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David N. Sattler
Western Washington University, david.sattler@wwu.edu

Amanda L. Marshall
Western Washington University

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Hurricane Preparedness: Improving Television Hurricane Watch and Warning Graphics*

David N. Sattler
Amanda L. Marshall
Department of Psychology
Western Washington University
Bellingham, WA 98225-9089
USA
E-mail: David.Sattler@wwu.edu

This paper examines the effectiveness of hurricane watch and warning graphics currently used by television stations during a hurricane threat and new, enhanced graphics developed by the first author. The participants were 378 persons (91 men, 287 women) in Charleston, South Carolina—an area that has had recent and repeated experience with hurricane threats. The hypothesis that participants viewing the enhanced graphics would have a better understanding of the time-frame associated with hurricane watch and warning advisories and of the actions to take, and would perceive the situation more seriously compared to those viewing the currently used graphics was supported. The new graphics may help increase preparedness and minimize property loss and exposure to life threat.

Advisories for hurricanes and other weather-related hazards are designed to help persons at risk understand the nature of the threat, the actions they should take to reduce personal harm and property loss, and when they should take action (Mileti and Sorenson 1987; Perry and Mushkatel 1984). "The 'suggested' actions may serve as brief cues . . . which bring to mind more elaborate adaptive strategies which have

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been previously communicated. For example, a warning to evacuate some threatened area is considerably more effective if residents are aware of various evacuation routes, checkpoints, and safe locations *at the time they receive the warning*" (Perry 1985, p. 143; emphasis in the original). Advisories also serve to reduce uncertainty, confusion, and anxiety (Mileti and Sorensen 1987).

People at risk of experiencing a natural hazard such as a hurricane tend to process advisory information in a series of stages. These stages include hearing the information, confirming the information, understanding the situation, believing that the situation is real, personalizing the situation by considering how the threat may affect them personally, and responding (Mileti and O'Brien 1992; Mileti and Sorensen 1987). Research suggests that people are more likely to believe the advisory or warning when the information is clear, specific to the situation, and contains sufficient information on which to base a decision (Mileti and O'Brien 1992). People also tend to make better decisions when they have high quality information about the situation (Hooke 2000; Weinstein 1989).

To inform viewers that a hurricane watch or hurricane warning advisory has been issued, television stations in the United States and other countries typically place a graphic on the screen that includes a map with the counties or areas affected and the words "hurricane watch" or "hurricane warning." In addition, during news broadcasts, television meteorologists discuss the threat in more detail. Because citizens rely on television broadcasts for current and updated information, it is vital that the hurricane advisory graphics present information clearly and accurately, and notify citizens about the nature of the threat and the actions they should take. If citizens viewing these graphics do not understand the weather advisory (the time frame, actions they should take, etc.), then they may not take appropriate action and may be at increased risk of personal harm, exposure to life threat, and loss of property (Sattler, Kaiser, and Hittner 2000). The graphics currently used by most if not all television stations do not include critical information associated with the advisory, including estimated time before landfall, what actions citizens should take to prepare, and when citizens should take action.

The present study examined the effectiveness of currently used television graphics and new enhanced graphics designed by the first author to inform citizens about a hurricane threat. The study was conducted in Charleston, South Carolina—a community that has had recent and tangible experience with hurricane threats. On September 21, 1989,

Hurricane Hugo—a Category 4 storm[1] with sustained winds of 135 miles per hour—struck Charleston and created over $7 billion (US) in damages. Numerous storms threatened the city during the 1990s, including Hurricanes Emily, Fran, Bertha, Bonnie, Dennis, and Floyd. In September 1999, Hurricane Floyd created at the time the largest evacuation during peacetime in the history of the United States, and more than two and one-half million persons along the southeast coast, including 70 percent of Charleston residents, fled the advancing storm (Dow and Cutter 2002; Sattler 2001). This project was conducted one year after the Hurricane Floyd threat.

