

Oxford Research Encyclopedia of Natural Hazard Science

Fatalism, Causal Reasoning, and Natural Hazards

John McClure

Subject: Mitigation, Resilience, Risk Communication and Warnings, Climate Change, Preparedness

Online Publication Date: Apr 2017 DOI: 10.1093/acrefore/9780199389407.013.39

Summary and Keywords

Fatalism about natural disasters hinders action to prepare for those disasters, and overcoming this fatalism is one key element to preparing people for these disasters. Research by Bostrom and colleagues shows that failure to act often reflects gaps and misconceptions in citizen's mental models of disasters. Research by McClure and colleagues shows that fatalistic attitudes reflect people's attributing damage to uncontrollable natural causes rather than controllable human actions, such as preparation. Research shows which precise features of risk communications lead people to see damage as preventable and to attribute damage to controllable human actions. Messages that enhance the accuracy of mental models of disasters by including human factors recognized by experts lead to increased preparedness. Effective messages also communicate that major damage in disasters is often distinctive and reflects controllable causes. These messages underpin causal judgments that reduce fatalism and enhance preparation. Many of these messages are not only beneficial but also newsworthy. Messages that are logically equivalent but are differently framed have varying effects on risk judgments and preparedness. The causes of harm in disasters are often contested, because they often imply human responsibility for the outcomes and entail significant cost.

Keywords: hazards, risk, fatalism, risk communication, mental models, earthquakes, climate change, causal attributions, framing, news media

The fact of the matter is that no building in the world will hold up if you've got this sort of ground movement. You can have the best architects, the best engineers and the best contractors, but if nature's going to drag things away from the foundations, there's nothing you can do.

— Builder of damaged Grand Chancellor Hotel in Christchurch; Fairfax (2011)

Fatalism as a Belief

Fatalism about disasters is the belief that nothing can be done to reduce harm from natural disasters. This belief is a major impediment to action. Of course, natural hazards like earthquakes are powerful, uncontrollable events. Furthermore, although some emergency agencies can give brief warnings of earthquakes, seismologists cannot yet predict when any given fault will rupture. These uncontrollable and unpredictable events lend themselves to fatalism. In fact, however, the fatalistic belief that nothing can be done to prevent harm from earthquakes and other natural hazards is incorrect, as preparation for the events can prevent much harm (Eiser et al., 2012; Solberg, Rossetto, & Joffe, 2010). The fatalistic attitude that nothing can be done deters people from taking preventive action (McClure, Walkey, & Allen, 1999). Turner, Nigg, and Paz (1986) developed a measure of fatalism about earthquakes made up of items like: "There is nothing I can do about earthquakes, so I don't try and prepare for that kind of emergency." Turner et al. found that California residents who endorsed these items were less likely to prepare than other citizens. Research has shown similar relationships for climate change, in that people who felt they were powerless to affect climate change were less likely to take actions to mitigate that change (Aitken, Chapman, & McClure, 2011).

Fatalism resembles the state of learned helplessness, a state wherein people who experience negative uncontrollable events become helpless in the sense that they think they have no control over the situation. People feeling helpless thus take no action to prevent a recurrence of the negative events (Abramson, Seligman, & Teasdale, 1978). As with fatalism, people who are helpless lack motivation and so are less likely to take action.

Fatalism also relates to locus of control, a key personality dimension that comprises people's beliefs about the sources of control over their lives (Strickland, 1989). People with an internal locus of control believe that people's circumstances are a consequence of their own actions, whereas people with an external locus believe that external forces, such as the government or fate, determine life's outcomes. These beliefs are reflected in people's actions: citizens with an internal locus of control exert more control over their circumstances than those with an external orientation (Strickland, 1989).

Research shows that beliefs about locus of control apply to preparedness for natural hazards. People with an internal locus of control tend to prepare more in anticipation of tornadoes (Sims & Baumann, 1972) and to take out flood insurance (Baumann & Sims, 1978). In regard to earthquakes, an internal locus of control relates to more adaptive perceptions of earthquake hazard (Simpson-Housley & Bradshaw, 1978) and to people's undertaking actions to mitigate damage to their homes, such as fastening the hot water cylinder to brackets and upgrading the earthquake resistance of their home (Spittal, McClure, Walkey, & Siegert, 2008; Spittal, Siegert, McClure, & Walkey, 2002). Whereas an external locus of control underpins fatalistic attitudes to earthquakes, people with an internal locus of control tend to think that damage can be prevented or reduced

Fatalism, Causal Reasoning, and Natural Hazards

(McClure, 1985; McClure et al., 1999). Hence programs aiming to increase preparedness for hazards like earthquakes are more likely to be effective if they counter or circumvent people's external locus of control, which underpins fatalism about those hazards. The same principles apply to other hazards, such as climate change (Aitken, Chapman, & McClure, 2011)

Research has explored ways of reducing fatalistic attitudes in regard to earthquakes and climate change, as fatalism is not absolute or unchangeable. Turner et al. (1986) found that when they presented citizens with scenarios about specific actions or targets, rather than the general need to prepare, people were less fatalistic about earthquakes. People's response was significantly more positive when the researchers framed preparation in terms of specific actions rather than in general terms. For example, when the researchers asked participants if anything could be done to help people in the local senior citizens' home, people responded with many useful, positive suggestions.

Mental and Causal Models

Protection Actions

Concepts relating to fatalism about natural hazards have been incorporated into general theories about people's actions to reduce threats from the hazards. For example, Mulilis and Duval's (1995) Person relative to Event theory applies coping strategies to disaster preparedness. The theory suggests that people employ adaptive strategies, such as problem-focused coping, when they judge that their resources to deal with a threat exceed the magnitude of that threat. This judgment is the inverse of fatalism. Research has shown that this model applies to hazard preparedness in general (see Paton, 2003; Paton, Smith, & Johnston, 2005) and to preparation for tornados (Mulilis, Duval, & Bovalino, 2000). Related research has examined outcome expectancies, which are people's expectancy whether their actions could affect the outcomes in a disaster. This research showed that people were more likely to prepare when they had a positive outcome expectancy, i.e., they expected that preparation would enhance their outcome in the event of a natural hazard (McIvor & Paton, 2007; Paton et al., 2005). People's beliefs that their actions will influence the outcome is a stronger predictor of preparation than belief about the risk (Lindell & Perry, 2000).

The Protective Action Decision Model (PADM) similarly proposes that people's decisions about their response to a perceived threat depends upon their judgments as to the efficacy of their actions in shaping the outcome (Lindell & Perry, 1992, 2000, 2012). A key predictor in the model is people's assessment that preparation actions will effectively increase their safety and reduce the likelihood of their experiencing adverse effects from a hazard. A key difference between the PADM and Mulilis and Duval's (1995) Person

Fatalism, Causal Reasoning, and Natural Hazards

relative to Event theory is that the PADM includes perceived barriers to implementation as a predictor of action. The PADM model predicts that, when people see the barriers as high, they are more likely to be more fatalistic and to abandon plans to prepare.

