

Responses When the Earth Trembles: The Impact of Community Awareness Campaigns on Protective Behavior

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This study takes a social marketing perspective to explore community disaster preparedness by considering (1) appropriate sources of information about disaster severity, (2) the ways that community members process information, and (3) how social marketing programs might improve people's ability to protect themselves against natural disasters. With a foundation in the persuasion knowledge model and a scenario-based approach, the authors apply a latent moderated structural equation model to data collected in southern Spain. Consumers first develop persuasion knowledge about a social marketing campaign by performing a threat appraisal and then engage in information seeking, which drives persuasion coping, before activating protective behavior. Systematic processing attenuates the effect of response barriers on persuasion coping but strengthens the subsequent effects of persuasion coping on protective behavior. Social marketers should encourage consumers to engage with community programs and help revise public policy to enhance communities' capacities to react to seismic disasters. This article also suggests implications related to the uses of social media and the adoption of the European Union's advanced seismic code.

Keywords: earthquake, protective behavior, persuasion knowledge model, social marketing, vulnerability

On May 11, 2011, a 5.2-magnitude earthquake in Lorca, Spain, toppled several buildings and killed nine people, making it the country's deadliest earthquake in more than 50 years. In December 2012, a cluster of small earthquakes hit Jaen, 180 kilometers east of Lorca, few of which were significant enough to gain more than fleeting attention. Lack of public awareness about and preparation for such

events signals an increase in the local population's vulnerability, with the threat of significant potential losses of life and property. In this setting, the current research considers consumer vulnerability in disaster preparation situations from a social marketing perspective. The aim is to determine whether and which public policies might enhance the effectiveness of community awareness campaigns for reducing consumer vulnerability during the early stages of disaster management. We define consumer vulnerability as the inability of community members to cope with an unfamiliar and chaotic environment induced by a disaster; thus, our view extends beyond the physical magnitude of an incident (Baker, Gentry, and Rittenburg 2005). Public policies that foster consumers' self-protective capacities should mitigate this harm when the community faces a natural disaster.

In addressing these options, we adopt the persuasion knowledge model (PKM; Friestad and Wright 1994) as a theoretical framework through which to analyze the factors that affect people's perceptions of and responses to future earthquakes. Specifically, we aim to identify which factors inhibit or encourage the use of persuasion knowledge, defined as a consumer's knowledge about the tactics marketers use in their persuasion attempts, in a natural disaster context. We conduct our study in southern Spain—specifically, Andalusia—which historically has demonstrated moderate seismic activity. That is, its seismicity is not as strong as that of

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well-known earthquake zones such as California or Japan, but recent incidents indicate the potential for a future disaster such that it demands public policy attention.

Our study makes three main contributions to various social marketing domains. First, community awareness of the risks of hazards such as earthquakes is a central focus for disaster management (Guion, Scammon, and Borders 2007). Unlike hurricanes, floods, and tornados, earthquakes strike without warning and often cause more deaths, injuries, and property damage than other natural disasters. However, despite extensive literature on natural disaster preparation and management, the process of preparing for earthquakes has received scant attention in the social marketing literature. We intend to address this gap by applying the PKM from marketing theory to a disaster awareness context.

Second, this study highlights unique international public policy issues from a European perspective. In 2007, the European Parliament adopted a resolution calling for a series of regulatory and financial measures that would strengthen actions to prevent, address, and repair the damage caused by earthquakes (European Parliament 2007). It also recognized the special nature of the Mediterranean region and urged the European Commission to focus on prevention, education, research, risk management, protection, and solidarity measures at community levels to help secure consumer protection from frequent disasters in the region. Accordingly, we investigate the impacts of these policy implications in Spain.

Third, by adopting a social marketing perspective on disaster research, we address Baker's (2009) appeal for marketing scholars to participate more actively in the dialogue about disaster management and recovery. Baker identifies factors that both constrain and facilitate resilience in response to a natural disaster and cites social marketers as potential resources to help communities recover from disasters, noting that consumers at risk before earthquakes tend to lack the resources to prepare, which leaves them particularly vulnerable. Spain's persistent economic crisis and unemployment rate of approximately 36.7% (ideal.es 2013) suggests that many residents of southern Spain belong to this vulnerable segment. Yet earthquakes do not seem to be a pressing issue for Spaniards, according to the indifferent reactions of residents and the general lack of assessments of the probability and potential severity of earthquakes in the area. By studying this segment of consumers, we provide insights and actionable implications for social marketers and public policy makers.

This article begins with a review of research on consumer vulnerability in natural disasters. In describing the PKM as our theoretical foundation, we develop several research hypotheses. We then explain the method and sample, followed by the analyses and study results. To conclude, we offer theoretical and public policy implications and recognize some important limitations.

Consumer Vulnerability in Natural Disasters

Disasters have been studied by scholars from diverse disciplines, which may explain the lack of a consistent definition

of the term (Baker 2009). Furthermore, disasters are characterized by both external variability and internal complexity (Oliver-Smith 2004). External variability refers to objective phenomena in physical domains that generate or trigger disasters. For example, geographers and geophysicists tend to define disasters as equivalent to the related hazards and focus on their physical impacts (Baker 2009), in which case the disasters often become epiphenomena or secondary events (Quarantelli 2005). By contrast, internal complexity refers to subjective phenomena in social domains such that a disaster is a "socially constructed crisis, in which models of interpretation and significance rather than physical structures are endangered" (Oliver-Smith 2004, p. 22).

Recent related literature has shifted focus from external variability to internal complexity such that disaster research has increasingly viewed a society's exposure to disaster in terms of its vulnerability (Baker 2009). Broadly speaking, vulnerability entails "an internal risk factor of the subject or system that is exposed to a hazard and corresponds to its intrinsic predisposition to be affected, or to be susceptible to damage" (Cardona 2004, p. 37). Baker, Gentry, and Rittenburg (2005, p. 134) specify that consumer vulnerability occurs "when control is not in an individual's hands, creating a dependence on external factors (e.g., marketers) to create fairness in the marketplace." Although physical exposure to an environmental hazard is a necessary condition of vulnerability, it is people's lack of capacity to cope with the outcomes that transforms physical risk into a disaster (Bankoff 2004; Bolin and Stanford 1999). Thus, most explorations of consumer vulnerability have addressed external factors and internal issues, such as an inability to handle unfamiliar, chaotic environments (Baker, Gentry, and Rittenburg 2005).

