

The relationship between demographic/educational parameters and perceptions, knowledge and earthquake mitigation in Israel

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Perceptions, knowledge and mitigation are factors that might play a role in preventing injury and loss of life during a major earthquake.² Little is known about the relationships between different demographic and educational parameters and these factors. A national representative sample of 495 adults was investigated in order to determine the relationship between demographic and educational parameters in terms of the perceived threat, perceived coping, knowledge and mitigation of earthquakes in Israel. Compared to females, males perceived the threat of earthquakes to be lower ($t=3.183$, $p=0.002$), manifested higher levels of perceived coping ($t=2.55$, $p=0.011$), and had higher levels of earthquake related knowledge ($t=2.047$, $p=0.041$). We conclude that there are gender differences in perceptions and knowledge regarding earthquakes.

Keywords: earthquake, education, gender, knowledge, mitigation, population

Introduction

Israel lies on the border of the Syrian African Rift. Over the past few centuries this area has been subjected to numerous major earthquakes, and experts have predicted that in the next 25–50 years Israel is likely to experience a major earthquake of a magnitude above 7 on the Richter scale (Ministry of Defence, 2004; Shapira, 1990). Public awareness of the potential threat of a major earthquake occurring in Israel has increased significantly among the Israeli public during the past few years, due to the relatively frequent occurrence of earthquakes in other parts of the world. Publication of the occurrence of several low-scale earthquakes in Israel, in addition to the issuing of warnings regarding the possibility of a major earthquake in the country, have also contributed to this increased level of awareness (Governmental Committee for Early Preparation for Earthquakes, 2003; Ministry of Defence, 2004).

A number of factors have been identified as impacting on the potential of the population for surviving an earthquake. Factors such as age, gender, marital status, education, earthquake instruction, knowledge related to prevention of injury, threat perception, perceived coping ability and actual behaviour have all been found to play a role.

The elderly are less likely to survive an earthquake compared to younger age groups (Tanida, 1996). Demographic factors have been shown to have an impact on

the attitudes and perceptions of individuals with regard to certain types of stressful events. For example, females perceived themselves more likely than males to be potential victims of crime, terrorist attacks and war (Arian and Gordon, 1993; Bar-Tal et al., 1995; Ferraro, 1996). Men perceived themselves more able to cope with the possibility of a severe genetic illness than women (Taylor, 2005). The impact of gender on the attitudes and behaviour of people who are victims of an earthquake has not been investigated.

The findings related to marital status and earthquake related behaviour are not clear cut. In a study conducted in Taiwan following an earthquake, psychiatric morbidity was found to be lower for individuals who were married (Chen et al., 2007). However, in a Turkish earthquake related study marital status was not found to be a predictive factor for depression and post-traumatic stress disorder (PTSD) (Salcioglu et al., 2007).

The gap between intention for action and actual action is a crucial issue in disaster management. The importance of earthquake related education programmes in schools and the broader community which emphasise the acquisition of coping behaviour and survival skills has been emphasised (Arya, 1993; Frew, 2002; Kuroiwa, 1993; Radu, 1993; Shiwaku et al., 2007). Knowledge of the proper behaviour during and immediately following a natural disaster has been shown to save lives. Knowledge regarding hazards not only increases the ability to assess risks, but also increases the perception of coping (Pomeroy et al., 2006).

Earthquake awareness can be determined by investigating two major components of behaviour: 1) the perceived threat, and 2) perceived coping ability. These two components enable the individual to make a cognitive appraisal of the danger stemming from natural disasters such as earthquakes. Perceived coping ability enables the individual to appraise his ability to cope with stressful and, in some cases, traumatic situations. Perceived threat is a cognitive appraisal of direct and indirect threats such as war, crime, severe illness, death and natural disasters. It is related to motivational and coping factors.

Earthquake mitigation refers to the behaviour of individuals during and after an earthquake to prevent damage and loss of life. A study investigating flood related behaviour patterns showed that when preparing individuals to cope with a flood, actual behaviour is a more important factor in reducing damage and loss of life than other factors such as reliance on others to take action or threat appraisal (Grothmann and Reusswig, 2006).

The aim of this study was to examine the degree to which demographic and educational differences impacted on perceived threat, perceived coping, earthquake related knowledge and actual mitigation behaviour in the context of earthquakes. It was hypothesised that: 1) females will have higher levels of perceived threat compared to males; 2) females will have lower levels of perceived coping abilities compared to males; 3) males will have a higher level of knowledge about earthquakes compared to women; and 4) the higher the level of education the greater the likelihood of participation in educational programmes related to earthquake preparedness.

Methods

Sampling

A national representative sample of 495 adult Israelis aged 18 years or older was drawn using a large database consisting of owners of telephones. Demographic characteristics of the participants are presented in Table 1.

Data collection

Telephone interviews were carried out using a structured questionnaire. Three attempts were made to contact the sample population. Interviews were carried out on 20 and 21 December 2005.

Tools

The research tool was a structured questionnaire consisting of 27 questions. These related to demographic characteristics, perceived threat and perceived coping ability, and included a knowledge test consisting of three multiple choice questions dealing with the topic of earthquakes. The telephone interview lasted approximately 15 minutes.