Test of models like the PADM show that preparedness reflects several factors in addition to aspects of fatalism, such as people's outcome expectancy and their judgment that they have the resources to cope. However, the efficacy concepts in these models represent one significant predictor of action to prepare (or related intentions). In these multifactorial models, efficacy mediates between risk perception and preventive action rather than being a direct predictor (Lindell & Perry, 2012). However, the findings in regard to the role of efficacy are consistent with the research focusing on the specific effects of fatalism.

Whereas the models like the PADM embed causal concepts like fatalism and efficacy in general theories of actions that include a range of concepts, other theories focus specifically on causal analyses in people's understanding of disasters and the way these causal analyses influence fatalistic beliefs and adaptive action. In contrast with some papers that review risk communication in general (e.g., Eiser et al., 2012; Solberg et al., 2010; Visschers, Meertens, Passchier, & de Vries, 2009), the role of causal analyses in risk communications about hazards is the focus here.

Causal Analyses

Tierney (1999) pointed out the importance of causal analyses in underpinning accounts of disasters after they occur. She noted that, when disasters occur, the search for causes is often very circumscribed. Most analyses of disasters focus on proximate causes that occur close to the event in time and emphasize two types of cause: failures in physical/technical systems and human error. An example was seen after the 1989 Loma Prieta earthquake near San Francisco, where most attention focused on the collapse of the Cypress Street viaduct double-decker bridge, which caused many of the deaths in this earthquake. Most analyses of the event focused on the engineering specifications for double-decker highways. The analyses typically ignored the organizational, institutional, and societal factors that contribute to such incidents. Tierney (1999) noted that individualistic assumptions about blame are often embedded in citizens' and investigators' judgments about human error. Furthermore, the assumptions about blame serve to divert attention away from social and structural sources of accidents and disasters, such as financial or time constraints imposed on designers and builders. Thus, the assumptions often fail to contextualize the causal analyses of the disaster. The truncated causal analyses contribute to fatalism and a failure to address some major causes of a disaster.

Tierney (1999) claimed that the mass media play a significant role in framing public views about why disasters and accidents occur. The news media emphasize causal factors that reflect reporters' sources, which in turn reflect journalists' knowledge of which

Fatalism, Causal Reasoning, and Natural Hazards

organizations are linked to the problem. News media reports tend to favor monocausal explanations over multicausal explanations and particularly focus on explanations dealing with the actions of individuals.

Whereas many analyses of disaster focus on natural causes of disasters, such as earthquakes or floods, Tierney (2013) argued that disasters that are triggered by natural events have social roots in the form of social and community planning. The interplay between uncontrollable natural causes and controllable social causes is a recurring theme and is central to causal analyses of disasters and fatalism. Because the roots of risk and resilience lie within the social fabric, a positive consequence of this perspective is that societies have the power to reduce their risk, to become more resilient, and to prevent harm from those hazards.

The fact that disasters have social roots might seem to be a wholly positive message, in that the social factors are controllable, at least in principle. However, Tierney (2013) noted that the social aspect of disasters also means that social or commercial interests are often opposed to actions that would increase resilience. For example, businesses may resist the introduction of seismic building codes because of the added cost to the construction or retrofitting of buildings. Businesses and politicians may similarly resist the introduction of new technologies for sustainable energy because they own businesses producing carbon-based products, such as coal and oil. Tierney (2013) noted that, “We already know a great deal of what we need to know in order to reduce the pain, suffering and other losses associated with disasters, but ...applying that knowledge is difficult because of institutional inertia and especially because of the benefits those in power obtain through activities that increase that risk” (p. 6). So, even if people recognize the risk and believe that the risk can be mitigated, they may take no action to mitigate the risk for reasons of cost or conflicting interests. Fortunately, economic interests sometimes converge with greater resilience, as where building companies gain business from retrofitting older buildings (McClure et al., 2015), or where strategies that reduce carbon emissions that contribute to climate change also reduce energy costs and enhance health (Bain et al., 2016).

Tierney’s (1999, 2013) analysis has a number of similarities to the cultural theory of risk, which argues that individual perceptions of risk are shaped by cultural worldviews about danger and risk (Douglas & Wildavsky, 1982; Kahan, Slovic, Braman, & Gastil, 2006; see also Joffe, 1999). Thompson (2003) applied this cultural framework to people’s fatalistic view that any actions they take to mitigate a hazard would make no difference to the outcome. In the cultural context, this fatalism reflects a worldview that sees nature as capricious and human actors as fickle and untrustworthy. Peters and Slovic (1996) showed that this fatalistic type of worldview predicted citizens’ attitudes to nuclear power. People with this worldview were more willing to relinquish power to experts and authorities. They also perceive the risks of nuclear power as lower than other citizens’ estimates of its risks. Peters and Slovic suggest that people’s worldview serves as an

Fatalism, Causal Reasoning, and Natural Hazards

'orienting disposition' that helps them make decisions about complex issues and risks in a sometimes dangerous world.

A key implication of the cultural account is that when interventions are framed in terms of citizens' cultural worldview, citizens and related institutions are more likely to agree to interventions that they would otherwise oppose (Kahan et al., 2006). An example of this strategy is seen in communications focusing on the commercial and health benefits of actions that also mitigate climate change, targeted to people who believe that climate change is not a real issue (Bain et al., 2016). Another example is seen in regard to regulations to reduce air pollution in the United States, which were strongly resisted by people with an individualist world view. When the government introduced the idea of tradable emissions permits, resistance was much reduced, because this new strategy affirmed the cultural values of people and companies who were opposed to any regulation (Kahan et al., 2006, p. 1097).

Mental Models

Tierney's (1999, 2013) analysis of causal models of disasters related to the concept of mental models, which refers to people's models about how things work in the real world. People's response to potential hazards reflects their mental models of the hazards; that is, their understanding of the social, physical, and engineering processes that underpin the hazard. Research has shown that citizens' mental models of natural hazards and the decisions they should make to address the hazards often differ from experts' mental models. Citizens' mental models often lead to less effective decisions about the hazards (see Bostrom, Fischhoff, & Morgan, 1992; Bostrom et al., 2012). Public communications from experts and civic bodies about hazards often fail to correct the misconceptions in these mental models.