In turn, Baker (2009) exhorts marketing, public policy, and disaster scholars to share their expertise to further disaster research and address the "paradoxes" she identifies as constraints to or facilitators of resilience. Baker's calls for interdisciplinary collaboration highlight the need to integrate disaster management and social marketing literature. Because it adapts "marketing technologies to programs designed to influence the voluntary behavior of target audiences to improve their personal welfare and that of the society of which they are a part" (Andreassen 1994, p. 110), social marketing ultimately can benefit both individuals and society. Of interest to this study, social marketing that focuses on important community issues—that is, social engagement programs—can achieve results beyond merely motivating citizens to act differently; indeed, it can engage key policy makers in programs for creating and implementing policy and structural changes.

Theoretical Background and Hypotheses

Persuasion Knowledge Model

Campaigns designed to increase community awareness of future earthquakes aim to improve knowledge and thereby encourage protective behavior. According to the PKM, consumers develop knowledge about persuasion that they use to "cope" with persuasion episodes (Friestad and Wright 1994). This persuasion knowledge is developmentally con-

tingent, and people continue to refine it over their lifetime. The PKM also includes agents, who undertake the persuasion attempt, and targets, who represent the objects of a persuasion attempt. The theory uses the term “persuasion attempt” to highlight the target’s perception of the agent’s presentation of information, which itself is designed to affect the target’s attitudes, beliefs, decisions, or actions. Thus, in an exchange between an agent and a target, the agent uses a persuasion episode to achieve a desired effect, and the target copes in response. Its ability to cope reflects the personal resources the target has available to select an appropriate response.

Furthermore, the PKM details three knowledge structures that interact to shape and determine the outcomes of persuasion attempts: persuasion knowledge, agent knowledge, and topic knowledge. Agent knowledge consists of beliefs about the traits, competencies, and goals of the persuasion agent; topic knowledge involves beliefs about the topic of the message. In addition to their persuasion knowledge, consumers activate their agent and topic knowledge, at some level, when they observe or interact with marketers.

Previous applications of the PKM have examined consumer vulnerability in various circumstances, such as evaluations of nutrition/health claims (e.g., Garretson and Burton 2000), children’s marketplace knowledge (e.g., Wright, Friestad, and Boush 2005), the intent of children’s advertising (e.g., Rose, Merchant, and Bakir 2012), consumers’ reactions to online covert marketing (e.g., Milne, Rohm, and Bahl 2009), and community stakeholders’ perceptions of coal industry advocacy messages (e.g., Miller and Sinclair 2009). Yet prior literature seems to have overlooked the PKM’s relevance as a potential model of community awareness campaigns. We propose a PKM-based research model in Figure 1, in which people perceive a community awareness campaign’s persuasion attempt, develop persuasion knowledge, and cope with the persuasion episode. Developing persuasion knowledge involves making inferences about the threat of future impacts on the basis of prior experience, so we operationalize topic knowledge as experience with earthquakes. Knowledge about the topic of the community awareness campaign relates necessarily to consumers’ past and current experience, and natural hazard research has been nearly unanimous in citing the effects of personal experience on protective behavior (Weinstein 1988). We also conceptualize persuasion coping knowledge with two factors: threat appraisal and persuasion coping. Threat appraisal is the process by which a person assesses factors that influence his or her likelihood of enacting protective behaviors, changing undesired behaviors, or both (Neuwirth, Dunwoody, and Griffin 2000). When people face a hazard, they use threat appraisal processes to evaluate variables related to potentially harmful responses but use coping appraisal processes to evaluate their ability to cope with or avert the threat (Mulilis and Lippa 1990). Persuasion coping instead relates to “beliefs about the cognitive, emotional, or physical actions [people] can execute to manage a persuasion attempt’s effects on them” (Friestad and Wright 1994, p. 4). With successful persuasion coping, they believe they are sufficiently capable to engage in protective behavior by managing risks or trying suggested solutions. Yet response barriers (e.g., cost, time, effort) can

also hinder persuasion coping in that consumers perform mental accounting to reason how persuasion knowledge will affect their future actions.

Information-Gathering Capacity and Information Seeking

The conceptual foundation for the PKM has been consolidated over three decades and supported by multiple experimental studies (Trumbo and McComas 2003). This study attempts to expand the model by contemplating the effects of information seeking, systematic processing, and source credibility. In particular, to develop persuasion knowledge about a persuasion attempt, people likely shift the amount of information seeking they engage in according to their capacity for information processing and their motivation to gather new information to reduce their knowledge gap. Information-gathering capacity is a person’s perceived ability to seek, gather, and process the information she or he needs, and it becomes a critical challenge when information gathering becomes more complex or unusual (Griffin et al. 2008). In a behavioral context, this ability corresponds with a person’s sense of self-efficacy (Bandura 1993) or perceived behavioral control (Ajzen 1991). Empirical evidence has confirmed the connection between information-seeking effort and information-gathering capacity (Griffin et al. 2008). In turn, increased information-gathering capacity induces changes in people’s original opinions as a result of their more thorough understanding of the issue (Kuvaas 2002). That is, people with greater information-gathering capacities are more likely to change their existing interpretations or appraisals as well as their perceptions of threats (Anderson and Nichols 2007). Thus, we offer the following hypothesis:

H₁: Information-gathering capacity is directly and positively related to (a) information seeking and (b) threat appraisal.

