



You're my only hope: An initial exploration of the effectiveness of robotic platforms in engendering learning about crises and risks



Kenneth A. Lachlan^{a,*}, Patric R. Spence^b, Adam Rainear^a, Joshua Fishlock^a, Zhan Xu^a, Bryan Vanco^a

^a University of Connecticut, USA

^b University of Kentucky, USA

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ABSTRACT

In the face of crises and risks, emergency responders are often faced with challenges in terms of reaching audiences in treacherous locations, or that are unreachable due to infrastructure failure. Social robots offer one solution for delivering information cornering risks under these circumstances. An exploratory study examined the responses of individuals to risk messages disseminated through robotic delivery platforms. The results suggest that risk messages delivered through robots may engender equal knowledge acquisition as those delivered through legacy media, though sex differences are noted for high involvement events. The findings are discussed in terms of implications for emergency management.

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As environmental crises and risks become more severe and more common, communication practitioners are continually looking toward findings ways of reaching at risk audiences and informing them of the conditions surrounding imminent threats. This is often made challenging due to the fact that under conditions of crisis and duress, it may be difficult or even dangerous to reach those who are most affected by the event in question (Lachlan & Spence, 2007). The newly emerging field of social robotics may offer one solution, as it is plausible to send robotic delivery platforms into crisis and risk environments to deliver critical information concerning the risk at hand, without risking the well-being of emergency managers and first responders. At the same time, little is known about the effectiveness of these technologies in delivering risk information, and the extent to which audiences will retain information delivered through a presumably novel medium.

The current study serves as an initial exploration into the effectiveness of robots in delivering information concerning crises and risks. A simple experiment was conducted in the laboratory to investigate whether audiences would retain similar amounts of crisis and risk related information from robots or legacy media, and whether their level of involvement in the risk at hand would be a

factor in the effectiveness of the robot. The results are then discussed in terms of their implications for future field research, and for emergency managers and first responders who may be considering their use. We begin with a discussion of the motivation for acquiring information under conditions of crisis and duress.

1. Risk information processing

Crisis and risk communication strategies may be categorized as types of strategic communication. They tend to be implemented as parts of larger scale communication programs and interventions that are intended to address both the physical and psychological ramifications of environmental risks and hazards. These communication efforts may take place, before, during, and after such events, or may exist well ahead of a potential crisis by exposing a risk against which individuals should mitigate.

Crises and risks, by their very nature, elicit a certain degree of anxiety among those who may be affected. This is not necessarily problematic, as a certain degree of anxiety may be useful in motivating people to action. On the other hand, excessive anxiety may lead to inactivity, hopelessness, antisocial behavior, or worse (Lachlan & Spence, 2010). In reducing unnecessary anxiety, crisis communication efforts should ideally meet the public's need for control. This typically entails providing information about the risk, how to avoid the risk, and tangible steps that can be taken to minimize susceptibility.

* Corresponding author. Department of Communication, University of Connecticut, 337 Mansfield Road, Unit 1259, Storrs, CT 06269, USA.

E-mail address: Kenneth.lachlan@uconn.edu (K.A. Lachlan).

This underscores the importance of learning processes in crisis and risk communication efforts. Incomplete or inaccurate risk messages will impair individuals in terms of making good decisions and reacting appropriately to the risk at hand; accurate messages that are understood, internalized, and acted upon will be more effective in pushing individuals to act in ways that reduce susceptibility to harm. Of course, messages cannot be effective at engendering learning and responding if they never reach their intended audience; thus, placement and access are key concerns in the dissemination of this information (Spence, Lachlan, & Burke, 2011). Furthermore, messages delivered through different formats or media may elicit different responses or different degrees of knowledge retention, even if they contain ostensibly the same information; thus, crisis communication efforts should attempt to offer tangible recommendations for action, while at the same time considering issues related to access and source preference (Spence, Lachlan, & Griffen, 2007).

Several decades of research suggest that for most, mass media is the most commonly relied upon source for information concerning crises and risks (Brashers et al., 2000; Murch, 1971; Spence et al., 2006). Brashers et al. (2000) offer that the active processing associated with scanning through media, standing alone, brings about a sense of control and (Brashers et al., 2000). Of course, this is also contingent upon being able to access the information in question, and infrastructure failure, power outages, and other physical obstacles may make the use of media impractical.