As an example of this approach, Bostrom et al. (1992) examined the differences between expert and lay people's mental models of radon gas, an odorless gas in many homes that is linked to higher levels of lung cancer. The research first established what experts thought people should know to make informed decisions about the radon gas hazard. They then established what citizens knew concerning the hazard potential of the gas and what decisions citizens would take in response to this hazard. The researchers used open-ended interviews and photograph-sorting exercises where participants explained why a photo was either relevant or irrelevant to radon. The researchers then constructed an influence diagram to compare how experts and citizens thought about decisions to address the hazard and to clarify relevant information that is absent in citizens' mental models. This method clarified differences between expert and lay perceptions of the effects of radon gas and showed that the nonexperts' mental model of the effects was often incomplete, imprecise, incoherent, or erroneous. Based on these findings, Bostrom et al. (1992) proposed that the mental models method could be used not only for studying risk perceptions but also to enhance risk communications. They claimed that the most useful information about people's mental models of disasters is not a summary of their

Fatalism, Causal Reasoning, and Natural Hazards

risk estimates but people's substantive knowledge of how hazards have their effect, i.e., a causal analysis. Determining what citizens already know about a hazard is the first step in assessing what they need to know. Subsequent risk communications are designed to address the misunderstandings in citizens' mental models, using clear messages that research shows are effective for this purpose.

Bostrom et al. (2012) applied the mental models approach to climate change and showed that the causal thinking at the core of citizen's mental models relates to their support for different actions to mitigate climate change. For example, participants who favored geo-engineering solutions tended to ascribe climate change to natural events, such as volcanos, rather than the burning of fossil fuels. In contrast, support for carbon emissions policies was highest among participants who saw carbon emissions as the leading cause of climate change. Related research shows that people who recognize the anthropogenic sources of climate change support strong mitigation policies more than people who discount these causes (Aitken et al., 2011; O'Connor, Bord, & Fisher, 1998).

Although research on mental models is not framed specifically in terms of fatalism, this research relates to fatalism in showing how people's misunderstanding of the causes of disasters can lead to a failure to see how damage can be prevented and a failure to respond adequately to the hazard. Research making the link between mental models and fatalism has applied the mental models approach to misunderstandings of risk of earthquakes. For example, Hurnen and McClure (1997) examined whether New Zealand citizens' knowledge about mitigating actions relates to their belief that earthquake damage is preventable (the inverse of fatalism) and their preparation for earthquakes. The study clarified what citizens think happens when an earthquake causes damage in order to reveal misunderstandings in their mental models. The study measured participants' knowledge about mitigating actions with items describing actions that engineers recommended to reduce earthquake damage (e.g., replacing brick chimneys with metal flues). To control for socially desirable responses, other items described actions that might sound useful to people who knew little about earthquake mitigation, but which actually produce negligible benefits (e.g., building an additional brick wall beside an existing brick wall to give added strength —brick walls perform badly in earthquakes because they are brittle and shatter when shaking occurs). Participants with higher earthquake knowledge better understood the causes of earthquake damage and how different actions can reduce this damage. They were also more prepared. The researchers then explained to participants how each action in the list of mitigating actions would reduce damage. Participants subsequently judged earthquake damage to be more preventable than previously.

Related research showed that people with an internal locus of control give more complex explanations of earthquake damage, taking more account of preventable factors, such as building design, in addition to unpreventable factors, like earthquake magnitude (McClure et al., 1999). These findings suggest that enhancing mental models of the

factors that mediate earthquake outcomes has key benefits. It helps people to see that damage can be prevented, and thereby leads to lower fatalism.

Reversing the Fatalism Trend: The Role of Causal Judgments

In all of the models that show how fatalistic beliefs deter people from preparing for disasters, a key component of fatalism is people's belief that their actions can prevent or reduce the disaster. Turner et al.'s (1986) fatalism model showed that people with fatalistic beliefs feel there is nothing they can do about earthquakes so there is no point in preparing. Similarly, people with an external locus of control think that outcomes are determined by external events rather than their own actions (Spittal et al., 2008). Paton et al. (2005) showed that people with negative outcome expectancies think that hazards will have negative consequences regardless of their actions. The PADM model shows that people's level of preparation reflects their decision as to whether their actions are likely to reduce damage (Lindell & Perry, 2012). Tierney's (2013) causal analysis observed that people focus on recent proximate causes, rather than underlying preventable causes, of damage. The mental models approach claimed that people's perception of disasters reflects their views of how hazards cause harmful outcomes (see Bostrom et al., 1992). In all the models, a key driver of fatalism is people's understanding of what causes negative outcomes in disasters.

Although these theories show that people's fatalistic beliefs affect their actions in regard to hazards, they don't show why people hold these beliefs. In particular, the theories don't reveal the social messages and patterns of thinking that produce fatalistic beliefs. An approach that does address this issue is attribution theory, which examines people's perceptions of the causes of different outcomes (Hilton & Slugoski, 1986; Kelley, 1967). For example, attribution research reveals which messages lead people to attribute events to controllable factors, such as human actions, rather than uncontrollable factors, such as fate (Weiner, 1986). In research applying this framework to fatalism about earthquake damage, McClure et al. (1999) showed that people with fatalistic beliefs attributed damage to uncontrollable factors, such as earthquake magnitude, whereas people who are less fatalistic attributed damage more to controllable factors, such as the design of buildings.

Research has clarified which messages shape these contrasting attributions to controllable and uncontrollable factors (McClure et al., 2001). The research compared the effects of different scenarios where earthquake damage was either distinctive (one building in a street is severely damaged) or widespread (most buildings in the street are severely damaged). The results showed that when damage was distinctive, people attributed the damage to controllable factors, such as building design, and saw the

damage as preventable. In contrast, with widespread damage, people attributed the damage more to the magnitude of the earthquake, an uncontrollable factor, and judged that the damage could not be prevented.

This finding clarifies what types of messages shape the causal attributions that underpin fatalistic beliefs. This research has clear implications for risk communications, in that when agencies accentuate that damage in earthquakes is distinctive, people are more likely to attribute the damage to building design and to perceive the damage as preventable. In addition, distinctive damage is often newsworthy in its own right. Research shows that risk communications can apply other causal analyses that lead people to see damage as controllable and preventable (McClure, Sutton, & Sibley, 2007; McClure, Sutton, & Wilson, 2007). These findings can be used to challenge fatalistic beliefs, and they also have important implications for the way news media report events like earthquakes.

The Effects of Media Messages on Hazard Fatalism and Mental Models

The studies that used controlled experiments teased out how different drivers of causal inference influence judgments and reduce fatalism. Other studies have examined news media reports in naturalistic, real-world contexts after events like earthquakes. The media reports use a range of techniques to interest their audiences, rather than manipulating one variable at a time, as in the controlled studies. Media reports thus provide a valuable opportunity to examine the effects of different communications in natural settings. Reports of disasters like earthquakes in the news media are usually sensational (Coleman & Thorson, 2002; Davis & McLeod, 2003; Gaddy & Tanjong, 1986; Vasterman, Yzermans, & Dirkzwager, 2005; Wilkins & Patterson, 1987) and reflect eyewitness reports rather than professional analyses of underlying causes (Walters & Hornig, 1993). The sensational reports lead people to amplify the risk and the difficulty of confronting the hazard (Pidgeon, Kasperson, & Slovic, 2003).