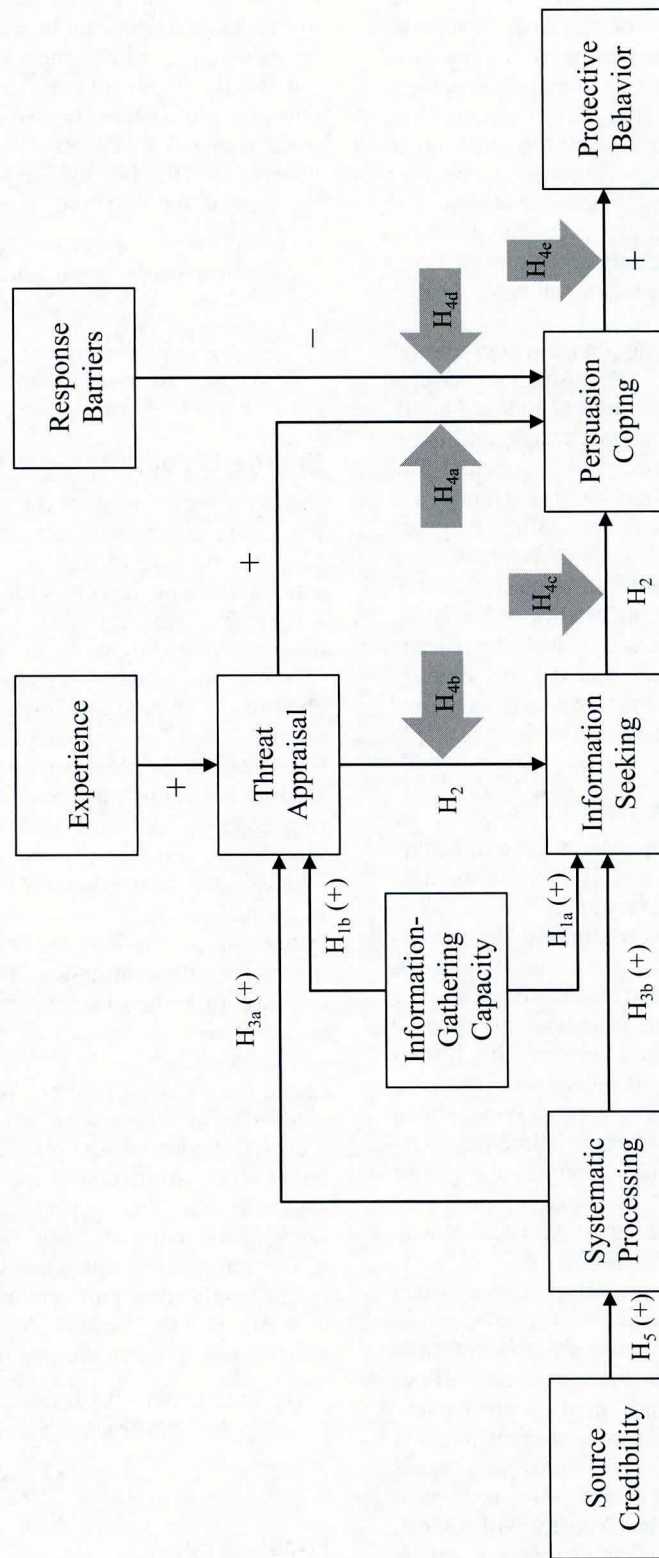
In a health communication setting, Kahlor (2010) shows that risk perceptions and subsequent affective risk responses prompt information seeking. In disaster research, Neuwirth, Dunwoody, and Griffin (2000) find that people who perceive high threat likelihood and severity but are unaware of effective protective behaviors seek out new information. Finally, in consumer behavior literature, external information seeking is a driver of extended decision making (Hawkins, Best, and Coney 2001), which represents a coping decision for our study. We posit that information seeking reinforces the relationship between threat and coping appraisals:

H₂: The effect of threat appraisal on persuasion coping is mediated by information seeking such that greater threat appraisals increase the level of information seeking and greater information seeking increases the level of persuasion coping.

Systematic Processing

An understudied area in PKM literature pertains to the relationship between knowledge formation and human information processing. A heuristic-systematic model (HSM) describes two forms of human information processing (Chaiken 1980, 1987). First, heuristic processing is compara-

Figure 1. Research Model



Notes: Shaded arrows indicate the moderating effects of systematic processing.

tively superficial and limited and requires few cognitive resources. People tend to employ heuristic processing as a default option because it enables them to conserve their information-seeking and processing resources. In this case, they judge the validity of messages on the basis of superficial cues, such as the length of the message or the presence of a trusted spokesperson. Second, systematic processing entails more comprehensive effort in an elaborative approach such that people who possess high motivation or can process information carefully scrutinize the message arguments before forming their judgments (Bhatnagar and Wan 2011). In general, systematic processing produces more stable attitudes and beliefs (Eagly and Chaiken 1993) and invokes more strongly held beliefs about risks (Griffin et al. 2008).

These separate processing strategies can co-occur, though involvement and desire for sufficiency usually determine whether a person engages in systematic processing. That is, both the personal relevance of the message topic and information insufficiency elevate the amount of judgmental confidence people need about message validity (Eagly and Chaiken 1993). Through systematic processing, they can account for all or most of the relevant information when forming attitudinal judgments, often with an analytical orientation (Keller, Wilkinson, and Otjen 2010). For our study, persuasion knowledge involves inferences about the severity or threat of a future earthquake such that it likely requires systematic processing through active threat appraisals and information seeking. Thus, we posit the following:

H₃: Systematic processing is directly and positively related to (a) threat appraisal and (b) information seeking.

In addition, the HSM posits that people engage in behavioral changes in response to a message if their comprehension of the relevant issue is high (Eagly and Chaiken 1993). Comprehension thus can influence persuasion through its impact on the level of attention the person devotes to the message content. In our study context, a disaster awareness campaign aims to increase people's understanding of a threat and explain ways to reduce their vulnerability. If their comprehension is high, people try to reduce their vulnerability by actively engaging in systematic processing, which helps them overcome, rather than be overwhelmed by, cognitive barriers. In a mental cost–benefit analysis, they make judgments by carefully examining and relating campaign arguments to the situational and individual information they already hold (Trumbo and McComas 2003).

However, the HSM makes no prediction about which information-processing mode affects persuasive outcomes in general or risk perceptions in particular. A series of field studies pertaining to public health communication shows that systematic processing consistently predicts greater levels of risk perception (Trumbo 2002), which seems relevant to our study because risk perception results from a threat that exploits vulnerability. As Baker (2009, p. 118) explains, “Risk is the objective probability that security will be lost, and vulnerability is a loss of security.” Therefore, risk is more strongly perceived by vulnerable people—who are relatively more constrained by economic, social, or environmental conditions—and those engaged in systematic processing. Because a disaster awareness campaign aims to

establish beliefs about the effectiveness of a solution, people who have been exposed to the campaign and engage in systematic processing likely develop stronger risk perceptions that prompt them to seek, understand, and adopt a solution to the threat. Systematic processing then might influence not only the impact of the threat appraisal on persuasion coping but also the impact of persuasion coping on final persuasive outcomes. In contrast, heuristic processing enables people to make reasonable choices solely on the basis of incomplete information (Fischer and De Vries 2008). Therefore, we formally posit the following,

H₄: Systematic processing influences the entire process by which people form intentions to engage in protective behavior, including the strength of the effects of (a) threat appraisal on persuasion coping, (b) threat appraisal on information seeking, (c) information seeking on persuasion coping, (d) response barriers on persuasion coping, and (e) persuasion coping on protective behavior.

Source Credibility

In a community awareness campaign, community members must gain an understanding of and cope with social marketers' actions to be able to form valid attitudes about the influence agent. In line with the PKM, we operationalize consumers' agent knowledge as the source credibility of the awareness campaign. In a medical decision-making context, Steginga and Occhipinti (2004) show that high uncertainty about the treatment and low confidence in doctors increase patients' use of systematic processing. In our case, vulnerable consumers analogously may be unsure of the real benefits of a community awareness campaign and the credibility of campaign advocates. Yet source credibility also could lead to systematic processing in other circumstances. Chaiken and Maheswaran (1994) reveal that highly task-motivated people who face an ambiguous message exhibit systematic processing, and the valence of their processing determines their attitudes. This substantial effect occurs because their heuristic processing of source credibility shapes their expectancies about the validity of the ambiguous message, which then activates their systematic processing of the message content. We posit that increased source credibility may have a greater impact on consumers' deliberations about and acceptance of especially pertinent and persuasive information if their interpretations of the message vary with their expectancies. This prediction is highly relevant for our study context because consumers exposed to an earthquake-preparedness community awareness campaign could interpret the message content differently depending on their knowledge of and experience with natural disasters. We hypothesize the following:

H₅: Source credibility is directly and positively related to systematic processing.