Based on Charleston's recent and repeated experience with hurricane threats, we expected that residents would have a fairly good understanding of hurricanes and the meaning of hurricane watch and hurricane warning advisories. To examine understanding of the advisories and the effectiveness of the currently used and enhanced hurricane watch and warning television graphics, this study included four conditions. In two conditions, the participants were shown information that is presented in either the currently used hurricane watch graphic or the currently used hurricane warning graphic. In the other two conditions, participants were shown either the enhanced hurricane watch graphic or the enhanced hurricane warning graphic. These enhanced graphics include information about estimated time before landfall and recommended actions. The content for the enhanced graphics was based on the National Hurricane Center's definitions of a hurricane watch and a hurricane warning (National Hurricane Center 2001). The enhanced graphics were designed to fit into the amount of space allocated for the current television advisory graphics. We predicted that, compared to participants viewing the current graphics, those viewing the enhanced graphics (a) would have a better understanding of the hurricane watch and warning advisories, (b) would have a better understanding of the precautionary actions they should take when each advisory is issued, and (c) would take the hurricane threat more seriously.

Method

Participants

The participants were 378 students (91 men, 287 women) at the College of Charleston in Charleston, South Carolina. The average age was 21 years, with a range from 18 to 67 years. Most were single (89

percent), white (87 percent), and had experienced Hurricane Hugo (60 percent). Persons in social science courses were asked to volunteer and complete the survey during class time. The response rate was 98 percent, and the participants did not receive any inducements for participating. The higher percentage of female participants reflects the demographics of students enrolled in social sciences courses and at the College of Charleston.

Materials

A cover letter attached to the anonymous and confidential questionnaire described the purposes of the study and presented informed consent information. Participants received a questionnaire that presented one of four graphics on paper: information currently presented

Figure 1. Examples of Currently Used (left) and Enhanced (right) Hurricane Watch Graphics

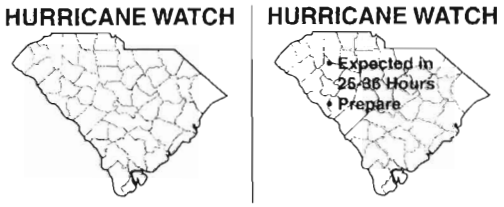
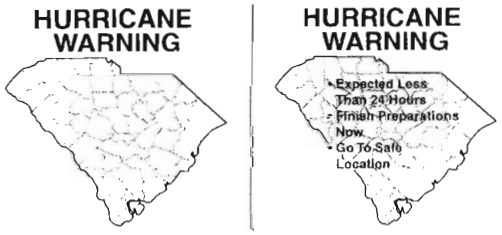


Figure 2. Examples of Currently Used (left) and Enhanced (right) Hurricane Warning graphics



in hurricane watch television graphics; information currently presented in hurricane warning television graphics; information in the enhanced hurricane watch graphic; or information in the enhanced hurricane warning graphic. Figure 1 presents examples of the currently used and enhanced hurricane watch graphics, and Figure 2 presents examples of the currently used and enhanced hurricane warning graphics. The image of the state or area under threat can be modified for any region throughout the world.

In the first section of the questionnaire, participants indicated the amount of time before landfall associated with the advisory by checking one of five answers (1=less than 24 hours, 2 = 25-36 hours, 3=37-48 hours, 4=more than 48 hours, 5=none of the above). Participants also were asked about the meaning of the hurricane advisory. Using a two-point true/false scale, participants indicated whether the advisory indicated citizens should "monitor the track of the storm," "begin preparations," "finish preparations," "have all preparations completed," or "go to a safe location." The second section asked participants what they would do if the National Weather Service issued a hurricane advisory for the Charleston area. Examples include: "I wouldn't do anything because I would wait for the situation to become more serious"; "I would begin preparations"; "I would go to a safe location"; and "I would take the situation seriously." Participants used a five-point scale (1=strongly disagree to 5=strongly agree) to indicate their answers. The third section asked for demographic information and experience with hurricanes. To indicate their answers, the participants checked one of several possible responses.

Procedure

Faculty members at the College of Charleston administered the questionnaires to participants in their classrooms. The participants were asked to read the instructions and to complete the anonymous and confidential questionnaire, which took about 10 minutes. Participants were debriefed and thanked.

Results

The first set of analyses examined the effectiveness of the hurricane watch graphics, and the second set examined the effectiveness of the hurricane warning graphics.