When natural disasters like earthquakes occur, the news media focus on scenes where the most damage occurs and where there is widespread damage (Coleman & Thorson, 2002; Gaddy & Tanjong, 1986; Hilton, Mathes, & Trabasso, 1992; Hiroi, Mikami, & Miyata, 1985). A good illustration of this point is provided by comments from an American journalist arriving in Kobe two days after the 1995 earthquake: “I was amazed how much of Kobe was still there.... I mean, I had watched hours and hours of TV in America about this earthquake, and I had no idea that there were houses and tall buildings still standing all over the city” (Reid, 1995).

Fatalism, Causal Reasoning, and Natural Hazards

Despite the predominant features of media reports, news reports and feature articles vary in style and serve different functions (Iyengar, 1992). One notable aspect of the differences is that media reports about a disaster usually change over time (Hilton, Mathes, & Trabasso, 1992). For example, Hilton et al. found that, in reports about the Challenger spacecraft explosion, the focus changed over time from an early focus on the fatal consequences, to causal hypotheses about the determinants of the disaster, and then to attributions of who was responsible for the defects in the spacecraft.

Changes over time in causal analyses are also shown in comparisons between reports written a long time after an earthquake (such as the anniversary of a major quake) and reports immediately after the earthquake. Cowan, McClure, and Wilson (2002) compared the effects of news reports written immediately after the 1995 Kobe earthquake with articles written one year later (“anniversary” articles). Articles written immediately after the earthquake reported widespread damage and emphasized the role of the earthquake in producing the damage, with sensational headlines like “Earthquake ravages Kobe.” The reports gave powerful agency to the earthquake, claiming that the earthquake devastated Kobe. Some reports even claimed that this massive damage showed that all the efforts that Japan put into engineering and preparations made no difference to Kobe’s outcomes—a very fatalistic view. An example is the claim that “The earthquake shattered [Japan’s] beliefs that its newer buildings and roads would be able to withstand a big earthquake, due to sophisticated engineering” (Cowan et al., 2002, p. 183). This assessment embodies *schadenfreude* more than insight.

In contrast to the sensational reports immediately after the earthquake, reports written about the same event a year later (anniversary reports) focused on differences in the building design of damaged and undamaged buildings and the lessons that could be learned from the earthquake, with headings like “Lessons from Kobe.” A typical anniversary report stated that “perhaps the greatest lessons from Kobe have been learnt from studies of damage to buildings. The overwhelming response has been that modern earthquake-resistant structures are much better than older buildings” (Cowan et al., 2002, p. 185). Cowan et al. presented exemplars of these immediate and anniversary reports (with references to Kobe removed) to two groups of participants. The group reading the anniversary reports were more likely to attribute the damage to building design and to think it could have been prevented than those reading the immediate reports, despite the fact that both reports were about the same earthquake. This finding shows that more analytical articles, such as those that link damage to faulty building designs, lead to less fatalistic views than typical “catastrophe” reports written immediately after an earthquake. This pattern occurs even when the news articles are mixed in with other information, as in most news reports.

The Role of Mass Media

Fatalism, Causal Reasoning, and Natural Hazards

Cowan et al.'s (2002) study suggests that news reports written a year after an earthquake are less fatalistic than the early reports, as the anniversary reports emphasize the effects of different designs of buildings on outcomes and link the damage to poor building design. However, research following the 2011 earthquake in Christchurch (New Zealand) shows that even immediately after the earthquake, news reports in New Zealand presented both fatalistic and accurate messages about the damage at the same time (McClure & Velluppillai, 2013). Sensational, fatalistic messages implied that damage was widespread or universal and could not have been prevented. For example, in his comments on a large hotel that was leaning dangerously and was close to collapsing, the builder of the hotel claimed that "The fact of the matter is that no building in the world will hold up if you've got this sort of ground movement. You can have the best architects, the best engineers and the best contractors, but if nature's going to drag things away from the foundations, there's nothing you can do" (Fairfax, 2011).

In contrast with this fatalistic view, engineers emphasized that most of the damaged buildings were older buildings that did not meet contemporary building standards. They also stated that most buildings that complied with current building standards, including older buildings that had been strengthened, performed well during the earthquake and suffered much less damage. For example, one engineering report stated that "With some exceptions, old buildings performed poorly and new buildings came through well, especially given the extreme shaking" (McClure & Velluppillai, 2013).

Research compared the effects of the two types of messages in two groups who were already familiar with the earthquake (McClure & Velluppillai, 2013). The group who read the fatalistic messages attributed the damage more to the earthquake and thought the damage couldn't have been prevented. In contrast, the group who read the engineers' comments attributed the damage more to building design and thought it could have been prevented. This difference occurred despite the fact that the participants already knew about the Christchurch earthquake and the two groups gave similar estimates of the amount of damage that resulted from the earthquake. This finding shows that the different messages in concurrent news reports influenced readers' mental model of what caused the damage—although readers had prior knowledge of the earthquake and the amount of damage that resulted.

Of course, news media are often motivated by the goals of attracting readers and viewers and making profits for their owners, but they also represent the 'fourth estate' of government in democracies and have a social responsibility to communicate accurately, as well as to generate interest (Schultz, 1998). These different motives for news media do not always conflict. As already noted, some aspects of a disaster, such as distinctive damage, are newsworthy and provide lessons on the effect of insufficient preparations; these messages contribute to reduced fatalism. Similarly, reports targeting specific examples of poor building design or engineering malpractice are highly newsworthy.

Media Framing

Fatalism, Causal Reasoning, and Natural Hazards

Agencies that disseminate messages about risk have a choice about how they present that information. As shown by research, the way risk communications are framed shapes people's assessment of the risk and their motivation to act (Tversky & Kahneman, 1981). As one example, research has shown that messages that frame the outcomes of actions in negative terms are more effective in leading people to take action than positively framed messages (Teigen & Brun, 1999; Tversky & Kahneman, 1981). For example, a negatively framed message—if you don't exercise, you are more likely to suffer illness—has a stronger effect on intentions to exercise than positively framed messages that have the same content—if you do exercise, you are likely enjoy better health (Robberson & Rogers, 1988). One explanation for the greater effectiveness of negative frames is prospect theory, which claims that people are tuned to be more sensitive to the risk in negative messages (Tversky & Kahneman, 1981). A related explanation based on evolutionary psychology argues that negative frames have more impact because it has been advantageous for people to recognize the risks inherent in different actions in terms of chances of survival.

Most framing research has applied to economic decisions and promoting good health. However, a few studies have applied framing effects to preparedness for earthquakes. McClure, White, and Sibley (2009) compared messages that showed the negative effects of not preparing (e.g., if you are poorly prepared for a major earthquake, you are more likely to experience harm in the event) with messages that spell out the positive effects of being prepared (e.g., if you are well prepared for a major earthquake, you are less likely to experience harm in the event). Consistent with findings in other domains, such as health, the negatively framed messages led to stronger intentions to prepare for earthquakes than their positively framed counterparts. Thus, very specific differences in risk communications can have a significant effect.