Method

Focus Group

We conducted the study in Andalusia, the southern region of Spain. For our research into vulnerability reduction through community awareness campaigns, we conducted focus groups to ensure that our target population could be

deemed vulnerable, in terms of disaster mitigation and preparedness. Voluntary participants were recruited through snowball sampling: We identified participants through personal contacts and asked each participant to recruit others. In total, we conducted eight focus groups, each of which consisted of five to eight general consumers. We employed open-ended questions to encourage detailed, flexible discussions of the topics (Charmaz 2006). To maximize the interactions between the moderator and the participants, we incorporated projective methodology and showed three photos of recent earthquakes as well as two videos of seismic-resistant housing construction. From the focus groups, we learned that, in general, residents of southern Spain do not have realistic disaster preparations in place because of their lack of information or economic resources.¹ Some were openly but unintentionally indifferent to the potential danger of a large-scale earthquake. Accustomed to regular, small vibrations, they tended to consider a destructive earthquake unlikely. Thus, the findings from our focus groups confirmed that the target population matches a general definition of vulnerability as “powerlessness, dependence, and a reduced capacity of individuals, groups, or communities to act in their own best interests” (Baker 2009, p. 116).

Questionnaire

The questionnaire consisted of three parts. First, we provided general questions regarding respondents' past experiences with seismic activity, measured as the number of earthquakes they had encountered and the most recent year in which they occurred. Second, we employed a projective scenario as an empirical test of our predictions (Sen 2004). The hypothetical, realistic scenario was designed to increase respondents' understanding of the concepts of prior experience and imminent possibility as well as to encourage

¹We thank an anonymous reviewer for suggesting that we provide some verbatim comments from the study participants that affirm our assertion that residents are largely unaware of the risks and ill prepared. For example, one company worker (male, 42) claimed,

Well, we have been used to small earthquakes since childhood, but nothing ever really happened to our house. Spain is not like Japan. When we look back over the last decade, there was no big earthquake.

However, a few participants older than 60 years of age, who had experienced large seismic movements in the 1950s in this region, acknowledged their destructive power. For example, one homemaker (female, 71) recalled,

When I married my husband and had our first baby, this city had a large earthquake. The building we used to live in was severely damaged. It was really scary.... But I don't know if anything has changed since that earthquake. Nobody has told me if our houses are safer now than before. I just don't have any information.

Despite these exceptions, the participants were generally unaware of and indifferent to seismic risks. As a taxi driver (male, 62) put it,

Here in this city, people just don't think about any future disaster. It sounds so unrealistic, or like nothing serious would happen. A big earthquake may come someday, but so what?

A young homemaker (female, 32) agreed:

We are used to earthquakes here.... I am not scared, or let's say, I don't feel any danger. It may happen, but the possibility just seems so remote.

their belief in the effectiveness of disaster mitigation and preparedness. The scenario described three earthquake disaster attributes—severity of threat, probability of threat, and coping—to enhance comprehension. For severity of threat, we included a detailed description of the May 11, 2011, earthquake in Lorca and the significant damage it caused to this southern Spanish town. For probability of threat, we used a scientific prediction of seismicity in Andalusia in the near future. Finally, for coping, the description offered an announcement about the development of seismic-resistant engineering technology and the availability of public funds to implement this technology through general household modifications in Andalusia. Third, to test for source credibility, the questionnaire stated that the scenario information came from three different sources: the regional government, the Architects' Association, and the local newspaper. According to prior research, the Architects' Association is expected to be the most credible; higher credibility for industry is directly related to lower risk perception (Trumbo and McComas 2003). By contrast, the local newspaper may be regarded as less credible; mass media coverage may not affect risk perceptions of people who have significant personal experience with hazards (Wiegman and Gutteling 1995). We expect the level of credibility for the regional government to be somewhere between the two. Appendix A details this scenario. The questionnaire also included questions pertaining to the proposed constructs.

Survey Procedure

We conducted the survey in southern Spain during the winter of 2012–2013. We collected data in two cities, Almeria and Granada, located in the seismic region in which constant earthquake vibration has been reported in recent years. Using a mall intercept approach, interviewers approached potential respondents on public property (e.g., along public streets, at park entrances, on public transportation) and explained that they were investigating consumer responses to natural disasters. People who agreed to respond were assigned randomly to one of the three source scenarios and asked to complete the questionnaire. Most respondents completed the questionnaire independently, with minimal interviewer influence. The interviewers also explained that participation was completely voluntary and that all responses would remain anonymous. We employed quota sampling to ensure that the age and gender proportions matched those of Spain's national population. In total, we obtained 1,000 responses. After discarding 38 observations because of missing values, the sample size was 962: 323 in the regional government condition, 322 for the Architects' Association, and 317 in the local newspaper setting.

Measures

Most of the measures for this study came from prior research. To assess threat appraisal, we used a two-item, ten-point measure derived from Neuwirth, Dunwoody, and Griffin (2000). Similarly, persuasion coping relied on a three-item, ten-point measure by Neuwirth, Dunwoody, and Griffin. We measured information seeking with three items on a seven-point Likert scale from Grunig (1989). Information-gathering capacity and systematic processing each used four items, obtained from Griffin et al. (2008) and rated on

seven-point Likert scales. We measured response barriers with another three-item, ten-point scale adapted from Neuwirth, Dunwoody, and Griffin. The two-item protective behavior measure used a seven-point Likert scale from Griffin et al. For experience, we gathered responses to three questions from Helweg-Larsen (1999). Finally, source credibility used a five-item measure adapted from Meyer (1988), on a seven-point semantic differential scale. All measures appear in Appendix B.

Results

Manipulation Check

Before proceeding with our model validation, we confirmed the source credibility for all three experimental groups, using a multivariate analysis of variance, in which we regressed the five indicators of source credibility on the experimental factor. The overall test through Roy's characteristic root confirmed that information source significantly ($p < .001$) and substantially ($\eta^2 = .110$) affected source credibility. Subsequent univariate tests revealed that the difference in source credibility between the most (Architects' Association) and the moderately (regional government) credible sources was significant for all five indicators. The difference between the regional government and the least credible source (local newspaper) was significant for three of the five indicators.