Involvement is also worth considering in this context. A significant body of research in dual processing suggests that the level of discomfort associated with risks, coupled with their relative novelty, may drive systematic (or information based) processing, as opposed to reliance on heuristic cues and information to make sense of threatening and equivocal situations (see Eagley & Chaiken, 1993; Trumbo & McComas, 2003). If this is the case, and those processing more actively are more inclined to learn, then efforts to engage affected audiences in systematic processing are paramount. In other words, risk messages need to find some way of inducing enough discomfort to motivate people toward internalizing information, without inducing so much stress as to shut these processes down (see Lachlan & Spence, 2010 for a discussion of inducing adequate levels of negative affect). Of course, this may be contingent upon what we can expect across different strata of the population in terms of their standing levels of risk perception and tendencies when processing risk information.

2. Demographic differences in processing

A substantive body of research also suggests that there may be differences across demographic strata in terms of their understanding and response to crisis and risk messages. Varying communities may respond to crisis and risk information based on pre-existing perceptions that are culturally bound, and great variability may exist from group to group in terms of responses that can be anticipated (Lindell & Perry, 2004). Message construction, channel preference, and language barriers are all potential barriers to effective risk communication and the extent to which audiences will internalize the knowledge they need to make good decisions (Fothergill, Maestas, & Darlington, 1999). Further, members of historically underserved or marginalized communities may be less likely to accept warning or risk messages without confirmation through interpersonal contacts with trusted others, thus leading to potential delays in response time and reinterpretation of the information delivered (Fothergill et al., 1999; Lindell & Perry, 2004).

2.1. Biological sex

In addition to intercultural differences, biological sex has been demonstrated as an important factor to consider when predicting response to crisis and risk messages (Seeger, Vennette, Ulmer, & Sellnow, 2002). Following the 9/11 attacks on New York and Washington, research indicates that women found radio and television more useful than interpersonal interactions and other sources (Spence et al., 2006); this finding was surprising in the context of decades of research to the contrary. For instance, a study examining information seeking concerning terrorist attacks in Israel revealed that men preferred to acquire information from more visual media, while women gravitated toward newspaper and radio (Keinan, Sadeh, & Rosen, 2003) past studies have indicated that women may find televised news and information less interesting than men (Jensen, 1988; Morley, 1986), may be less inclined to attend to it (Konig, Renckstorf, & Wester, 1988), and may largely avoid televised news as a result of primarily masculine presentation characteristics (Vettehen, Schaap, & Schlosser, 2004).

In addition to interest and preference, there is a large body of literature indicating sex differences in response to mediated messages that are otherwise identical (Bem, 1981; Burgoon, Dillard, & Doran, 1983; Cantor, Zillmann, & Einsiedel, 1978; Jacklin & Maccoby, 1978; Messaris & Kerr, 1983; Messaris & Saret, 1981; Mosher, 1973; Perse, Nathanson, & McLeod, 1996; Schuck, Schuck, Hallam, Mancini, & Wells, 1971; Signorielli, 1989; Terry & Calvert, 1997). In terms of crisis and risk specific contexts, research conducted in the aftermath of Katrina indicated that men comprehended direct instructions better than did women, though they expressed less of a desire to seek information under the circumstances (Lachlan & Spence, 2007). At the same time, a long history of research suggests that women may be better than men at internalizing nonverbal cues and information, and that women may be better able to internalize information in interpersonal contexts as a result (Briton & Hall, 1995; Burgoon & Dillman, 1995; Kette & Konecni, 1995; LaFrance & Henley, 1994); women are also more likely to report high levels of communication satisfaction when it comes to face-to-face exchanges (Knapp & Hall, 1997). Therefore, nonverbal cues may be of paramount importance when considering the responses of women to crisis and risk messages, despite the fact that nonverbal fidelity may be largely lost in mediated exchanges. Nonverbal cues may therefore play a greater role in communication behaviors of women compared to men. Of note, to some extent social robotics involve a degree of nonverbal fidelity, as even simple messages delivered through a robotic platform will present an interaction more closely resembling an interpersonal one, with particular consideration for proxemics and kinetics.

3. Social robotics

It may be the case that under certain high involvement circumstances, robotic delivery technologies may be useful for delivering information concerning environmental risks, crises, and other circumstances that present threats to those who stand to be negatively impacted. First, it may be the case that under particular circumstances, it may be too dangerous to get human informants to the scene of a risk, or that traditional media have gone offline due to infrastructure failures or loss of power. Take for example the case of a chemical spill. In the event of a shelter in place order, where a number of people are isolated to a particular location and unable to move without incurring risk of harm, robotic technologies could be used to interact with these individuals and deliver information concerning cleanup, timeline, and risks that are posed, while at the same time taking effort to provide calm and a sense of efficacy.

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