Many studies on framing make no distinction between the framing of outcomes (experiencing or avoiding harm) and the framing of preventive actions (taking or not taking preventive action). As a consequence, these studies confound the two components of risk messages. McClure and Sibley (2011) manipulated the two factors independently in a design with four conditions:

- 1. Positive behavior and outcome:** If you are well prepared for a major earthquake, you are more likely to survive the event in good shape.
- 2. Negative behavior and outcome:** If you are poorly prepared for a major earthquake, you are more likely to experience harm in the event.
- 3. Negative behavior, positive outcome:** If you are poorly prepared for a major earthquake, you are less likely to survive the event in good shape.
- 4. Positive behavior, negative outcome:** If you are well prepared for a major earthquake, you are less likely to experience harm in the event.

The study examined the effects of these frames on judgments about the general importance of earthquake preparation and specific preventive actions. Judgments of the importance of preparedness were affected by outcome frames but not action (behavior)

Fatalism, Causal Reasoning, and Natural Hazards

frames, in that people judged preparation more important with negatively framed outcomes than positive outcomes. In contrast, intentions to take specific actions were enhanced by the negative framing of both the outcome and the action. These findings clarify that negative framing messages are more likely to increase preventive actions in relation to natural hazards. The findings with framing can be used to counter fatalistic attitudes to action.

Framing extends beyond positive and negative ways of communicating the same message. Research has also examined framing in relation to different descriptions of low-frequency risks, such as earthquakes or motoring fatalities. People generally find it hard to be concerned about such low-frequency risks, and their lack of concern combines with fatalism to hinder voluntary action (Newell, Rakow, Techiam, & Sambur, 2016; Slovic, Fischhoff, & Lichtenstein, 1978). However, if low-frequency risks are framed over a lifetime, such as 50 years, people assess the risk more accurately than when the risk is framed in a short time period or a very long period (Slovic et al., 1978). Slovic et al. suggested that the low rate of seatbelt use in the United States was due to people's focus on the low probability of having an accident in a single trip (once in every 3.5 million trips). Groups exposed to a lifetime frame were more likely to increase their use of seatbelts than those exposed to a single-trip frame.

Other research shows that people make more accurate risk judgments when data are framed as natural frequencies rather than probabilities (Budescu, Broomell, & Por, 2009; Gigerenzer & Hoffrage, 1995; Newell et al., 2016). Natural frequencies are based on a representative sample of the population. For example, the probability of a woman's having breast cancer is 0.8%, but this can be expressed in natural frequencies by saying that eight out of every 1,000 women have breast cancer.

Applying these concepts to earthquake risk, Henrich, McClure, and Crozier (2015) varied key aspects of the description of the risk of an earthquake. Many experts describe earthquake risk in terms of recurrence rates, such as a 500-year recurrence rate—i.e., one earthquake every 500 years. A frame using this lengthy recurrence rate is likely to lead people to think that the event will happen toward the end of the time frame and is therefore unlikely in their lifetime. To test this idea, Henrich et al. created five logically identical but semantically different statements describing the earthquake risk to the population of a hypothetical city (based on Wellington, New Zealand). The frames varied the time frame, the phrasing as frequencies or probabilities (1600 dead in 500 years, 10% chance of 1600 dead in 50 years, two deaths per year), and the sample frame (1.9 deaths per 100,000, 19 per million). Participants judged the statement that described the risk in relation to a 50-year time frame and that used a frequency frame (10% chance of 1600 dead in 50 years) as communicating more risk than the other four statements. This finding suggests that risk communications for low-frequency hazards like earthquakes will be more effective if they frame the risk in terms of frequencies of deaths over a lifetime.

Fatalism, Causal Reasoning, and Natural Hazards

These different frames may not directly affect mental models or causal explanations of natural hazards, which is the key focus here. However, the effects of different frames are important because some frames are ineffective or counterproductive, as they unintentionally lead people to discount their own responsibility and attribute the responsibility for action to others (Johnston, Bebbington, Lai, Houghton, & Paton, 1999). Certain frames relating to low-frequency events may lead people to discount the risk rather than recognize it (Newell et al., 2016; Weber, 2006). Newell et al. showed that the counterproductive effect is strongest when people's choice of where to live is based on feedback about occurrences of disasters on a global level rather than occurrences in their own home or village (Newell et al., 2016). As nothing terrible happens most of the time in regions vulnerable to the risk, ongoing feedback about non-occurrences leads people's risk tolerance to increase, rather than decrease. Risk communications can counter this effect by using longer time frames where disasters are more likely to occur. In regard to climate change, frames can also show trends, such as increasing prevalence of disasters related to climate change (Newell et al., 2016). Although frequency framing may not directly affect fatalism or people's sense of efficacy to mitigate a disaster, people's feeling of efficacy is more likely to lead to effective action when frames enhance their recognition of the risk.

Forensic Analyses and Social Marketing

Research that has focused on fatalism relating to disasters and how causal analyses can counter this fatalism has yet to be integrated with two novel approaches to preparedness for disasters. The first approach is the forensic approach to disaster events, which uses longitudinal case studies that aim to probe deeply into underlying causes of disasters (see Burton, 2010, 2015). This approach suggests that conventional explanations of disasters that largely focus on exposure and vulnerability are insufficient to reduce risk. The forensic approach suggests dropping the term *natural disaster*, because the disasters reflect social causes as much as natural ones. This focus is consistent with the core distinction between controllable and uncontrollable causes (see also Tierney, 1999, 2013). This approach also proposes meta-analyses that combine the results from multiple studies and compare results from different disasters. The aim is to clarify systemic causes that transcend the specific characteristics of particular disasters or geographies. As noted previously, analyses extended over time reveal more of the specific causes that contribute to disasters; they also clarify who or what is responsible (Cowan et al., 2002; Hilton et al., 1992). The forensic approach thus aims to clarify the causes of losses and the intervening factors that increase or reduce losses. Although research using this approach is underway, the full results of many of the projects are yet to be published (Burton, 2015).

The forensic approach focuses on the actual causes of events, rather than citizens' attributions of the causes and concepts like fatalism. However, when the results of forensic analyses are communicated, they are likely to feed into citizens' understanding

Fatalism, Causal Reasoning, and Natural Hazards

of disasters. The analyses therefore hold the potential to generate more accurate mental models and attributions for disasters and to reduce fatalism about the preventability of the disasters.

The second novel approach to disasters is the social marketing approach, which uses commercial marketing techniques to plan and evaluate programs that target citizens' behaviors (Bostrom, Bohm, & O'Connor, 2013; Mckenzie-Mohr, 2000). Advocates for this approach claim it has three features that distinguish it from other approaches. First, it applies the concept of market segmentation, as different social groups respond to different sources and different messages. So risk communications should be targeted to, and tailored for, the different groups. Second, it recognizes that people are often at different stages of readiness and that programs should develop strategies that accommodate such differences. Third, it identifies barriers to the desired action, which include internal barriers, such as fatalistic beliefs, and external barriers, such as resource restraints. Social marketing programs identify the barriers and address the main barriers that emerge.