Model Validation

To validate the research model, we followed a two-step procedure. First, we conducted a full-sample confirmatory factor analysis with Mplus version 4.21. Our factor model consisted of nine latent variables with 30 indicators. The model fit the data reasonably well, according to the following fit indices: comparative fit index = .943, Tucker-Lewis index = .931, root mean square error of approximation = .057 (with a 90% confidence interval [CI] = [.053, .060]), and standardized root mean square residual = .043. Only the test of exact fit indicated not entirely adequate results, with $\chi^2(314) = 1,280.103$ ($p < .001$). However, this statistic tends to be substantial for larger samples, such as ours (Jöreskog and Sörbom 1993), and the difficulty of passing

this stringent test is widely acknowledged (Bollen 1989). Had the sample size been smaller than 268 (i.e., obtained the Hoelter value for the 5% significance level), the discrepancy between the empirical and the implied covariance matrices would not have been significant.

Using the confirmatory factor analysis results, we calculated the composite reliability (CR) and average variance extracted (AVE) of each construct. As we show in Table 1, most of the scores exceeded the recommended cutoff values of .70 and .50 for CR and AVE, respectively, and thus were satisfactory (Hair et al. 2006), though persuasion coping scored somewhat lower. Discarding one of its three indicators would have helped achieve the cutoff values, but it also would have decreased model fit and, thus, validity. Excluding this indicator also did not influence the subsequent hypotheses tests, so we decided to retain it.

We report on discriminant validity in Table 2. In line with Fornell and Larcker's (1981) criterion, the square roots of the AVEs exceeded the interconstruct correlations, with one exception (persuasion coping-information seeking). Noting some recent criticisms of this criterion (Rönkkö and Evermann 2013), we also applied Anderson and Gerbing's (1988) approach and tested whether combining any two sets of indicators into one construct worsened model fit significantly. To maintain the overall error rate of 5%, we conducted the 36 tests using an adapted significance level of $1 - (1 - .05)^{1/36} \times .0014$. All 36 eight-factor models exhibited a significantly worse fit than the nine-factor model. Thus, discriminant validity seemed to be reasonable (Bollen 1989).

Next, we employed latent moderated structural equations (Klein and Moosbrugger 2000), implemented in Mplus version 4.21, to estimate the full-sample structural equation models of the hypothesized relationships. This method is computationally demanding, in that it uses numerical integration to estimate the interaction effects between latent variables. Because the latent moderated structural equations method can estimate a maximum of two interactions at a time, we estimated four models: Model 1, with only the linear effects, which we used to assess direct and indirect effects; Model 2, to test the interaction effects of H_{4e} and H_{4d} ; Model 3, for the interaction effect of H_{4a} and H_{4e} ; and

Table 1. Means, Standard Deviations, and Reliabilities for Construct Measures

Construct	Number of Items	M	SD	α	CR	AVE
Threat appraisal	2	8.740	5.007	.760	.762	.617
Persuasion coping	3	14.280	5.814	.669	.686	.436
Information seeking	3	11.620	5.362	.833	.833	.625
Source credibility	5	23.140	7.908	.941	.941	.761
Protective behavior	2	7.940	3.972	.930	.930	.870
Response barriers	3	8.390	6.815	.839	.853	.666
Information-gathering capacity	4	11.600	4.917	.746	.750	.502
Systematic processing	4	18.180	6.209	.886	.886	.659
Experience	3	9.172	4.779	.836	.845	.649

Notes: Results are based on the full sample. α = Cronbach's alpha.

Table 2. Discriminant Validity

Construct	Threat Appraisal	Persuasion Coping	Information Seeking	Source Credibility	Protective Behavior	Response Barriers	Information-Gathering Capacity	Systematic Processing	Experience
Threat appraisal	.785	153.941	184.065	928.243	385.477	953.328	970.067	462.942	958.204
Persuasion coping	.786	.660	51.337	1,480.089	374.618	1,355.328	732.727	438.923	1,305.579
Information seeking	.740	.955	.791	2,009.427	640.464	1,358.125	730.843	451.22	1,306.683
Source credibility	.182	.238	.250	.872	2,027.392	1,434.064	740.238	2,566.846	1,309.823
Protective behavior	.632	.841	.729	.224	.933	1,384.345	747.333	1,049.04	1,309.474
Response barriers	.114	.222	.183	.119	.175	.816	766.525	1,367.365	1,475.784
Information-gathering capacity	.001	.067	.067	.132	.009	.017	.709	649.356	741.799
Systematic processing	.565	.795	.792	.309	.640	.182	.273	.812	1,304.713
Experience	.087	.076	.030	.033	.027	.004	.141	.049	.806

Notes: Results are based on the full sample. The italicized numbers are the square roots of the AVE of each construct's indicators. Elements in the lower triangle are interconstruct correlations. Elements in the upper triangle denote the decrease in model fit (chi-square with 8 d.f.) that would occur if the two constructs were modeled as one; values greater than 26.124 indicate that the decrease in model fit would be significant at the 1% level.

Model 4, which referred to the interaction effects of H_{4b} and H_{4c} .

Hypotheses Testing

Table 3 provides the structural model results regarding the direct effects; the indirect effects, including full and partial mediation of information seeking; the moderating effects of systematic processing; and the direct and indirect effects of source credibility.

In examining the direct effects and their coefficients in Model 1 (Table 3), we determined that the main variable of interest, protective behavior, was strongly influenced by persuasion coping (standardized coefficient $\beta_{std} = .816$), such that it accounted for two-thirds of the variation in protective behavior ($R^2 = .666$). Persuasion coping in turn was enhanced by information seeking ($\beta_{std} = .651$), threat appraisal ($\beta_{std} = .209$), and systematic processing ($\beta_{std} = .144$), whereas response barriers exerted a negative effect on persuasion coping ($\beta_{std} = -.060$). Together, these four predictors explained substantial variation in persuasion coping ($R^2 = .883$). Threat appraisal ($\beta_{std} = .402$) and systematic processing ($\beta_{std} = .572$) also had positive effects on information seeking ($\beta_{std} = .083$), which our model could explain ($R^2 = .770$). Systematic processing ($\beta_{std} = .590$) and experience ($\beta_{std} = .082$) also increased threat appraisals.

Information-gathering capacity had a positive effect on information seeking, in support of H_{1a} . Furthermore, it enhanced threat appraisal, with a positive effect ($\beta_{std} = .083$). The proportion of explained variance in threat appraisal was somewhat smaller but was still substantial ($R^2 = .370$), in support of H_{1b} . Considering that systematic processing was explained by only one predictor, the proportion of explained variance seemed reasonable ($R^2 = .098$).

