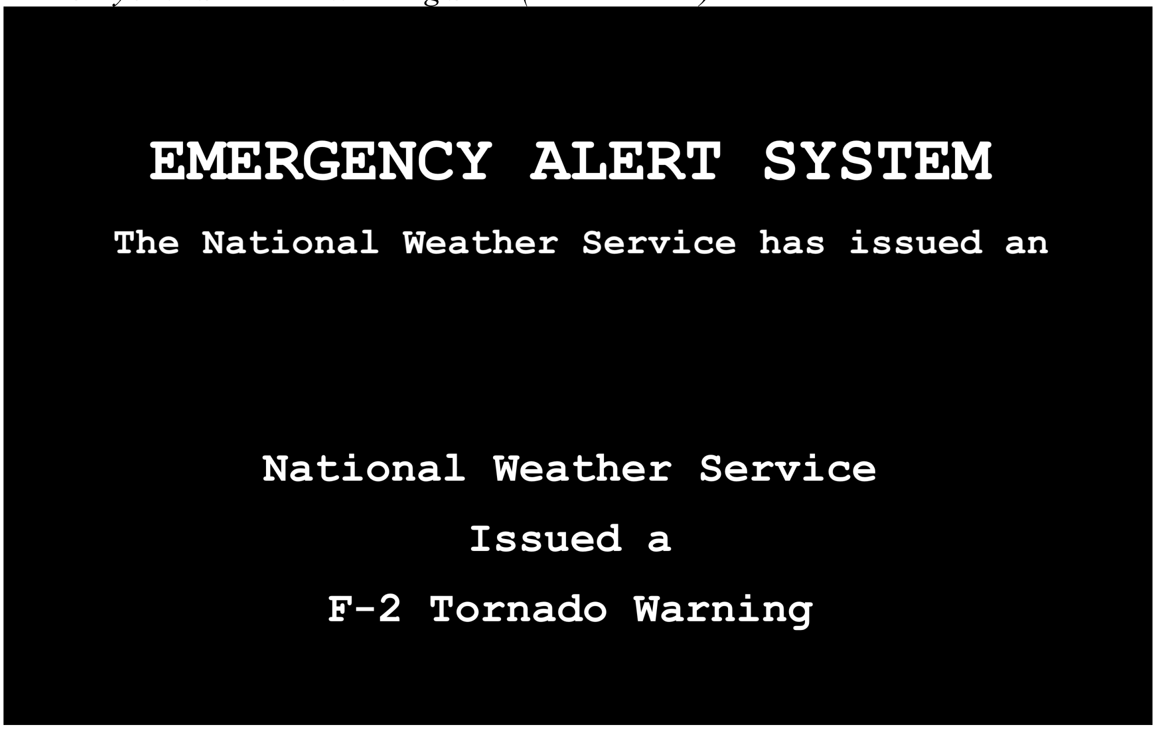
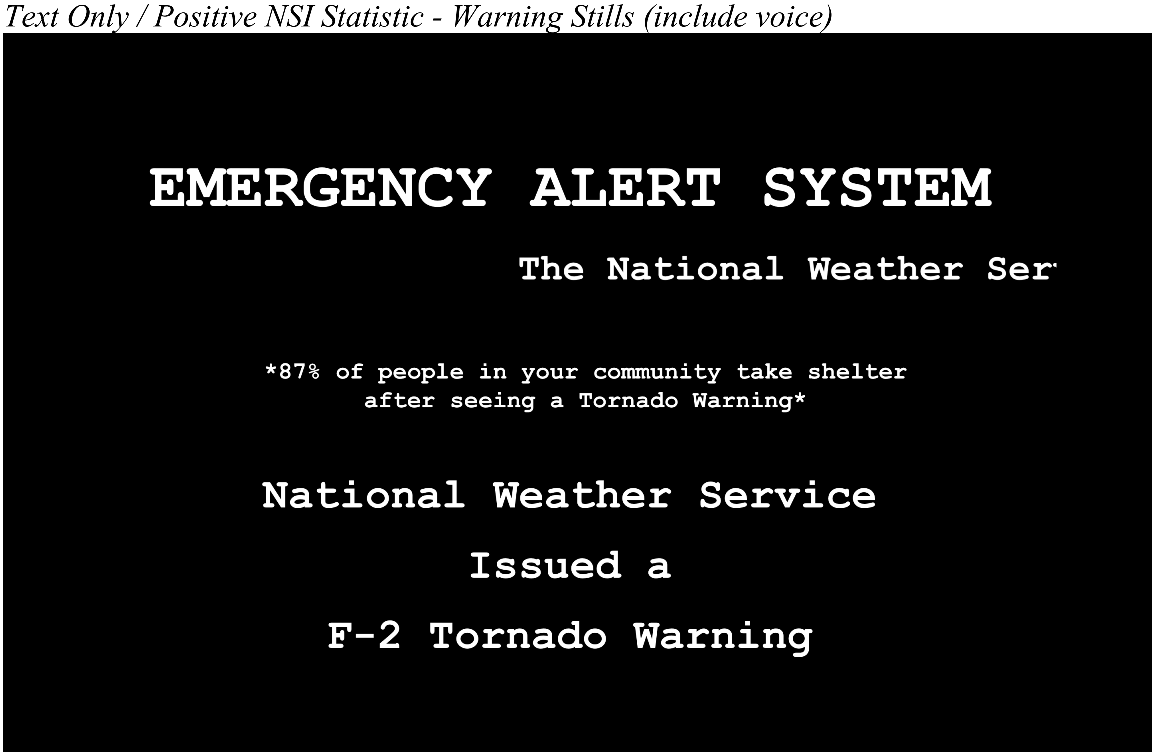
Appendix A