Mckenzie-Mohr (2000) cited case studies showing how these strategies are effective in changing environmental behaviors. One study applied social marketing to disaster preparedness by drawing on lessons from the 2005 disaster in New Orleans following Hurricane Katrina (Guion, Scammon, & Borders, 2007). As an example of barriers that prevented appropriate action, many citizens in New Orleans lacked private transport to leave the city, while many Amtrak trains left the city half empty. A second barrier to action was seen where poorer residents were reluctant to leave their homes when the hurricane was approaching, either because they had no relatives who could offer accommodation outside the disaster area or because they thought that their homes would be looted in their absence. Many citizens thus thought that evacuating would be more dangerous than staying at home and believed that the city shelters would be unsanitary and would lack adequate supplies of food and water. Some of these beliefs were accurate, and some were not. Where barriers are based on inaccurate beliefs, emergency agencies can challenge the misconceptions. This research demonstrates the value of understanding barriers to action, but there is less research applying market segmentation to hazards, and the research that has been reported on this issue offers mixed results (Bostrom et al., 2013).

The social marketing approach does not focus primarily on causal analyses, but it may be more effective if it does incorporate causal analyses. An example would be showing where fatalistic attitudes serve as barriers to action—in terms of causal judgment, these attitudes are inhibitory causes that impede action. The social marketing approach suggests ways of addressing barriers that extend beyond the communication of causal information. In addition, research suggests that social marketing is most effective where it includes strategies to enhance self-efficacy, which is the inverse of fatalism (Bostrom et al., 2013). Therefore, this approach would benefit from incorporating causal analyses of disasters.

Co-Benefit Analyses

The theory and research that focus on enhancing the accuracy of people's mental models and causal analyses in order to increase adaptive actions have been applied to earthquakes, but the concepts also apply to other hazards. A possible limitation in causal analyses of disasters is that, with hazards like climate change, many people refuse to accept scientific evidence of the social (anthropogenic) causes. Where these significant barriers exist, one strategy to enhance adaptive action uses co-benefits that complement the benefits deriving from the reduced risk from a hazard. This is particularly useful with climate change, as many people are skeptical that climate change exists or is caused by human activity, and thus see little need to take action to mitigate its effects (Bain et al., 2016). In addition, people who think climate change largely reflects natural causes rather than human actions see the risk from climate change as low and think there is little need to act (Aitken et al., 2011).

Fortunately, there are several co-benefits to actions that also serve to mitigate climate change, such as reduced pollution and economic development in the form of new, "green" industries. Bain et al. (2016) showed that these benefits motivate both people who accept climate change and those who do not, although the development benefits of action are particularly compelling for people who doubt the anthropogenic causes of climate change. This result applied to both political motivation in the form of voting for pro-environmental politicians and personal actions, such as conserving energy. The findings with co-benefits shows that risk communications don't have to get people to believe in the anthropogenic causes of climate change in order to motivate action that will mitigate climate change. Thus, although an accurate causal analysis of the causes disasters is beneficial, it is not necessary for generating adaptive actions.

The principle of using co-benefits also applies to getting people to prepare for earthquakes, although there is less outright denial of the controllable causes of damage with earthquakes than there is with climate change. Even when people hold the fatalistic belief that preparations will have no effect when the "really big one" (earthquake) hits, they may recognize the economic benefits of actions that mitigate damage from earthquakes. These include lower insurance costs, higher rents, and higher resale values for buildings that meet earthquake standards (McClure, Henrich, & Johnston, 2015). Other benefits include the greater peace of mind of knowing that the building where one works or lives is resistant to earthquakes. The risk communications can cite the co-benefits of actions that increase resilience, especially with citizens who are skeptical about the social causes of hazards.

Conclusions

Fatalism, Causal Reasoning, and Natural Hazards

Overcoming fatalism about natural disasters is a key element to getting people to be more prepared for those events. Research has clarified the causal judgments that contribute to fatalism and underpin a failure to respond to the hazards. Sociological research by Turner et al. (1986) revealed the concept of fatalism in regard to earthquakes, and other research on mental models and causal attributions showed that citizens' understanding of the causes of disasters contributes to their fatalism. This research also showed which messages lead to a more accurate causal understanding of hazards and a reduction in fatalism—along with a stronger tendency to take preventive action.

There are several interlocking strands to this conclusion. Research by Bostrom and colleagues shows that failure to act often reflects misunderstandings in citizens' mental models of disasters, whereas research by McClure and colleagues shows that fatalistic attitudes reflect people's attributing damage to uncontrollable natural causes rather than human actions. Research has clarified which specific communications and frames can enhance efficacy and reduce fatalism. Turner et al. (1986) showed that people become less fatalistic if they are asked to focus on specific actions rather than the global concept of preparation. Bostrom and colleagues' research on mental models shows that enhancing the accuracy of mental models of disasters leads to increased action, whereas McClure and colleagues showed which messages lead people to see the damage as preventable and to attribute damage more to controllable human actions. These revised causal judgments contribute to increased preparation.

The broad distinction between uncontrollable aspects of hazards, such as seismic activity, and the controllable causes of outcomes, such as building design, should not be construed as a simple binary feature of the determinants of disasters. Controllable factors range from actions that are highly controllable for most citizens, such as getting a bottle of water, through actions that depend on finances and home ownership, such as strengthening one's home, to actions like making one's workplace more resilient. Some of these actions may be difficult, although not impossible, for employees who have few choices (Paton & McClure, 2013). The key point is that all the actions are controllable in principle, and even the more difficult actions, such as changing work locations, do occur when a community has a heightened awareness of a hazard and employers shift to more earthquake-resilient buildings (McClure et al., 2015).

The way that risk messages are framed can reduce fatalism and enhance action. However, inadequate preparation is not always due to misunderstanding or a lack of knowledge about the events. Tierney (1999, 2013) noted that the causes of harm in disasters are often concealed or contested, because some causes of damage imply human responsibility for outcomes while preparation may involve significant cost. This is one reason why legislation requiring minimal standards of preparation is beneficial (and also why such legislation is often contested). An example is building codes. Where such legislation is lacking or limited in scope, research shows which messages and risk

communications are most likely to reduce fatalism and enhance voluntary preparation for disasters.

Acknowledgments

Thanks go to Ann Bostrom, Liv Henrich, and an anonymous reviewer for valuable comments on this article.