Next, we considered some focal indirect effects. To obtain the inference statistics, we followed the approach suggested by Preacher and Hayes (2008) and applied bias-corrected bootstrapping with 10,000 samples to determine the 95% CIs. Thus, we could examine the potential mediating effect of information seeking on the link between threat appraisal and persuasion coping. The estimate of the indirect effect was .317 (95% CI = [.216, .457]). Because the direct effect of threat appraisal on persuasion coping remained significant and similar in size to the indirect effect, this finding indicated partial mediation (Zhao, Lynch, and Chen 2010). The variance accounted for (VAF; Shrout and Bolger 2002) was .556—that is, 55.6% of the total effect of threat appraisal on persuasion coping could be attributed to the mediating effect of information seeking, in partial support of H_2 .

To analyze the moderating effects of systematic processing, we combined Models 2–4 and found that all five hypothesized moderating effects were significant, in support of H_{4a} – H_{4e} . Systematic processing strengthened the effects of threat appraisal on information seeking and of persuasion coping on protective behavior. Moreover, it weakened the effects of threat appraisal on persuasion coping, information seeking on persuasion coping, and response barriers on persuasion coping.

Finally, source credibility positively affected systematic processing ($\beta_{std} = .313$), so we found support for H_5 . Although we did not include it as a formal hypothesis, we

examined the linear effect of source credibility on protective behavior to gain additional insights. Source credibility had no direct effect on protective behavior, but it revealed a significant indirect effect of .245 (95% CI = [.187, .308]). As a full mediation, its VAF was 100%. We also distinguished four indirect effects of source credibility on protective behavior: through persuasion coping and systematic processing (.044, 95% CI = [.001, .106], VAF = .180); through persuasion coping, threat appraisal, and systematic processing (.038, 95% CI = [.014, .069], VAF = .155); through persuasion coping, information seeking, and systematic processing (.115, 95% CI = [.071, .176], VAF = .469); and through persuasion coping, information seeking, threat appraisal, and systematic processing (.048, 95% CI = [.031, .073], VAF = .195).

Implications

Theoretical Implications

This study represents an important step toward reducing the vulnerability of residents living in areas prone to natural disasters, such as southern Spain, which suffers from moderate seismicity. The lack of economic, technological, and social resources leaves many people vulnerable to natural disasters. By applying the PKM and HSM, we have examined how systematic processing might stimulate protective behavior and, thus, the development of persuasion knowledge. These two theories are closely related, yet little prior research has addressed them in an integrated framework. Consistent with our theoretical prediction, respondents with a greater capacity to engage in systematic processing assess the level of threat and seek disaster-related information in an effort to gather agent knowledge (i.e., information about the goals and characteristics of the persuasion agent). This information shapes their persuasion knowledge and thus helps people cope with persuasive attempts.

As our findings suggest, information seeking is a partial mediator of threat appraisal and persuasion coping. Threat appraisal can exert its full, positive impact on persuasion coping—and, ultimately, protective behavior—only if it combines with an increase in information seeking. That is, the presence of initial information is crucial because the availability of disaster or threat information leads to the formation of persuasion knowledge and coping through information-seeking behavior. Lowering information barriers and increasing the accessibility of information thus provide viable instruments for facilitating information seeking. To this end, social media offer particularly promising methods for information dissemination and exchange. For example, the Great Tohoku Earthquake in Japan prompted a 500% increase in Twitter usage because people reached out to friends and family in the aftermath of the incident (Tsukayama 2011). Information dissemination through smartphones could be highly effective; 69% of Spanish Twitter adopters access the service primarily through mobile devices (Durrani 2014).

Furthermore, systematic processing directly and indirectly affects persuasion coping, with positive effects on protective behaviors. The moderating effects of systematic processing include both strengthening the effect of persuasion coping on protective behavior and mitigating the negative effect of

Table 3. Structural Model Results

Dependent Variable	Model 1			Model 2			Model 3			Model 4			
	Hypothesis	β	SE	p	β	SE	p	β	SE	p	β	SE	p
Systematic Processing													
• Source credibility	H ₅	.340	.037	<.001	.340	.039	<.001	.339	.039	<.001	.340	.039	<.001
Threat Appraisal													
• Information-gathering capacity	H _{1b}	.253	.060	<.001	.252	.067	<.001	.246	.068	<.001	.252	.068	<.001
• Experience		.477	.198	.016	.479	.215	.026	.474	.215	.027	.483	.215	.025
• Systematic processing	H _{3a}	.676	.046	<.001	.676	.047	<.001	.675	.047	<.001	.681	.047	<.001
Information Seeking													
• Threat appraisal	H ₂	.345	.034	<.001	.345	.039	<.001	.349	.039	<.001	.343	.039	<.001
• Information-gathering capacity	H _{1a}	.112	.036	.008	.111	.042	.008	.115	.042	.006	.105	.042	.012
• Systematic processing	H _{3b}	.562	.037	.002	.562	.036	<.001	.560	.036	<.001	.572	.037	<.001
• Threat appraisal × Systematic processing	H _{4b}										.032	.013	.014
Persuasion Coping													
• Information seeking	H ₂	.920	.100	<.001	.922	.178	<.001	.921	.175	<.001	.963	.175	<.001
• Response barriers		-.092	.033	.006	-.078	.035	.024	-.084	.036	.019	-.081	.036	.025
• Threat appraisal		.253	.055	<.001	.250	.087	.004	.274	.083	<.001	.255	.083	.002
• Systematic processing		.199	.066	.003	.194	.105	.066	.155	.104	.135	.136	.106	.200
• Response barriers × Systematic processing	H _{4d}				.041	.015	.007						
• Threat appraisal × Systematic processing	H _{4a}							-.074	.015	<.001			
• Information seeking × Systematic processing	H _{4c}										-.071	.016	<.001
Protective Behavior													
• Persuasion coping		.654	.030	<.001	.635	.055	<.001	.647	.054	<.001	.642	.055	<.001
• Systematic processing					.042	.067	.537	.052	.066	.426	.014	.074	.845
• Persuasion coping × Systematic processing	H _{4e}				.025	.009	.006	.040	.010	<.001			

Notes: β = unstandardized path coefficient; p = error probability. Italics indicate the hypotheses and results associated with mediation effects.

response barriers. Systematic processing also weakens the creation of persuasion coping by threat appraisal and information seeking, which indicates a ceiling effect.

As previous research has indicated, people improve their current knowledge and ability to process information systematically after receiving educational treatments and formats that enhance the presentation of the material (Bovy 1981). Tools that enhance information presentations and help focus attention on learning goals also can improve cognitive processing (Leidner and Jarvenpaa 1996). However, when such tools are missing, source credibility becomes more influential. Although we found no direct effect of source credibility on protective behavior, it exerted an indirect, linear effect on protective behavior. That is, highly credible sources are more likely to stimulate people to process information systematically than are less credible sources. Thus, the identity of the source describing future earthquake threats, the severity of potential damage, and possible protections against these threats makes a difference.

