

When good intentions turn bad: promoting natural hazard preparedness

Paton, Smith and Johnson examine indicators of personal emergency preparedness and present a model for conceptualising the implications

Abstract

Despite considerable expenditure on public hazard education, levels of natural preparedness remain low. Building on natural hazard and health research about protective behaviour, a social cognitive model of hazard preparedness is proposed. The model commences with factors that motivate people to prepare, progresses through the formation of intentions, and ends in decisions to prepare or not prepare. Variables implicated at each stage are identified and their role described. The model was tested by examining earthquake preparedness. Analysis suggests that the reasoning process that leads to preparing or not preparing represent discrete processes. The implications of the model for conceptualising and assessing preparedness are discussed, as are implications for risk reduction and communication.

Introduction

Central to contemporary emergency planning is the use of risk management principles to promote resilience to natural hazards. At the individual-community level, resilience describes a capacity to maintain levels of functioning following significant disruption by hazard activity using available resources (Paton, 2000; 2004). Promoting the availability of resources will thus play a key role within a resilience strategy. Being prepared (e.g. storing water, securing high furniture, preparing a household emergency plan) minimises the risk of injury and damage within a household. It also facilitates a capability for coping with the temporary disruption associated with hazard activity. Because it represents a significant predictor of the capacity to adapt to unforeseen circumstances, it is important to develop strategies to promote the adoption and maintenance of hazard preparedness measures and activities.

Recognition of the ineffectiveness of public information programs in this regard (Lindell & Whitney, 2000; Paton, Smith & Johnston, 2000) has stimulated

more detailed research on preparedness behaviour. One approach that is gaining currency in the literature involves examining the utility of social cognitive models of protective behaviour (Duval & Mulilis, 1999; Grothmann & Reuswig, in press; Paton, 2003) to predict preparedness. This paper describes the testing of a social cognitive model (Paton, 2000; 2003) that argues that preparedness represents the outcome of a three-stage reasoning process: motivation to prepare; forming intentions to prepare, and their conversion into actual preparation (Paton, 2003). This model was tested in regard to preparedness for earthquake hazards.

The motivation phase: precursor variables

Consistent with existing theoretical and empirical work, risk perception (Sjöberg, 2000) was included as a precursor variable. It was assessed with a measure used extensively in New Zealand (Johnston et al, 1999). Two additional precursors were proposed. Research on community response to adversity identified critical awareness (the extent to which people think and talk about hazards) as an important precursor and was assessed using a measure described by Dalton et al. (2001). Anxiety about earthquakes may reduce the likelihood that people will prepare (Duvall & Mulilis, 1999; Lamontagne & LaRochelle, 2000), and a measure specifically developed for this study was included as precursor variable. It is argued that if risk perception, critical awareness and hazard anxiety are present at appropriate levels, people progress to the next phase, with intention formation being influenced by another set of variables (see figure 1, page 27).

Intention formation variables

The model postulates that once motivated, people make judgements regarding whether their actions will mitigate hazard effects (Outcome Expectancy). If the latter judgement is favourable, whether or not a person forms intentions to prepare is a function of the level of their self-efficacy beliefs (beliefs regarding personal capacity to act) (Duval & Mulilis, 1999; Lindell & Whitney, 2000; Paton, Johnston & Houghton, 2001). Self-efficacy also influences the number and quality of

action plans, and the amount of effort and perseverance invested in risk reduction behaviours (Paton, 2003). Given the need to maintain preparedness to deal with infrequently occurring hazards, the latter is a particularly important variable. A role for action coping being linked to preparedness (Duval & Mulilis, 1999; Lindell & Whitney, 2000; Paton et al., 2001) led to its inclusion (figure 1). These variables were assessed as follows:

- outcome expectancy and intentions (Bennett & Murphy, 1997);
- self-efficacy (Schwarzer, 1992); and
- action coping (Carver et al, 1989).

The inclusion of intention also introduces a need to consider whether intent is converted into actual behaviour.

Linking intentions and preparation

According to the model, even if favourable intentions are formed, they may not be acted on if people transfer responsibility for their safety to others (Duval & Mulilis, 1999; Lindell & Whitney, 2000; Paton, Smith & Johnston, 2000), or do not feel a sense of belonging (low sense of community) to their neighbourhood (Paton et al., 2000). It could also be disrupted by a lack of trust in information sources or by the infrequency of hazard activity (Paton, 2003). These variables were assessed as follows:

- trust (Dillon & Phillips, 2001);
- perceived responsibility (Mulilis & Duvall, 1995); and
- sense of community (Bishop et al, 2000).