References

- Abramson, L. Y., Seligman, M. E. P., & Teasdale, J. A. (1978). **Learned helplessness in humans: Critique and reformulation.** *Journal of Abnormal Psychology, 87*, 49–74.
- Aitken, C., Chapman, R. B., & McClure, J. (2011). **Climate change, powerlessness and the commons dilemma: Assessing New Zealanders' preparedness to act.** *Global Environmental Change, 21*, 752–760.
- Bain, P. G., Milfont, T. L., Kashima, Y., Bilewicz, M., et al. (2016). **Co-benefits of addressing climate change can motivate actions around the world.** *Nature Climate Change, 6*, 154–157.
- Baumann, D. D., & Sims, J. H. (1978). **Flood insurance: Some determinants of adoption.** *Economic Geography, 54*, 189–196.
- Bostrom, A., Bohm, G., & O'Connor, R. E. (2013). **Targeting and tailoring climate change communications.** *WIREs Climate Change, 4*, 447–455.
- Bostrom, A., Fischhoff, B., & Morgan, M. G. (1992). **Characterizing mental models of hazardous processes: A methodology and an application to radon.** *Journal of Social Issues, 48*, 85–100.
- Bostrom, A., O'Connor, R. E., Böhm, G., Hanss, D., Bodi, O., Ekström, F., ... Sælensminde, I. (2012). **Causal thinking and support for climate change policies: International survey findings.** *Global Environmental Change, 22*, 210–222.
- Budescu, D. V., Broomell, S., & Por, H.-H. (2009). **Improving communications of uncertainty in the reports of the intergovernmental panel on climate change.** *Psychological Science, 20*, 299–308.
- Burton, I. (2010). **Forensic disaster investigations in depth: A new case study model.** *Environment Magazine, 52*, 36–41.

Fatalism, Causal Reasoning, and Natural Hazards

Burton, I. (2015). **The forensic investigation of root causes and the post-2015 framework for disaster risk reduction.** *International Journal of Disaster Risk Reduction*, 12, 1-2.

Coleman, R., & Thorson, E. (2002). **The effects of news stories that put crime and violence into context: Testing the public health model of reporting.** *Journal of Health Communication: International Perspectives*, 7, 401-425.

Cowan, J., McClure, J., & Wilson, M. (2002). **What a difference a year makes: How immediate and anniversary media reports influence judgments about earthquake.** *Asian Journal of Social Psychology*, 5, 169-185.

Davis, H., & McLeod, S. L. (2003). Why humans value sensational news: An evolutionary perspective. *Evolution and Human Behavior*, 24(3), 208-216.

Douglas, M., & Wildavsky, A. B. (1982). *Risk and culture: An essay on the selection of technical and environmental dangers*. Berkeley: University of California Press.

Eiser, J. R., Bostrom, A., Burton, I., Johnston, D. M., McClure, J., Paton, D., ... White, M. P. (2012). **Risk interpretation and action: A conceptual framework for responses to natural hazards.** *International Journal of Disaster Risk Reduction*, 1, 5-16.

Fairfax (2011). <http://www.stuff.co.nz/dominion-post/news/4720023/Strengthening-of-leaning-Christchurch-hotel-begins>.

Gaddy, G. D., & Tanjong, E. (1986). **Earthquake coverage of the Western press.** *Journal of Communication*, 36, 105-112.

Gigerenzer, G., & Hoffrage, U. (1995). **How to improve Bayesian reasoning without instruction: Frequency formats.** *Psychological Review*, 102, 684-704.

Guion, D. T., Scammon, D. L., & Borders, A. L. (2007). **Weathering the storm: A social marketing perspective on disaster preparedness and response with lessons from Hurricane Katrina.** *Journal of Public Policy & Marketing*, 26, 20-32.

Henrich, L., McClure, J., & Crozier, M. (2015). **Effects of risk framing on earthquake risk perception: Life-time frequencies enhance recognition of the risk.** *International Journal of Disaster Risk Reduction*, 13, 145-150.

Hilton, D. J., Mathes, R. H., & Trabasso, T. R. (1992). The study of causal explanation in natural language: Analyzing reports of the Challenger disaster in the *New York Times*. In M. L. McLaughlin, M. J. Cody, & S. J. Read (Eds.), *Explaining one's self to others* (pp. 41-59). Hillsdale, NJ: Lawrence Erlbaum.

Hilton, D. J., & Slugoski, B. R. (1986). Knowledge-based causal attribution: The abnormal conditions focus model. *Psychological Review*, 93, 75-88.

Fatalism, Causal Reasoning, and Natural Hazards

- Hiroi, O., Mikami, S., & Miyata, K. (1985). A study of mass media reporting in emergencies. *International Journal of Mass Emergencies*, 3, 21–49.
- Hurnen, F., & McClure, J. (1997). **The effect of increased earthquake knowledge on perceived preventability of earthquake damage.** *Australasian Journal of Disaster and Trauma Studies*, 3, 1–14.
- Iyengar, S. (1992). *Is anyone responsible? How television frames political issues*. Chicago: University of Chicago Press.
- Joffe, H. (1999). *Risk and “the other.”* Cambridge, U.K.: Cambridge University Press.
- Johnston, D., Bebbington, M. S., Lai, C.-D., Houghton, B. F., & Paton, D. (1999). **Volcanic hazard perceptions: Comparative shifts in knowledge and risk.** *Disaster Prevention and Management*, 8, 118–126.
- Kahan, D., Slovic, P., Braman, D., & Gastil, J. (2006). Fear of democracy: A cultural critique of Sunstein on risk. *Harvard Law Review*, 119, 1071–1109.
- Kelley, H. H. (1967). Attribution in social psychology. *Nebraska Symposium on Motivation*, 15, 192–238.
- Lindell, M., & Perry, R. W. (1992). *Behavioural foundations of community emergency planning*. Washington, DC: Taylor and Francis.
- Lindell, M. K., & Perry, R. W. (2000). **Household adjustment to earthquake hazard: A review of research.** *Environment and Behaviour*, 32, 461–501.
- Lindell, M. K., & Perry, R. W. (2012). **The protective action decision model: Theoretical modifications and empirical evidence.** *Risk Analysis*, 32, 616–632.
- McClure, J. (1985). **The social parameter of “learned” helplessness: Its recognition and implications.** *Journal of Personality and Social Psychology*, 48, 1534–1539.
- McClure, J., Allen, M., & Walkey, F. H. (2001). **Countering fatalism: Causal information in news reports affects judgments about earthquake damage.** *Basic and Applied Social Psychology*, 23, 109–121.
- McClure, J., Henrich, L., & Johnston, D. (2015). **Are two earthquakes better than one? How earthquakes in two different regions affect risk judgment and preparation in three locations.** *International Journal of Disaster Risk Reduction*, 16, 192–199.
- McClure, J., & Sibley, C. G. (2011). **Framing effects in disaster preparation: Is negative framing more effective?** *The Australasian Journal of Disaster and Trauma Studies*, 2011(1), 1–13.