Compared with systematic processing, source credibility is a more actionable variable that can be managed by relevant external parties. Our findings indicate that respondents perceived the Architects' Association to be more credible than either the regional government or the local newspaper, so this organization should take the lead in encouraging citizens' systematic processing of disaster awareness campaigns, which could influence people to adopt more protective behavior. Because we found that the three information sources actually had similar effects in the structural model, dissemination of a disaster awareness campaign benefits from wider announcement coverage and greater frequency. Thus, awareness campaigns should be coordinated across entities, including both public agencies and private organizations.

Public Policy Implications

Our findings and their implications offer several public policy recommendations. First, policy makers and social marketers should jointly design policies that encourage community engagement in disaster preparation. Following examples from other countries (e.g., New Zealand), the European Commission's Humanitarian Aid and Civil Protection Directorate General (ECHO) developed a global risk reduction program for disaster-prone regions (European Commission 2011a). The program focuses on developing new strategies and complementing existing ones to enable local communities and institutions to better prepare for, mitigate, and adequately respond to natural disasters by enhancing their capacities to cope and react. To achieve greater resilience, ECHO is designed to be implemented across central governments, local authorities, and professional organizations (e.g., Architects' Association). However, in some European Union member states, the plan has not been well implemented at local levels. For example, many Spanish cities located in earthquake-prone areas, particularly Andalusia, have not integrated the ECHO program in their city codes and have no emergency plans for responding to sudden-onset natural disasters. Thus, the first recommendation is to ensure the reinforcement of ECHO's global risk reduction program at the municipal level, perhaps by translating the general mitigation strategy into a detailed, community-based social marketing plan.

Second, the European Commission manages the European Civil Protection Mechanism through its emergency response center, the Monitoring and Information Center (MIC). The MIC was established after an April 6, 2009, earthquake near L'Aquila, Italy, with the mandate to monitor the situation on the ground and support disaster management. To foster disaster-response cooperation among 31 countries, the MIC aims to pool the resources available to disaster-stricken countries and distribute them (European Commission 2011a).² The Institute for the Protection and Security of the Citizen (IPSC) provides scientific and technical support to the MIC and other civil protection agencies in Europe.³ For example, it helps the MIC offer disaster relief throughout Europe by serving as a center of communication and providing the public with disaster preparedness information (European Commission 2011b). The MIC and IPSC thus represent ideal platforms for information dissemination: they are highly credible sources that can transmit reliable information to stimulate people's systematic processing. Noting the limited resources for civil protection in Spain, our second recommendation is that policy makers seek the cooperation of the MIC or IPSC and maximize their participation in European Union-wide awareness campaigns, which eventually should lead to a national-level effect.

Third, cooperation with the MIC or IPSC is a realistic starting point, but regional governments must also take the lead and develop local plans for disaster preparation. In this regard, Spanish policy makers could look to New Zealand's community engagement programs as a model. In the late 1990s, New Zealand established local emergency management consortia; its Civil Defence Emergency Management Act redefined the duties of central and local governments and brought private sector utilities into emergency management strategic decision-making and operational contexts. The New Zealand government encourages local authorities to identify hazards and associated risks within their communities and then consult with communities about which local authorities should act and what communities or individuals must do for themselves. This system enables people to be proactive, as opposed to reactive, in taking a disaster preparation initiative (Britton 2007). Such public policies seem promising in a Spanish context because of the country's strong societal communities and group unity (Allik and Realo 2004).

Fourth, local Spanish policy makers should integrate social marketing principles when developing their social change programs. Such approaches may involve careful market segmentation of seismic regions by consumer vulnerability attributes, such as poverty, education, or experience. Policy makers thus could adjust to meet the needs of these segments by providing beneficial, easy-to-implement programs, with subsidies and financial aid, to assess and reform residential buildings. Policy makers could also organize personalized seminars for the most marginalized and vulnerable populations to communicate scientists' seismic predictions. Through such social marketing programs, if residents were to develop sufficient awareness of the potential for imminent disaster,

²The countries include the 28 European Union member states, plus Iceland, Liechtenstein, and Norway.

³It is one of the seven science institutes of the Joint Research Centre (the European Commission's in-house science service).

the magnitude of the psychological or emotional devastation following such an event would be much less manifest.

Fifth, technical issues should be addressed as well. For example, public policies that monitor the construction of new buildings in particularly vulnerable areas should be revisited. Policy makers should review existing seismic codes to decide whether stricter regulations are needed. Public policies that ensure the integrity of buildings are similarly important because collapsing structures and falling rubble cause most of the casualties following an earthquake. The European Union's seismic code Eurocode 8, which regulates requirements for the design and construction of new buildings and the rehabilitation of existing buildings in seismic regions, is revised and updated every five years (European Committee for Standardization 2004). However, the application of Eurocode 8 depends on national authorities, who are required to issue a national annex that includes specifications for that particular country (Solomos, Pinto, and Dimova 2008). The Spanish central government has yet to approve a Spanish national annex and still relies on obsolete national seismic codes (Ministry of Development 2002). A public policy that urgently develops and accepts a national annex would enable engineers and architects to adopt the more advanced European seismic code.

Thus, our research offers a stepping stone for community engagement programs to foster consumers' self-protective capabilities in relation to seismic risks. Our goal was to explore earthquake disaster preparation from a social marketing perspective; our findings also provide policy makers with useful insights for how to undertake effective market segmentation and identify vulnerable consumers who lack the information and resources needed to prepare for disasters adequately. For this vulnerable segment, policy makers are strongly advised to engage in comprehensive disaster planning and coordination with the European Union's civil protection agencies to ensure full scientific and technical support for the execution of viable social marketing programs.

Limitations and Research Directions

Our results contribute to extant literature by specifying the effectiveness of community awareness campaigns for disaster preparedness; we also recognize several limitations and corresponding research directions. First, this study does not address socioeconomic or demographic factors such as gender, income, or age, which could influence both cognitive processing and protective behaviors. To explicate the reasons people adopt protective behaviors, further research should take these factors into account.

Second, use of experience as a proxy for the level of threat appraisal may be troublesome. This surrogate measure could elicit responses relatively easily, but it might not reflect people's actual experience. Additional research could instead measure material, economic, and social damage or harm caused by earthquakes directly.

Third, because we used a scenario method, some disaster-related knowledge might have been primed post hoc by the descriptions of past and future earthquakes, which could invoke persuasion knowledge among some respondents. The extent to which this priming contributed to our results is unknown, but we cannot deny the potential for implicit memory effects.

Fourth, this study focused on a broad process rather than the more limited notion of information seeking and processing. Yet in some cases, people may not know where to find relevant information or what kinds of questions to ask. Varying threat severity and probability degrees also might affect people's information-seeking and processing mechanisms differently. We did not pretest the data to verify respondents' prior motivation, ability, or opportunity to process the type of information. Research extensions should cover such issues.