Text Only / No Statistic - Warning Stills (include voice)



Text Only / Positive NSI Statistic - Warning Stills (include voice)



Appendix B

Susceptibility Measure

Consider the weather warning you just saw. Imagine that was a real warning issued for Statesboro. How susceptible are you to THAT tornado's effect. Susceptibility is defined as being vulnerable to harm or at risk for a particular threat. Please answer these questions as best as you can

1. How susceptible are you to getting injured by this tornado?

Not Susceptible 1 2 3 4 5 6 7 Highly Susceptible

2. How susceptible is your property to getting damaged by this tornado?

Not Susceptible 1 2 3 4 5 6 7 Highly Susceptible

3. What is the possibility your property will get damaged by this tornado?

Not Possible 1 2 3 4 5 6 7 Highly Possible

4. How at risk is your community of getting hit by this tornado?

Not at Risk 1 2 3 4 5 6 7 Highly at Risk

5. Given that you live in Georgia, what is your risk of getting hit by a tornado?

No Risk 1 2 3 4 5 6 7 High Risk

Appendix C

Self-Efficacy Measure

Please use the information provided in the video to respond to the following questions.

1. How capable are you at effectively preparing to help respond to a tornado strike?

    Not Capable 1 2 3 4 5 6 7 Highly Capable

2. How able are you to take the time to prepare in the event of a tornado strike?

    Not Able 1 2 3 4 5 6 7 Highly Able

3. How easy would it be for you to prepare for a tornado strike?

    Not Easy 1 2 3 4 5 6 7 Very Easy

4. How much knowledge do you have about preparing in response to a tornado?

    No Knowledge 1 2 3 4 5 6 7 Great Knowledge

5. How effective are you at preparing in the event of a tornado strike?'

    Not Effective 1 2 3 4 5 6 7 Highly Effective

Appendix D

Response Efficacy (Actions)

The National Oceanic and Atmospheric Association recommends the following if a tornado is coming:

- Avoid windows.
- Get in the basement and under some kind of sturdy protection (heavy table or work bench), or cover yourself with a mattress or sleeping bag
- Know where very heavy objects rest on the floor above (pianos, refrigerators, waterbeds, etc.) and do not go under them. They may fall down through a weakened floor and crush you.
- Head protection, such as a helmet, can offer some protection also.

Please answer the following questions regarding how effective these strategies would be at protecting you in the event the tornado came.