The demographic variables included in the structured questionnaire were as follows: age, gender, level of education (elementary, secondary or academic), marital status, religion and level of religiosity.

Perceived threat and coping ability were measured by a 5-point Likert scale:

Perceived threat was measured by the following question: ‘To what extent are you worried about the outcome of an earthquake.’ (1 = not at all, 2 = a little bit, 3 = moderately worried, 4 = very worried, 5 = do not know).

Table 1 Participants’ characteristics according to gender (N=495)

	Men (n=194)	Women (n=311)	Test statistics	p value
Age, y (SD)	46.32 (16.94)	46.26 (15.68)	t=0.034	0.973 ^a
Marital status, married, n (%)	141 (73.1)	224 (73.0)	$\chi^2=-0.23$	0.982 ^b
Education, above high school, n (%)	100 (51.8)	152 (49.2)	$\chi^2=-0.704$	0.482 ^b
Perceived threat, mean (SD)	2.36 (1.05)	2.66 (0.99)	t=3.183	0.002 ^a
Perceived coping ability, mean (SD)	3.24 (0.91)	3.01 (0.92)	t=2.550	0.011 ^a
Knowledge test scores about earthquake immediate life-saving actions, mean (SD)	1.22 (0.815)	1.06 (0.82)	t=2.047	0.041 ^a
Getting earthquake mitigation instruction, yes, n (%)	37 (19.1)	64 (20.6)	$\chi^2=-0.411$	0.681 ^b
Conducting earthquake mitigation actions, yes, n (%)	17 (8.8)	21 (6.9)	$\chi^2=-0.781$	0.435 ^b

Notes: ^a Groups compared using *t* test; ^b groups compared using χ^2 test.

Source: Authors.

Perceived coping ability was measured by the following question: ‘I’m certain that I can cope with an unpredicted earthquake (event).’ (1 = disagree, 2 = agree somewhat, 3 = agree, 4 = agree completely, 5 = do not know).

Getting instruction was measured by the following question: ‘Have you been instructed regarding the actions that one needs to take before, during and after an earthquake?’ (1 = no, 2 = yes).

Level of knowledge related to earthquakes was measured by the questions: 1) ‘What is the first action that you must take *during* an earthquake if you are in a building?’; 2) ‘What is the first action that you must take *a few minutes after* an earthquake while you are in a building?’; and 3) ‘To what extent do you evaluate the chances of a major earthquake occurring in Israel?’

Table 2 MANCOVA table for gender while controlling for age, marital status and education (N=495)

Demographic	Dependent variable	Degrees of freedom	F value	p value
Gender	Perceived threat	1,350	6.448	0.012*
	Perceived coping ability	1,350	6.808	0.009**
	Knowledge test scores	1,350	1.509	0.220
	Actual behaviour	1,350	0.005	0.941
Age	Perceived threat	1,350	0.619	0.432
	Perceived coping ability	1,350	0.006	0.937
	Knowledge test scores	1,350	3.124	0.078
	Actual behaviour	1,350	0.160	0.690
Marital status	Perceived threat	1,350	0.162	0.687
	Perceived coping ability	1,350	0.249	0.618
	Knowledge test scores	1,350	1.193	0.276
	Actual behaviour	1,350	0.006	0.937
Education	Perceived threat	1,350	3.199	0.075
	Perceived coping ability	1,350	0.859	0.355
	Knowledge test scores	1,350	0.200	0.655
	Actual behaviour	1,350	0.532	0.466
Receiving earthquake mitigation instruction	Perceived threat	1,350	0.745	0.389
	Perceived coping ability	1,350	2.541	0.112
	Knowledge test scores	1,350	0.024	0.877
	Actual behaviour	1,350	8.236	0.004**

Notes: * $p < .05$; ** $p < .01$.

Source: Authors.

Each participant scored one point for each correct answer with a maximum score of three.

Actual behaviour was measured by the question: 'Have you prepared in any way for a possible earthquake?' This question was measured by a 2-point scale (0 = no; 1 = yes). This question was followed by another that sought to determine what actions the respondent had undertaken. The question was open-ended and the participant could state more than one action that he/she had taken in order to prepare themselves.

Statistical analyses T tests and chi square tests were used in order to compare demographics, perceived threat, perceived coping, scores of the knowledge test regarding earthquakes, getting earthquake mitigation instruction and conducting earthquake mitigation actions (Table 1). Multivariate Analysis of Covariance (MANCOVA) was used to assess the relationship between the knowledge test scores, perceived threat, perceived coping ability and actual behaviour to gender while controlling for age, marital status, education and getting earthquake mitigation instruction (Table 2). All the analyses were conducted using SPSS programme (SPSS, 2002).

Results

There were significant gender differences in perceived threat, perceived coping ability and knowledge test scores. Men displayed lower levels of perceived threat than women ($t=3.183$, $p=0.002$), higher levels of perceived coping ability than women ($t=2.550$, $p=0.011$), and higher knowledge test scores than women ($t=2.047$, $p=0.041$).

