


Preparing for disaster: preparedness in a flood and cyclone prone community

Katerina Kanakis and Dr Connor J. McShane suggest that emergency planning that targets both social connectedness and self-efficacy may be most effective in enhancing preparatory behaviours. 

ABSTRACT

Research suggests that the perception of a threat, high levels of self-efficacy, and high levels of social connectedness and trust may facilitate engagement in preparatory behaviours for severe weather events. To identify the psychosocial determinants of preparatory behaviours in cyclone- and flood-prone communities, a questionnaire was completed by 275 (103 males, 169 females, three not identified) participants from a north Queensland community. The results from this study show that perceived susceptibility to a future severe weather event, social connectedness, and self-efficacy significantly predict part of the variance in preparatory behaviour. Therefore communicating personal vulnerability to an event, providing information on how to undertake recommended preparatory action, and increasing engagement in the community may contribute to effective preparation at the community level.

Introduction

Being prepared for an extreme weather event can help individuals and communities manage the consequences that the event brings (Sattler, Kaiser & Hillner 2000). Individual and social factors can play important roles in facilitating individual preparation for a future extreme weather event (Ramirez, Antrobus & Williamson 2013, Poussin *et al.* 2014, Benight & Bandura 2004, Terpstra 2011, Grothmann & Reusswig 2006, Astill & Griggs 2014, Bonanno *et al.* 2007, Sattler, Kaiser & Hillner 2000, Pennings & Grossman 2008). Australian research has investigated individual preparation concerned with bushfires (Paton, Burgelt & Prior 2008, Whittaker *et al.* 2013, Penman *et al.* 2013) however these behaviours are generally different to those required for other extreme weather events such as floods and cyclones. It is important to identify factors that predict preparedness to enhance the effectiveness of preparatory information communicated

by governments and emergency services organisations to susceptible communities.

Research suggests that the first step in encouraging adaptive behaviours for preparing for an extreme weather event, is for the individual to *perceive* a threat to which they need to respond (Witte 1992, Sattler, Kaiser & Hillner 2000, Terpstra 2011, Grothmann & Reusswig 2006). Perceived threat can be conceptualised as the combination of the perceived susceptibility to and perceived severity of the threat (Witte 1992, Maloney, Lapinsky & Witte 2011). Research investigating cyclone or hurricane and flood preparedness found that perceived threat significantly predicted preparation (Sattler *et al.* 2000, Grothmann & Reusswig 2006, Tempstra 2011). As such, part of the challenge for increasing preparedness in individuals is to ensure the nature of the threat is well communicated. Perceptions of threat of future severe weather events can be influenced by the source of the threat communication (Astill & Griggs 2014) with research suggesting that people are more likely to prepare if the information is communicated from a trusted source (Ramirez, Antrobus & Williamson 2013). Further, research indicates that levels of trust and quality of connections that a person has within a community can help preparedness (Ramirez, Antrobus & Williamson 2013, Pennings & Grossman 2008, Terpstra 2011). This suggests that those who seek more information from reliable sources and have good relationships within the community would be better informed about the situation and thus more likely to make the necessary preparations.

Perceptions of threat and behavioural intentions are also influenced by evaluations of past experiences. Prior experience with a severe weather event can influence the way a threat is perceived (Pennings & Grossman 2008, Usher *et al.* 2013). As individuals experience the world around them differently (Paton, McClure & Burgelt 2006), experiencing a previous natural disaster or extreme weather event may influence their perception of a future threat. However, researchers are divided on this issue with some supporting the premise that prior experience lowers preparedness (Briere & Elliott 2000) while others suggest that experience is beneficial in increasing preparedness (Sattler, Kaiser & Hillner 2000, Bonanno *et al.* 2007). Yet much of this literature has investigated



Image: Lesley Kanakis

The main street of Ingham during the 2009 floods.

populations in which the event occurs relatively infrequently (Suls *et al.* 2013, Watanabe *et al.* 2004, Bonanno *et al.* 2007). As such, the role of experience in increasing preparedness remains unclear.

Yet, recent research suggests that the role of threat perception and past experience may play a lesser role in preparedness behaviour than previously expected. Specifically, recent research suggests that individual coping appraisal plays a bigger role in adaptive outcomes (Poussin, Bolzen & Aerts 2014). 'Self-efficacy' is the belief that one has the ability and capacity to perform the behaviours necessary to produce a desired outcome (Witte 1992, Bandura 1998). As such, once an individual has actually perceived a threat, high levels of self-efficacy can allow the individual to start making the necessary preparations.