Travel disruptions and freight transport can be disrupted by rail lines buckled by earthquake

Preparedness measure

Preparedness items were selected from the Mulilis-Lippa Preparedness Scale (Mulilis, Duval, & Lippa, 1990). A decision to use a subset of the items was made for several reasons (Paton et al, 2003). While assisting an ability to cope with disruption, some items may not be indicative of a decision to prepare for earthquakes. For example, while people may have 'three days food', this may reflect their shopping habits (i.e., they purchase groceries every few weeks for convenience) rather than a decision to prepare for earthquakes, and may not be indicative of a belief in the importance of storing food specifically for emergency use. Similarly, people could have a torch in case of power cuts, a battery radio because they like listening to it while gardening, and so on.

Caution must be exercised with regard to assuming the presence of items with multiple functions, or which reflect different decision processes, as indicative of either a capacity to cope with disruption or peoples' beliefs regarding the importance of preparedness. The inclusion of such items could also result in overestimating preparedness and confound analysis of the reasoning processes that underpins it (Paton et al, 2003). For this reason, items that more accurately reflect decisions to specifically safeguard the household from disruption were selected. These were:

- securing cabinet doors with latches;
- securing tall furniture, heavy items, and water heaters;
- preparing and maintaining a household emergency plan; and
- preparing and regularly checking an emergency kit and its contents.

Method

Data were collected from 600 randomly selected homes in each of Gisborne, Pahiatua, Wanganui, and Blenheim (New Zealand). The sample was compiled from rates databases to maximise the number of home owners surveyed. Homeowners were targeted because, irrespective of their attitude to preparedness, renters may be unable to adopt some preparedness measures (e.g., fixing furniture to walls, securing hot water cylinders, making structural changes to chimneys, etc) because their lease precludes such activities. They may also be less inclined to do so if they perceive their tenure in a given property as temporary (e.g., looking for somewhere else to live, temporary employment, etc).

Of 2400 questionnaires distributed in September 2001, 660 were returned (27.5%). In the phase two survey, in February 2002, 640 were returned (27%). The subdivision of data collection into two phases was important. The distribution of the phase one questionnaire could be construed as a form of hazard preparedness education. The two-stage data collection

process represented a more objective analysis of the predictive relationship between intentions (tested at Time One) and subsequent preparedness (tested at Time Two). Matched data from 197 respondents who responded to both surveys provided sufficient numbers to test the predictive capabilities of the model.

Analysis

Structural equation modelling (SEM: using the LISREL 8.5 method of structural modelling Bollen, 1987) was used to determine the dimensional structure of the measures derived and the structure of the relations among them (Bollen & Lennox, 1991; Marcoulides & Schumaker, 1996). For each measure, a structural (dimensional) analysis of the indicators was undertaken. A factor analysis, using maximum likelihood estimation of the structural loadings, was applied to each set of indicators. Confirmatory factors analysis, using phase two data from the 197 respondents who completed both questionnaires, confirmed that the psychometric properties of the scales were sufficient for analyses to proceed. These estimates of scale reliabilities were used to model the relations among the variables.

The model prescribes a set of relations (paths) among variables based on the hypothesised causal ordering of their influences on each other. SEM simultaneously determines the reliability of each item, hence each measure, and the magnitude of the paths specified among the structural variables. The index of fit for the model is affected by the dimensionality of measures and the specification of the paths. SEM provides a statistical means for testing the fit of a proposed path structure to the data and thus provides a plausible account of how the variables affect each other. Collecting data from the

same individuals on two separate occasions afforded a more objective test of the preparedness process.

Results

Factor analysis revealed that both the anxiety items and the intention items could be resolved as two separate scales. The former are described as Earthquake Anxiety (1) and Earthquake Anxiety (2). Intentions are described as 'Intention to Prepare' and 'Intention to Seek Information'.

With regard to the phase one analysis (figure 1, phase 1), the model provided a good fit for the data ($\chi^2 = 20.3$, $df = 18$, $p=0.32$). The figures adjacent to each arrow represent their independent contribution to the relationship and provide an indication of the relative weighting of each variable within the process. Phase one data supported the conclusion that risk perception, critical awareness and earthquake anxiety motivate preparedness, and that outcome expectancy, self efficacy and action coping mediate its relationship with intentions.