Hurricane Watch Graphics

Compared to participants viewing the current hurricane watch graphic, those viewing the enhanced graphic: (a) were more accurate in their understanding of the time before landfall ($M = 3.07$ vs. $M = 2.36$; $F_{1,209} = 24.58$; $p < .0001$); (b) indicated that they were more likely to take action rather than wait for the situation to become more serious ($M = 2.71$ vs. $M = 3.09$; $F_{1,209} = 4.54$; $p < .05$); and (c) indicated that they would take the situation more seriously ($M = 3.83$ vs. $M = 4.13$; $F_{1,209} = 4.91$; $p < .05$). There were no significant differences on items asking if the hurricane watch advisory indicates whether citizens should monitor the track of the storm or begin preparations.

Hurricane Warning Graphics

Compared to participants viewing the current hurricane warning graphic, those viewing the enhanced warning graphic were: (a) more accurate in their understanding of the time before landfall associated with this graphic ($M = 2.30$ vs. $M = 1.26$; $F_{1,164} = 42.51$; $p < .0001$); (b) more likely to indicate that the hurricane warning meant to finish preparations ($M = 1.47$ vs. $M = 1.14$; $F_{1,156} = 20.61$; $p < .05$); (c) more likely to indicate that the hurricane warning meant to go to a safe location ($M = 1.30$ vs. $M = 1.10$; $F_{1,155} = 10.89$; $p < .001$); (d) tended to indicate that they would take the situation more seriously ($M = 2.19$ vs. $M = 2.53$; $F_{1,164} = 3.37$; $p = .06$); and (e) tended to indicate that they would go to a safe location ($M = 3.43$ vs. $M = 3.73$; $F_{1,164} = 2.72$; $p < .10$).

Discussion

The hypothesis that participants viewing the enhanced hurricane watch and warning graphics would have a better understanding of the advisories, the precautionary actions they should take, and would perceive the hurricane threat more seriously compared to those viewing the currently used graphics was supported. Participants viewing the enhanced hurricane watch graphic also indicated that they would be more likely to take action compared to those who viewed the currently used graphic.

It is particularly noteworthy that most of the participants viewing the currently used hurricane warning graphic *overestimated* the time before landfall and thought that a warning indicated that a storm may make landfall in 25-36 hours. These individuals might be at risk of

under-preparation because they would have less time than believed to prepare (i.e., less than 24 hours). Most importantly, however, participants viewing the enhanced warning graphic correctly indicated that the advisory states that a storm is estimated to make landfall in less than 24 hours. These findings suggest that: (a) citizens—even those with recent and repeated hurricane experience—may not have a clear understanding of the meaning of the hurricane watch and warning statements (cf., Sattler, Kaiser, and Hittner 2000); (b) the currently used graphics do not provide citizens with vital information about hurricane watch or warning advisories or the situation; and (c) the new graphics may help citizens to understand the nature of the threat, to prepare, to minimize their risk of injury, and to reduce property damage and loss. In short, the findings suggest that the enhanced watch and warning graphics are a simple and inexpensive way to provide citizens with useful information that can lead to a better understanding of the threat and informed decision-making (Sattler et al. forthcoming; Sorensen and Mileti 1987; Fitzpatrick and Mileti 1991; Weinstein 1989).

It is likely that the enhanced graphics may be especially valuable for persons who have little or no hurricane experience and who may be unfamiliar with the watch and warning advisories. This is especially important, given that population trends in the United States and other countries indicate that an increasing number of people are moving into regions that are vulnerable to natural disasters (Phifer and Norris 1989). It is also important because people receive such information from a variety of sources (e.g., local media, national cable television, family, and friends), and it is important that the information they receive from the media and weather services is as accurate and complete as possible. Research should continue to examine ways to improve warning responses and how to best inform and educate the public about hazard threats.

The enhanced graphics are designed to fit into the space allotted for the current graphics and should be easy to implement. However, if a graphic for a given area is too large, then we suggest moving the information presenting the recommended actions and time frame to a scrolling bar at the bottom of the screen. The new graphics are designed so that sections can be shaded—as is the current practice—to indicate the counties or areas that have been placed under a watch or warning. If used effectively, we believe that the enhanced graphics may serve to increase community preparedness, minimize exposure to life threat, help reduce property damage and loss, and minimize distress and suffering (Sattler et al. 1997).

Note

1. Hurricanes are classified by sustained wind speed using the Saffir-Simpson scale: Category 1 (74-95 mph, minimal damage), Category 2 (96-110 mph, moderate damage), Category Class 3 (111-130 mph, extensive damage), Category Class 4 (131-155 mph, extreme damage), Category Class 5 (greater than 155 mph, catastrophic damage).

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