The aim of this study was to investigate the preparatory behaviours of a cyclone- and flood-prone community when an event threat was not present. Given the likelihood of increases in frequency or severity of cyclone and flood events (Middelmann 2007), it is important to understand the level of preparation currently undertaken and how this can be improved. This study seeks to clarify the role of threat appraisal, coping appraisal, experience and social factors in determining the level of individual preparedness in flood and cyclone vulnerable communities.

Method

Participants

The rural north Queensland community of the Hinchinbrook Shire has a population of approximately 11 700 people (Australian Bureau of Statistics 2015) and was chosen as the target population due to the high frequency exposure to cyclones and floods (Australian Bureau of Meteorology 2011b, Australian Bureau of Meteorology 2011a). Residents were recruited through convenience sampling and at community events and forums to participate in the project. This included markets, meetings, and disaster-preparedness events. The project was advertised in the local paper and the local council website added a link to the online version of the survey. A total of 275 (103 males, 169 females, three not identified) participants completed the questionnaire. The average age of participants was 55.55 years (SD = 17.51, range = 18-89). Participants had been residents of the Shire for an average of 35.55 years (SD = 23.12, range = .25-81). Of the participants, 77 per cent had previously experienced damage to their property as a result of a severe weather event.

Measures

The questionnaire was available in hard copy and online formats. The questionnaire included demographic items such as age, gender, dependent children, and marital status, in addition to study-specific questions. For example, the type and quantity of preparatory

behaviours that individuals performed before a flood or cyclone was measured using a list of preparatory behaviours (adapted from Sattler, Kaiser & Hillner 2000 and the Queensland Government Disaster Management Preparation Checklist (Queensland Government 2011)). Three frequency scores were calculated from a list of where participants sourced information for an upcoming weather event. These information sources included from others within the community (family and neighbours), from media (television, radio and internet), and from community services personnel (police, SES, area warden and local council). Respondents provided a 'yes' or 'no' if they had experienced property damage as a result of a previous weather event. As the entire community is affected by flooding and cyclones (Australian Bureau of Meteorology 2011a), this was used as a measure of experience.

Perceived susceptibility and severity were measured using single items (see Table 1). Social support was measured through two social support sub-scales from the COPE Inventory (Carver, Scheier & Weintraub 1989). Social connectedness was measured using items from a social capital scale (Onyx & Bullen 2000, Woodhouse 2006). Trust was measured through items adapted from the Organisational Trust Inventory-Short Form (Cummings & Bromiley 1996). The New General Self-Efficacy Scale was used to measure self-efficacy (Chen, Gully & Eden 2001). Further information about each of the scales is detailed in Table 1.

Procedure

Participants were given an information sheet about the study and a consent form. Participants who completed the paper copy of the questionnaire did so at the site of recruitment. Some participants chose to take the paper copy home and send it to the research supervisor at a later date. Some participants opted to complete the online version of the questionnaire. The questionnaire took approximately 20 minutes to complete and participation was voluntary. This project was approved by the James Cook University ethics committee (H5053).

Results

Table 2 shows the means and standard deviations for 'susceptibility', 'severity', amount of 'preparatory behaviours' endorsed, amount of 'information' sources sought, 'social support', 'social connectedness', 'trust', and 'self-efficacy'.

The frequencies and percentages of 'preparatory behaviours' that the participants endorsed are presented in Table 3. The majority of respondents endorsed most of the 'preparatory behaviours'. 'Having a torch' was the most frequently endorsed item. Only two of the items were endorsed by less than 50 per cent of the respondents. The least frequently endorsed item was 'sandbagging internal drains'.

Table 1: Description of scales used in this research.

| Scale | Survey example items | Number of items | Response format | Cronbach's Alpha |
|-----------------------------|---|-------------------------|--|------------------|
| Susceptibility | <i>Indicate the likelihood of you experiencing a weather event or warning in the next 12 months.</i> | 1 | 5-point Likert scale 1 = Very unlikely future event occur 5 = Very likely future event occur | - |
| Severity | <i>Indicate the likelihood of you receiving property damage as a result of a weather event in the next 12 months.</i> | 1 | 5-point Likert scale 1 = Very unlikely future damage 5 = Very likely future damage | - |
| Social support | <i>I try to get emotional support from friends or relatives.</i> | 8 | 4-point Likert scale 1 = I usually don't do this at all 4 = I usually do this a lot | >.8 |
| Social connectedness | <i>Do you think that your community feels like home?</i> | 11 | Yes-no format 1 = no, 2 = yes | >.7 |
| Trust | <i>I think most people I talk to tell the truth.</i> | 9 (3 reverse scored) | 7-point Likert scale 1 = strongly disagree 7 = strongly agree | >.8 |
| Self-efficacy | <i>I will be able to achieve most of the goals that I have set for myself.</i> | 8 | 7-point Likert scale 1 = strongly disagree 7 = strongly agree | >.9 |