'Intention to Prepare' and 'Intention to Seek Information' differed in regard to the paths supporting their formation. Critical awareness demonstrated direct and indirect relationships with both, reiterating its importance as a motivating factor (see figure 1). The relationship between outcome expectancy and 'Intention to Seek Information' was mediated by self-efficacy. Outcome expectancy had a direct relationship with 'Intention to Prepare', and an indirect relationship mediated by self-efficacy and action coping (see figure 1). The latter is consistent with the hypothesized model. The existence of 'Intention to Seek Information', and the paths from which it is derived, were not predicted.

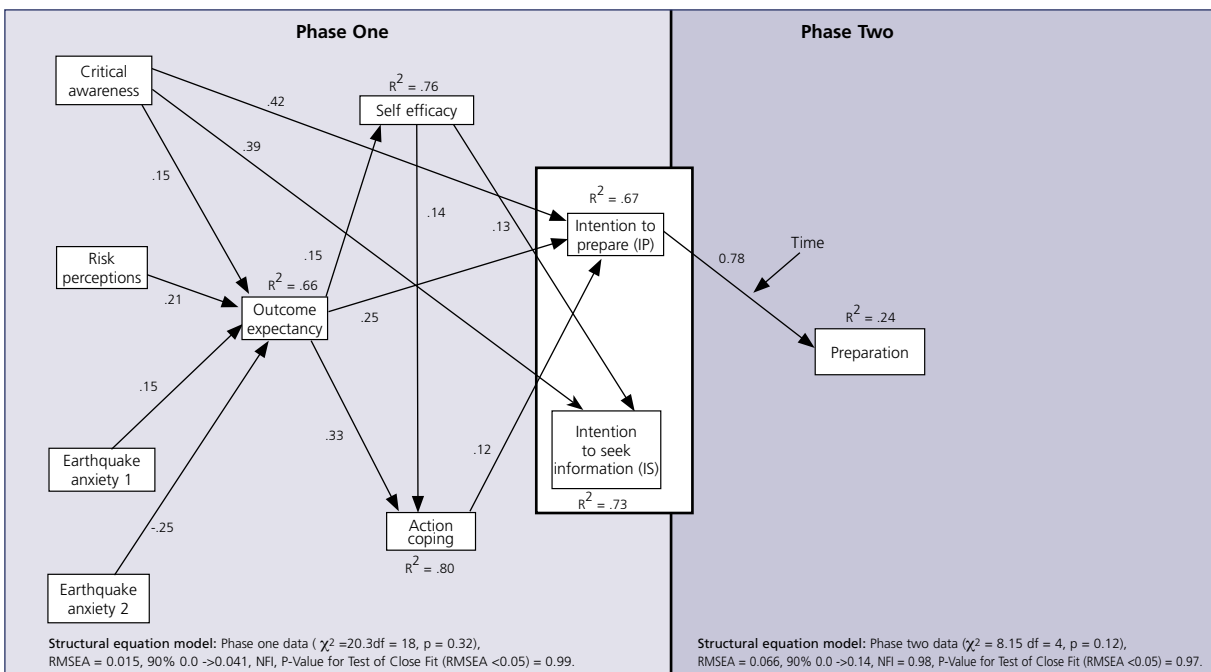


Figure 1: Combined phase one and phase two structural models



While the house at the centre of the photograph has been damaged, those around it have remained relatively intact. Differences in quality of construction or maintenance can help explain the uneven distribution of damage. This highlights the importance of including building checks and regular maintenance in an earthquake preparedness plan and rectifying any problems to minimise damage

In the phase two analysis (figure 1, phase 2), the model provided a good fit for the data ($\chi^2 = 8.15$, $df = 4$, $p=0.12$) and confirmed the importance of the distinction between 'Intention to Prepare' and 'Intention to Seek Information'. Only 'Intention to Prepare' predicted earthquake preparedness. In contrast, 'Intention to Seek Information' represented an end point, and did not, either directly or indirectly, predict preparedness.

Moderated regression analyses were used to test for moderators. For 'Intention to Prepare', only 'Time' moderated this relationship (Beta = -0.132, $p=0.034$). People who anticipate the next damaging earthquake occurring within 12 months were more likely to prepare. Those who anticipate this occurrence within a longer time frame were less likely to prepare even if they had formed intentions to do so.