1. How effective are these actions at minimizing the negative consequences of tornado strikes?

   Not Effective 1 2 3 4 5 6 7 Highly Effective

2. How effective would these actions be in reducing the damage caused by a tornado?

   Not Effective 1 2 3 4 5 6 7 Highly Effective

3. How effective will these actions be at lowering distress following a tornado strike?

   Not Effective 1 2 3 4 5 6 7 Highly Effective

4. How effective will these actions be at minimizing damage from a tornado to your property or belongings?

   Not Effective 1 2 3 4 5 6 7 Highly Effective

5. How effective are these actions at reducing the impact of tornadoes?

   Not Effective 1 2 3 4 5 6 7 Highly Effective

Appendix E

Response Efficacy (Kit)

The following questions ask about response efficacy. Response efficacy is defined as the ability of a tool or procedure to produce a desired result.

The National Oceanic and Atmospheric Association recommends all Georgia residents have an Emergency Supply Kit. This supply kit contains a three-day supply of water, non-perishable food, radio, first aid kit, matches, etc.

Please answer the following questions regarding how effective various related responses may be to the tornado strike.

1. How effective is an emergency kit in minimizing the negative consequences of tornado strikes?

Not Effective 1 2 3 4 5 6 7 Highly Effective

2. How effective would an emergency kit be in reducing the damage caused by a tornado?

Not Effective 1 2 3 4 5 6 7 Highly Effective

3. How effective do you think an emergency kit will be at lowering distress following a tornado strike?

Not Effective 1 2 3 4 5 6 7 Highly Effective

4, How effective is an emergency kit at minimizing damage from a tornado to your property or belongings?

Not Effective 1 2 3 4 5 6 7 Highly Effective

5. How effective is an emergency kit at reducing the impact of tornadoes?

Not effective 1 2 3 4 5 6 7 Highly Effective

6. How effective is planning ahead of time at reducing the potential harm caused by tornadoes?

Not effective 1 2 3 4 5 6 7 Highly Effective

7. How effective are emergency alert radio messages at helping respond to a tornado strike?

Not effective 1 2 3 4 5 6 7 Highly Effective

Appendix F

Comprehension Questions

The following questions are asking you about the weather warning you just viewed. Please answer these questions as best as you can.

1. According to the warning, what category was the tornado?

- F-1
- F-2
- F-3
- F-4
- F-5

2. What was the expected wind speed associated with the tornado?

- 55
- 81
- 113
- 142
- 171

3. According to the warning, what is the expected damage to the home?

- Some visible damage
- Broken glass in doors and windows
- Collapsing of some walls
- Collapsing of all walls
- Home's slab swept completely clean

4. According to the warning, what is the expected damage to a home's roof?

- No roof damage
- Loss of roof covering material (<20%)
- Uplift of roof deck
- Major roof damage, with part of roof remaining
- Removal of roof
- No roof – Home's slab swept completely clean

5. According to the warning, what is the expected damage to a home's foundation?

- No damage expected
- Home shifts off foundation
- Tearing off of the sides of the home
- Complete destruction of home
- Home's foundation completely wiped clean, and slab carried a few feet

6. According to the waring, what percent of the community will respond to the warning by taking shelter?

- Sliding scale (0-100)

6. According to the waring, what percent of the community will NOT respond to the warning by taking shelter?

- Sliding scale (0-100)

Appendix G

Social and Economic Conservatism Scale

“Please indicate the extent to which you feel positive or negative towards each issue. Scores of 0 indicate greater negativity, and scores of 100 indicate greater positivity. Scores of 50 indicate that you feel neutral about the issue.”

1. Abortion (reverse scored). (S)
2. Limited government. (E)
3. Military and national security. (S)
4. Religion. (S)
5. Welfare benefits (reverse scored). (E)
6. Gun ownership. (E)
7. Traditional marriage. (S)
8. Traditional values. (S)
9. Fiscal responsibility. (E)
10. Business. (E)
11. The family unit. (S)
12. Patriotism. (S)

Appendix H

Demographics

1 What is your gender?

- Male
- Female

2. What is your age? (in years)

[----]

3. What is your race/ethnicity? (Check all that apply)

- African American
- Asian
- Caucasian
- Hispanic
- Native American
- Pacific Islander
- Other (not listed)
- I prefer not to respond

4. What is your education level?

- First year student
- Sophomore
- Junior
- Senior

5. How likely do you think it is that a tornado will strike in Statesboro?

Likert Scale [Very Unlikely ------------------- Very Likely]

6. How likely do you think it is that you will ever experience a tornado?

Likert Scale [Very Unlikely ------------------- Very Likely]

7. Do you currently live in a mobile home?

- Yes
- No

8. Have you ever been in a tornado before?

- Yes
- No

If yes to item 8 go to item 9 and then the following questions, if no skip item 9 and go to following questions.