Appendix A: Scenario

According to the Scientific Norms of Earthquake Resistant Construction, the depression of Andalusia is the area of greatest seismic hazard in Spain, with active faults that threaten the metropolitan area. The last major earthquake occurred on December 25, 1884, at Granada, with a magnitude of between 6.5 and 6.7 degrees on the Richter scale. At that time, 900 people were killed, 2,000 were injured, and the quake destroyed over 1,000 houses in more than 20 villages in this region. The majority of deaths and injuries were not caused by gaping holes in the ground but by falling rubble from buildings. Since then, almost every day, there have been micro-earthquakes in the southern region of Spain, but none have been very relevant, because they rarely exceeded 4 on the Richter scale.

The president of the Architects' Association has warned that Andalusia may be due for a major earthquake soon if history, statistics, and monitoring are anything to go by. Statistically, Spain has suffered a major, destructive earthquake every 70 years, but because the last one was in 1884, the risk of reoccurrence may be increasing with every day that passes. In fact, scientists indicate that there has been an increase in minor earthquakes in high-risk areas of Spain in recent years, and studies suggest that this may be a warning of impending disaster.

A few years ago, Lorca suffered the nation's most destructive earthquake in 50 years. Nine people died and nearly 300 were injured when twin quakes hit the town. The larger of the two earthquakes had a magnitude of 5.2 and came at 6:47 P.M. local time, almost two hours after a 4.4 magnitude quake had already caused considerable damage and forced many people out of their homes into the city's streets. The earthquake caused immeasurable damage. One insurance analyst estimated that the costs of the damage could reach around 40 million euros. The mayor said 80% of the buildings in Lorca—a town of 93,000 inhabitants—suffered some damage. Buildings might have been more likely to fall if they had sustained previous damage. Some residents left to stay with friends and family in other areas because their homes were unsafe or they feared aftershocks. Thousands of people camped outside overnight in fear of further tremors. Troops and emergency workers put up temporary shelter for thousands of homeless; up to 6,000 people slept in tents spread across five emergency camps set up by the Red Cross and the Ministry of Defense. A reporter broadcasting live for a state television station narrowly escaped being hit by the facade of a church's falling bell tower. A 13th-century tower in the city's castle was also reported to have been seriously damaged by the force of the quake. Patients had to be evacuated from the city hospital,

which was damaged. Television footage and news photographs showed at least one building that fell across a city street, along with images of cars crushed by falling rubble, fallen walls, and large cracks in buildings.

The president of the National Geological Association said, however, that a 5.2 magnitude earthquake “should not have claimed any victims” and that the buildings in this city “should not have fallen down.” He pointed out, “Many cities of Andalusia are areas of seismic risk. So they should have been prepared. An earthquake of 5.2 is not sufficiently intense to collapse buildings.”

Recently, the Regional Government of Andalusia announced public support to improve the earthquake resistance of buildings or houses built more than 50 years ago by installing special devices called “energy dissipaters.” Energy dissipaters are special elements that can be retrofitted to existing buildings to avoid damage to the main structure after an earthquake. They were developed by researchers from the Department of Mechanics of Structures at the University of Granada to protect buildings against severe earthquakes. The researchers designed these low-cost energy dissipaters to be easily installed in existing structures with readily available construction techniques. Their system has been tested at full-scale and been patented for actual production in the near future.

Appendix B: Questionnaire Items

Threat Appraisal

(Neuwirth, Dunwoody, and Griffin 2000; measured on a 0–10 rating scale [high values indicate greater likelihood/magnitude/importance])

- Considering the information, how likely is it that you will become one of the persons affected by an earthquake in your region?
- Considering the information, how worried are you that an earthquake may destroy your house or the building where you or your family live?

Persuasion Coping

(Neuwirth, Dunwoody, and Griffin 2000; measured on a 0–10 rating scale [high values indicate greater likelihood/magnitude/importance])

- Considering the information, how likely is it that you will learn how to protect your house or the building where you live against an earthquake?
- Considering the information, how likely is it that you think your efforts would make a difference in reducing the risk of damage from an earthquake?
- Considering the information, how likely is it that, if you were to see news offering information about how to make your house more earthquake resistant, you would request it?

Information Seeking

(Grünig 1989; measured on a seven-point Likert scale [1 = “completely disagree,” and 7 = “completely agree”])

- After reading this information, I started getting to know how to protect my house or the building where I live from earthquakes in this region.

- This information convinced me that I should ask the experts’ opinion about how to protect my house or the building where I live from earthquakes.
- After reading this information, if I were to see an announcement offering a free booklet that further explains how to make my house or the building where I live more earthquake resistant, I would most likely request it.

Information-Gathering Capacity

(Griffin et al. 2008; measured on a seven-point Likert scale [1 = “completely disagree,” and 7 = “completely agree”])

If I wanted to get more information about earthquakes in this region...

- I would know what questions to ask of the experts.
- I would know where to go for more information.
- I would readily take the time to gather any additional information I might need.
- Much of the information would be easy for me to understand.

Response Barriers

(Neuwirth, Dunwoody, and Griffin 2000; measured on a 0–10 rating scale [high values indicate greater likelihood/magnitude/importance])

Considering the information, please rate the costs to protect your house or the building where you live against earthquakes.

- Costs
- Complexity
- Disruption of daily life

Protective Behavior

(Griffin et al. 2008; measured on a seven-point Likert scale [1 = “completely disagree,” and 7 = “completely agree”])

- I would be very likely to do something to protect my house or the building where I live from an earthquake.
- I would be very likely to modify my house or the building where I live to make it more earthquake resistant.

Experience

(Helweg-Larsen 1999)

- How many years have you been a resident of this region?
- How often have you experienced earthquakes?
- How many people do you know who have suffered from damage or have lost anything in previous earthquakes?

Source Credibility

(Meyer 1988; measured on a seven-point semantic differential scale)

The Regional Government of Andalusia/Architects’ Association/local newspaper is the source for this information. Considering what you know, please circle a number between the pair of words that best describes your feelings about the information:

- Cannot be trusted/Can be trusted
- Is inaccurate/Is accurate
- Is biased/Is unbiased

- Is unfair/Is fair
- Does not tell the whole story/Does tell the whole story

Systematic Processing

(Griffin et al. 2008; measured on a seven-point Likert scale [1 = "completely disagree," and 7 = "completely agree"])

- After I encounter information about this topic, I am likely to stop and think about it.
- If I need to act on this matter, the more viewpoints I get, the better.
- After thinking about this topic, I have a broader understanding.
- When I encounter information about this topic, I read or listen to most of it, even though I may not agree with its perspective.

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