The analyses failed to confirm a moderating role for sense of community and response efficacy. While not confirmed as a moderator, personal responsibility exercised a direct influence on preparedness, accounting for an additional 5 percent of the variance in preparedness. Similarly, a moderating role for trust was not forthcoming but it may have had a direct impact on 'Intention to Seek Information'.

Discussion

Conceptualising earthquake preparedness as a social-cognitive process can contribute to understanding hazard preparation decisions. The analysis confirmed that preparation should be conceptualised as three separate, but linked, phases: motivation to prepare, formation of intentions, and the conversion of intentions into actions.

Earthquake Anxiety (2) acts to reduce the likelihood that people will begin the preparedness process. That is, it



Having good foundations to your house and ensuring that the house is secured to its foundations can minimise the risk to a house

inhibits the person from embarking on the preparedness process in the first place. The existence of such an overtly inhibitory mechanism has not been considered in previous preparedness research.

Critical awareness, risk perception and anxiety (1) represent outcomes of reasoning processes that result in judgements that motivate people to commence the preparation process. They predict outcome expectancy. Intentions were predicted by outcome expectancy, self-efficacy and action-coping judgements, with outcome expectancy preceding efficacy judgements. However, the process was more complex than originally anticipated. This complexity was attributed to the nature of the intentions evoked within the process.

The finding of a distinction between 'Intention to Prepare' and 'Intention to Seek Information' was significant. They represent discrete variables, are influenced by different pathways in the model, and hold different relationships to preparedness. Only 'Intention to Prepare' predicts actual preparedness. The relationship between 'Intentions to Prepare' and preparing was moderated by the timing of the next damaging earthquake. The relationship between 'Intention to Seek Information' and adjustment adoption was moderated by trust in sources of information.

The discrete nature of these stages suggests that the reasoning that leads to forming 'Intentions to Prepare' and that leading to forming 'Intentions to Seek Information' are qualitatively different. This distinction has significant implications for conceptualising the preparedness process.

The fact that each intention was predicted by different pathways signals a need for additional analysis of the nature of the reasoning and judgements underlying the development of each (Paton et al 2003). This difference indicates that decisions to prepare and decisions not to prepare represent the operation of discrete reasoning processes. These data suggest that it may be inappropriate to conceptualise preparedness in a continuous manner, with 'not preparing' at one end and high levels of preparing at the other. Rather, this finding raised the possibility that each outcome is driven by different decision or reasoning processes. This has implications for risk communication.

Current approaches to promoting preparedness assume it exists on a scale from low to high levels, and that any intervention will result in a movement towards greater preparedness. The present study casts doubt on these assumptions. Firstly, it is important to acknowledge that some people may be inhibited from engaging in the process in the first place. In this study, earthquake anxiety (2) was implicated in this regard. Secondly, the existence of two discrete processes that hold different relationships with preparedness suggests that one set of strategies is required to facilitate



The risk of damage to a house and injury to its inhabitants can be minimised by securing the roof and internal fixtures such as high bookcases and mirrors

hazard preparedness and another to reduce 'not-preparing'. Strategies intended to promote preparing will be rendered ineffective if received by those whose prevailing reasoning supports decisions not to prepare. Thus, a specific set of strategies will be required to counter 'not-preparing' reasoning before it will be possible to actively encourage preparedness.

Differences in the content of each of the three stages have implications for risk communication and preparedness strategies. Strategies should mirror the developmental process described here:

- motivating people to prepare (precursor variables),
- facilitating the formation of intentions (intentions formation variables), and
- promoting the conversion of intentions to preparedness (moderator variables).

No one intervention strategy will be capable of facilitating change in all stages and their constituent variables. For example, providing information, based on sound risk communication principles may facilitate change in risk perception, outcome expectancy, and the timing of hazard events. Simply providing information is less suitable for changing critical awareness, self-efficacy, action coping, or trust, where strategies based on social justice principles, participation and empowerment are more appropriate (Paton, 2000; Paton, 2004). Information based strategies will also be less effective for those for whom earthquakes are a source of anxiety. The management of this anxiety must precede other change strategies. The fact that critical awareness predicts both outcomes calls for more analysis of this variable. Attitudinal and normative influences may prove fruitful in this process (Paton et al, 2003).

A need for additional research into the role of personal responsibility and trust is suggested by the possibility of their direct roles in predicting 'Intention to Prepare' and 'Intention to Seek Information' respectively. Finally, this

model was validated for home owners. Additional work is required to examine this issue for renters who tend to be less well prepared (Burby et al, 2003).

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