When gender and education parameters were entered into the MANCOVA equation while controlling for age and marital status, significant differences were revealed. These differences were found, first, between gender in relation to perceived threat ($F=6.969$, $p=0.009$) and perceived coping ability ($F=7.339$, $p=0.007$), and, second, between receiving earthquake mitigation instructions and conducting earthquake mitigation actions ($F=8.236$, $p=0.004$).

An analysis of the open-ended question identified a number of actions that are perceived as necessary in order to mitigate damage during an earthquake. The most common actions were: tightening hanging objects, locking moving objects, checking if the gas and electric circuits are intact, preparing emergency equipment (first aid kit, flashlight, radio with batteries and so on), talking with close friends and family members, reading materials about earthquakes, being instructed what actions to take in case of an earthquake, and preparing a vital phone list of emergency forces, close friends and relatives.

Discussion

Our results show that men have lower levels of perceived threat in comparison to women. These results strengthen earlier studies (Kibler and Lyons, 2004; Tamres et al., 2002). One explanation of these results can be found in Lazarus and Folkman's

model of coping with stress (Folkman and Lazarus, 1980; Lazarus and Folkman, 1984). According to this model, in the face of stressful situations, women tend to use more emotion-focused coping capabilities that can be linked to higher rumination, which in turn links to an elevated level of anxiety and perceived threat. However, since men tend to use more problem-focused coping mechanisms, their tendency toward a stressful situation displays a higher level of knowledge regarding earthquakes—as was found in our study—and a higher perceived coping ability based on their knowledge. One may claim that this perceived coping ability of an unpredictable event also partly contains a denial behaviour that is more attributable to men than women (Folkman and Lazarus, 1980).

The findings of our study also support Johnston et al. (2005) who claim that a higher level of knowledge is a contributing factor to a perceived coping capability. The increase in the level of knowledge regarding natural disasters improves the risk assessment that is made by the individual and raises his/her confidence in his/her risk evaluation. This in turn leads to a higher level of perceived coping ability. Furthermore, these results support a recent meta-analysis that found similar results (Tamres et al., 2002). In this meta-analysis the main claim is that women tend to use more coping strategies than men. However, these coping techniques are more related to emotion-focused coping (Tamres et al., 2002).

The literature indicates that a negative correlation exists between a perceived threat to a perceived coping ability (Kibler and Lyons, 2004). A theoretical framework that can explain the relationship between a perceived threat and a perceived coping ability is the person-relative-to-event theory, which is based on the Lazarus and Folkman model of coping with stress (Lazarus and Folkman, 1984; Mulilis and Duval, 1995, 1997). This theory postulates that when a person is evaluating a risk and uses a coping mechanism (problem focused or emotion focused), the results of these appraisal processes lead to a higher probability of a behavioural action, which assists in dealing with the threatening situation (Mulilis and Duval, 1995). According to Mulilis and Duval (1995), threat appraisals are related to the extent of personal preparation. Thus, the higher the threat is perceived, the more likely the individual is to engage in problem-focused coping mechanisms and to take an action.

Another approach is via self-efficacy, which is related to perceived threat and perceived coping ability in threatening situations (Bandura, 1997). Self-efficacy is the belief people have in their ability to cope in potential threatening situations and how they perceive this threat. This perception is a core belief of the individual that he/she has control over the situation (Bandura, 1997; Benight and Bandura, 2004). These perceptions of threat and coping mechanisms are especially important in the context of extremely stressful situations deriving from unpredictable natural disasters. In natural disasters, such as volcanic eruptions and earthquakes, the element of surprise is a key factor in generating traumatic stress. However, the way people perceive the situation can mediate the traumatic event (Kibler and Lyons, 2004). In a study on the eruption of Mount St Helens (Murphy, 1987), it was found that perceived self-efficacy was one of the major predictors of PTSD in the short term and the only predictor of PTSD in the long term (Murphy, 1987).

Limitations

Our study has three limitations. First, the study is based on a survey of population perceptions and therefore displays differences rather than cause-and-effect relationships between variables. Second, the study did not confirm the reports on actual behaviours and the results are based only on the population perceptions. Third, the nature of the stressor (future earthquake) was indirect and signifies a remote threat. The problem of earthquakes as stressors is that in Israel most people tend to focus on more immediate life-threatening situations (for example, terror, war, traffic accidents), rather than a natural disaster that has not occurred since 11 July 1927, when an earthquake of 6.2 magnitude hit northern Israel and led to the death of 500 people and the injury of more than 1,000. As Israel has not undergone any major natural disaster for more than 80 years, most people tend to ignore this threat, even though in recent years there has been a small set of minor earthquakes with short and transitory impacts.

Conclusion

The results of this study are important for future policy. The findings of gender differences in earthquake perceptions and levels of knowledge might be relevant for planning different training programmes for men and women. While men should be confronted with more informational directions, women should have less threatening and more practical trainings and exercises. We conclude that there are gender differences in perceptions and knowledge regarding earthquakes.

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² This paper is part of the PhD thesis conducted by Yechiel Soffer under the supervision of Avishay Goldberg and Yaron Bar-Dayan.

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