9. When you were in the tornado, how prepared did you feel?

Likert Scale [Not at all prepared ------------------- Very Prepared]

10. Are you familiar with the Enhanced Fujita (F-scale) Scale for Tornado Damage?

- Yes
- No

11. What response options do you have available in the event of a tornado strike? (Select all that apply)

- Underground Shelter
- Basement/Lower Floor
- Interior room without windows

12. Please indicate your political orientation:

Likert Scale [Very Liberal ------------------- Very Conservative]

Figure 1

Mean susceptibility (Tornado Type)

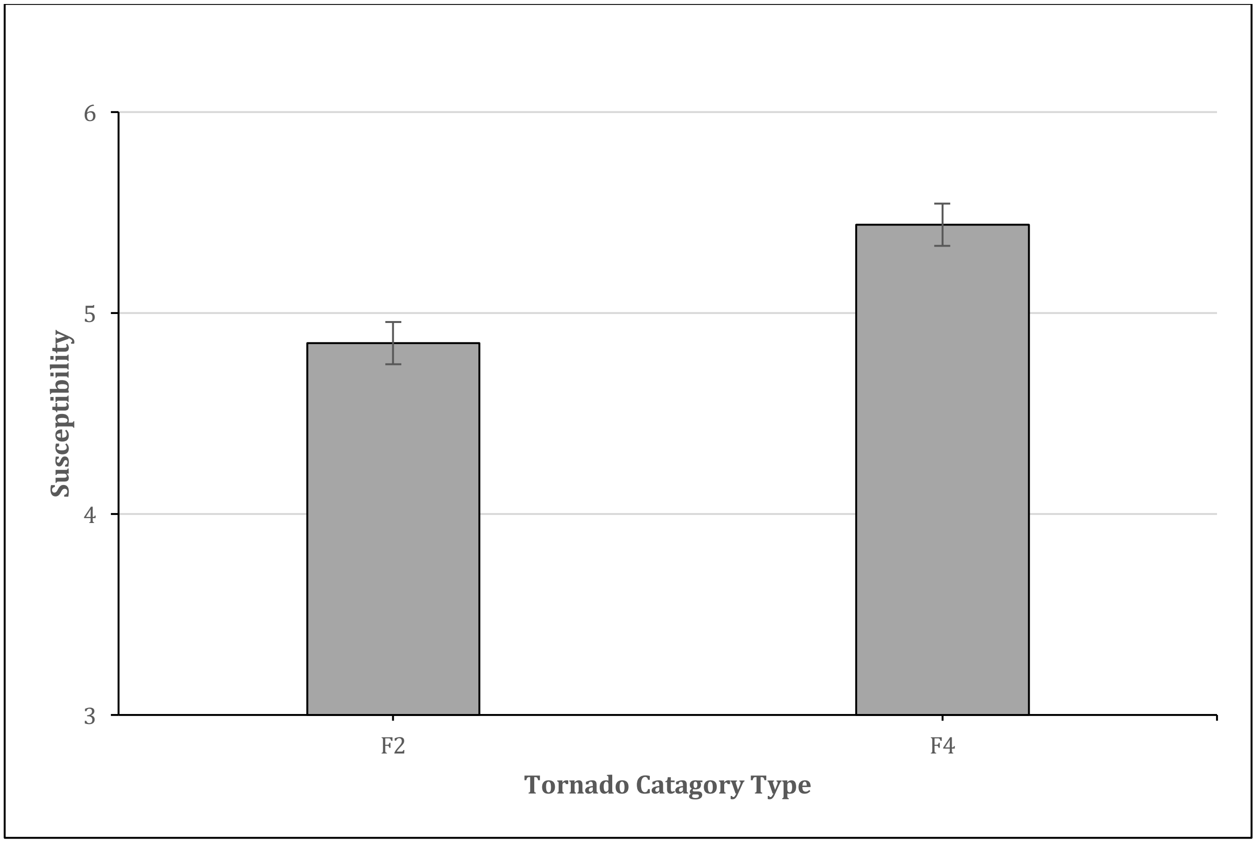


Figure 2

Response Efficacy Action between Tornado Category

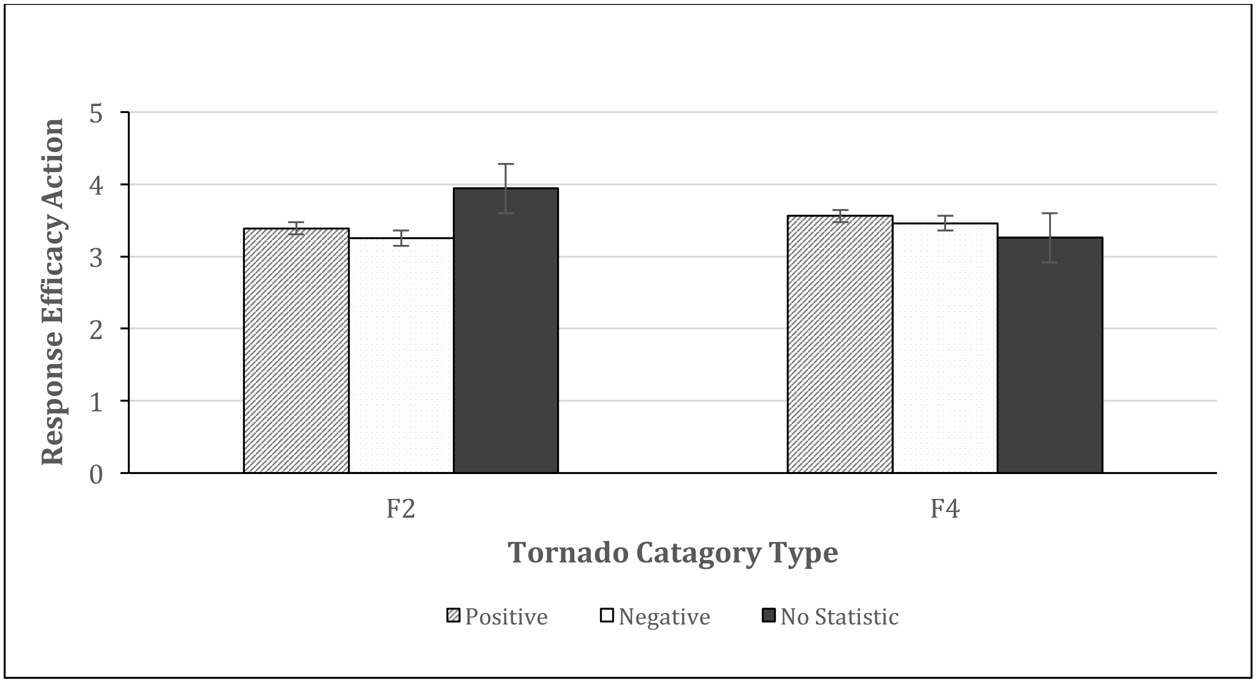


Figure 3

Mean Comprehension (Tornado Category)