Fatalism, Causal Reasoning, and Natural Hazards

- McClure, J., Sutton, R. M., & Sibley, C. (2007). **Listening to reporters or engineers: How instance-based messages about building design affect earthquake fatalism.** *Journal of Applied Social Psychology, 37*, 1956-1973.
- McClure, J., Sutton, R. M., & Wilson, M. (2007). **How information about building design influences causal attributions for earthquake damage.** *Asian Journal of Social Psychology, 10*, 233-242.
- McClure, J., & Velluppillai, J. (2013). **The effects of news media reports on earthquake attributions and preventability judgments: Mixed messages about the Canterbury earthquake.** *Australasian Journal of Disaster and Trauma Studies, 2013*(1), 27-36.
- McClure, J., Walkey, F., & Allen, M. (1999). **When earthquake damage is seen as preventable: Attributions, locus of control and attitudes to risk.** *Applied Psychology: An International Review, 48*, 239-256.
- McClure, J., White, J., & Sibley, C. G. (2009). **Framing effects on preparation intentions: Distinguishing actions and outcomes.** *Disaster Prevention and Management, 18*, 187-199.
- McIvor, D., & Paton, D. (2007). **Preparing for natural hazards: Normative and attitudinal influences.** *Disaster Prevention and Management, 16*(1), 79-88.
- McKenzie-Mohr, D. (2000). **Fostering sustainable behavior through community-based social marketing.** *American Psychologist, 55*(5), 531-537.
- Mulilis, J. P., & Duval, T. S. (1995). **Negative threat appeals and earthquake preparedness: A person-relative-to-event (PrE) model of coping with threat.** *Journal of Applied Social Psychology, 25*, 1319-1339.
- Mulilis, J. P., Duval, T. S., & Bovalino, K. (2000). **Tornado preparedness of students, non-student renters and non-student owners: Issues of PrE theory.** *Journal of Applied Social Psychology, 30*, 1310-1329.
- Newell, B. R., Rakow, T., Techiam, E., & Sambur, M. (2016). **Rare disaster information can increase risk-taking.** *Nature Climate Change, 6*, 158-161.
- O'Connor, R. E., Bord, R. J., & Fisher, A. (1998). The curious impact of knowledge about climate change on risk perceptions and willingness to sacrifice. *Risk Decisions and Policy, 3*, 145-155.
- Paton, D. (2003). **Disaster preparedness: A social cognitive perspective.** *Disaster Prevention and Management, 12*, 210-213.
- Paton, D., & McClure, J. (2013). *Preparing for disaster: Building household and community capacity.* Springfield, IL: Charles C Thomas.

Fatalism, Causal Reasoning, and Natural Hazards

Paton, D., Smith, L. M., & Johnston, D. (2005). When good intentions turn bad: Promoting natural hazard preparedness. *Australian Journal of Emergency Management*, *20*, 25–30.

Peters, E., & Slovic, P. (1996). **The role of affect and worldviews as orienting dispositions in the perception and acceptance of nuclear power.** *Journal of Applied Psychology*, *26*, 1427–1453.

Pidgeon, N., Kasperson, R. E., & Slovic, P. (2003). *The social amplification of risk*. Cambridge, U.K.: Cambridge University Press.

Reid, T. R. (1995). *Washington Post*, February 2, p. 2. Retrieved from http://articles.philly.com/1995-02-05/news/25702909_1_kobe-japanese-tv-tv-correspondent.

Robberson, M., & Rogers, R. (1988). **Beyond fear appeals: Negative and positive persuasive appeals to health and self-esteem.** *Journal of Applied Social Psychology*, *61*, 277–287.

Schultz, J. (1998). *Reviving the fourth estate*. Cambridge, U.K.: Cambridge University Press.

Sims, J. H., & Baumann, D. D. (1972). **The tornado threat: Coping styles of the North and South.** *Science*, *176*, 1386–1392.

Simpson-Housley, P., & Bradshaw, P. (1978). **Personality and the perception of earthquake hazard.** *Australian Geographical Studies*, *16*, 65–77.

Slovic, P., Fischhoff, B., & Lichtenstein, S. (1978). **Accident probabilities and seat belt usage: A psychological perspective.** *Accident Analysis and Prevention*, *10*, 281–285.

Solberg, C., Rossetto, T., & Joffe, H. (2010). **The social psychology of seismic hazard adjustment: Re-evaluating the international literature.** *Natural Hazards Earth Systems Science*, *10*, 1633–1677.

Spittal, M. J., McClure, J., Walkey, F. H., & Siegert, R. J. (2008). **Psychological predictors of earthquake preparation.** *Environment and Behavior*, *40*, 798–817.

Spittal, M., Siegert, R. S., McClure, J., & Walkey, F. H. (2002). **The spheres of control scale: The identification of a clear replicable three-factor structure.** *Personality and Individual Differences*, *32*(1), 121–131.

Strickland, B. R. (1989). **Internal-external control expectancies: From contingency to creativity.** *American Psychologist*, *44*, 1–12.

Teigen, K. H., & Brun, W. (1999). The directionality of verbal probability expressions: Effects on decisions, predictions, and probabilistic reasoning. *Organizational Behavior and Human Decision Processes*, *80*, 155–190.

Fatalism, Causal Reasoning, and Natural Hazards

Thompson, M. (2003). Cultural theory, climate change and clumsiness. *Economic and Political Weekly*, 38, 5107–5112.

Tierney, K. J. (1999). **Toward a critical sociology of risk**. *Sociological Forum*, 14, 215–242.

Tierney, K. (2013). *The social roots of risk: Producing disasters, promoting resilience*. Stanford, CA: Stanford University Press.

Turner, R. H., Nigg, J. M., & Paz, D. H. (1986). *Waiting for disaster: Earthquake watch in California*. Los Angeles: University of California Press.

Tversky, A., & Kahneman, D. (1981). **The framing of decisions and the psychology of choice**. *Science*, 211, 453–458.

Vasterman, P., Yzermans, C. J., & Dirkzwager, A. J. E. (2005). **The role of the media and media hypes in the aftermath of disasters**. *Epidemiologic Reviews*, 27, 107–114.

Visschers, V. H., Meertens, R. M., Passchier, W. W., & De Vries, N. N. (2009). Probability information in risk communication: A review of the research literature. *Risk Analysis*, 29(2), 267–287.

Walters, L. M., & Hornig, S. (1993). **Faces in the news: Network television news coverage of Hurricane Hugo and the Loma Prieta**. *Journal of Broadcasting & Electronic Media*, 37, 219.

Weber, E. U. (2006). **Experience-based and description-based perceptions of long-term risk: Why global warming does not scare us (yet)**. *Climatic Change*, 77, 103–120.

Weiner, B. (1986). *An attributional theory of motivation and emotion*. New York: Springer-Verlag.

Wilkins, L., & Patterson, P. (1987). **Risk analysis and the construction of news**. *Journal of Communication*, 37, 80–92.

John McClure

Victoria University of Wellington