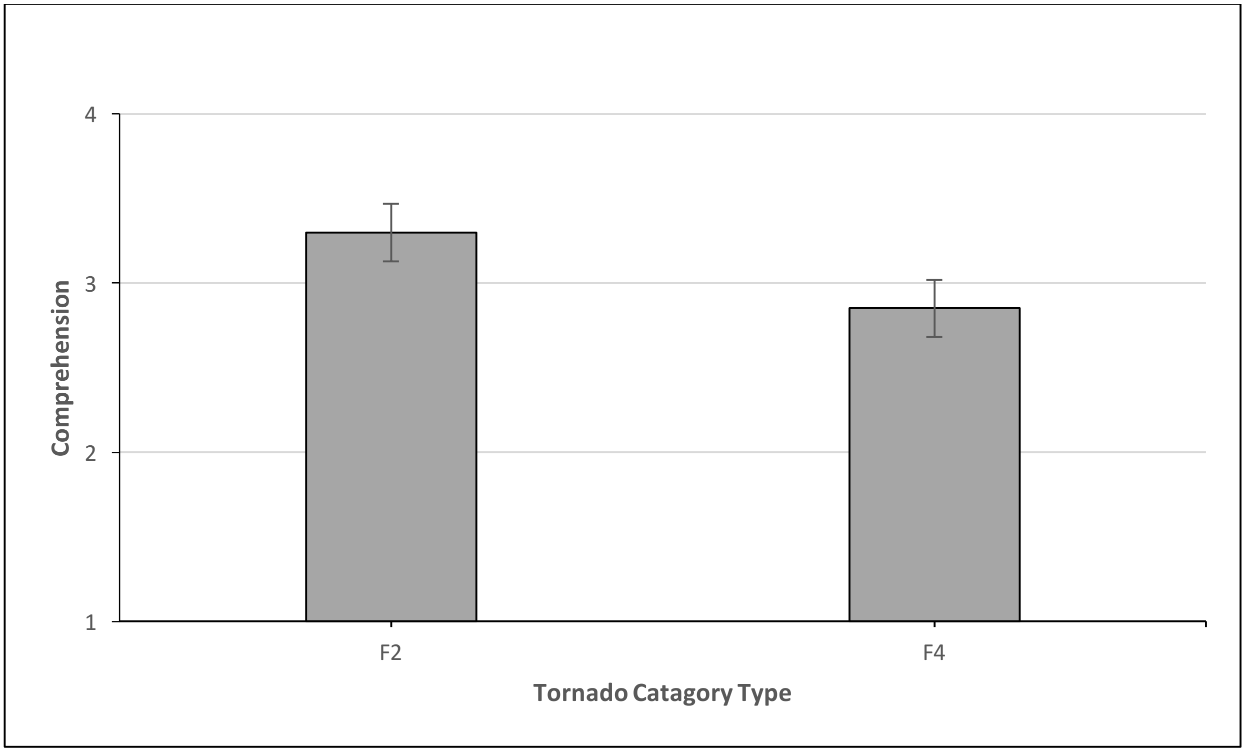


Table 1

Means and SEMs for Tornado Category (Efficacy Measures)

	Response Efficacy Action		Response Efficacy Kit		Self-Efficacy	
	Mean	*SEM*	Mean	*SEM*	Mean	*SEM*
F2	3.52	.099	3.76	.088	4.53	.108
F4	3.44	.106	3.70	.101	4.55	.126

Table 2

Means and SEMs for Social Influence (Efficacy Measures)

	Response Efficacy Action		Response Efficacy Kit		Self-Efficacy	
	Mean	*SEM*	Mean	*SEM*	Mean	*SEM*
No Statistic	3.63	.131	3.82	.129	4.34	.138
Positive Stat	3.48	.117	3.74	.099	4.47	.148
Negative Stat	3.35	.073	3.64	.067	4.78	.083

Table 3

Frequency Table Showing Gender

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Female	129	64.8	65.2	65.2
Male	69	34.7	34.6	100.0

Table 4

Frequency Table Showing Age

Age	Frequency	Percent	Valid Percent	Cumulative Percent
18	48	24.1	24.1	24.6
19	73	36.7	36.7	61.3
20	50	25.1	25.1	86.4
21	15	7.5	7.5	94.0
22	6	3.0	3.0	97.0
23	2	1.0	1.0	98.0
26	1	.5	.5	98.5
53	1	.5	.5	99.0
58	1	.5	.5	99.5
78	1	.5	.5	100.0

Table 5

Frequency Table Showing Race

Race	Frequency	Percent	Valid Percent	Cumulative Percent
African American	66	33.2	33.3	33.3
Asian	7	3.5	3.5	36.9
Caucasian	105	52.8	53.0	89.9
Hispanic	14	7	7.1	97.0
Other	5	2.5	2.5	99.5
Prefer not to respond	1	.5	.5	100.0

Note: One participant did not complete this question.

Table 6

Frequency Table Showing Education Level

Education Level	Frequency	Percent	Valid Percent	Cumulative Percent
First Year Student	104	52.3	52.5	52.5
Sophomore	61	30.7	30.8	83.3
Junior	27	13.6	13.6	97.0
Senior	6	3	3	100.0