Table 2: Descriptive statistics of threat, preparatory behaviour, information, social factors and self-efficacy.

| Scale | N | Sample range | Sample Mean (SD) |
|------------------------|-----|--------------|------------------|
| Susceptibility | 272 | 1-5 | 4.12 (.80) |
| Severity | 269 | 1-5 | 3.22 (.95) |
| Preparatory behaviours | 271 | 5-20 | 16.77 (2.49) |
| Information | 271 | 1-10 | 4.70 (1.96) |
| Social support | 265 | 8-32 | 18.22 (6.34) |
| Social connectedness | 275 | 1-11 | 7.73 (2.42) |
| Trust | 274 | 12-63 | 46.86 (8.25) |
| Self-efficacy | 275 | 8-56 | 45.47 (6.07) |

Pearson correlations were conducted to investigate the relationship between each of the variables that were investigated (Table 4). 'Experience of damage', 'susceptibility', 'information' (people, media, community services), 'social connectedness', and 'self-efficacy' presented significant, but weak, correlations with 'preparatory behaviour'.

A hierarchical multiple regression was performed for 'preparatory behaviour' as the dependent variable with 'experience of damage', 'susceptibility', 'information' (media, community services), 'social connectedness', and 'self-efficacy' entered as independent variables in blocks. Table 5 displays the R², R² change, unstandardised regression coefficients (B), and the standardised regression coefficients (β). The final model of predictors explained 19 per cent of the variance in 'preparatory behaviour' with 'susceptibility', 'social connectedness' and 'self-efficacy' being the only significant predictors.

To examine whether 'experience of damage' influenced the determinants of 'preparatory behaviour', another hierarchical multiple regression was performed. 'Preparatory behaviour' was entered as the dependent variable with 'susceptibility', 'information' (media, community services), 'social connectedness', and 'self-efficacy' entered as independent variables in

Table 3: Frequencies and percentages of endorsed preparatory behaviours.

| Preparatory Behaviour | Frequency | Percentage |
|---|-----------|------------|
| Sandbag internal drains and toilets to prevent sewage backflow | 47 | 17.1 |
| Evacuation plan | 130 | 47.3 |
| Taped windows with strong tape | 204 | 74.2 |
| The property is checked for corrosion, rotten timber, termite infestations and loose fittings | 216 | 78.5 |
| Emergency kit (may include spare batteries, essential medication, important documents and cash in a sealed bag) | 218 | 79.3 |
| Disconnected all electrical goods | 228 | 82.9 |
| Trees and overhanging branches are trimmed | 229 | 83.3 |
| Generator or fuel for cooking without power | 240 | 87.3 |
| Roof is kept in good condition and checked regularly | 246 | 89.5 |
| Gutters and downpipes are kept clear | 247 | 89.8 |
| Fuel for generator and/or car | 248 | 90.2 |
| Ensure home, contents and car insurance is current and adequate | 249 | 90.5 |
| Portable radio | 251 | 91.3 |
| First aid kit | 255 | 92.7 |
| Identified where and how to turn off the main supply for water, power and gas | 255 | 92.7 |
| Stored enough fresh water for three days | 258 | 93.8 |
| Secured outdoor furniture and garden items | 259 | 94.2 |
| Identified the strongest room in the house | 260 | 94.5 |
| Three days worth of non-perishable food and can opener | 273 | 99.3 |
| Torch | 274 | 99.6 |

Table 4: Correlations of individual factors, social factors and preparatory behaviour.

| Factor | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|-----------------------------------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|
| 1. Age | - | | | | | | | | | | | |
| 2. Experience damage | .07 | - | | | | | | | | | | |
| 3. Susceptibility | -.08 | .12* | - | | | | | | | | | |
| 4. Severity | .09 | .27** | .35** | - | | | | | | | | |
| 5. Information People | -.25** | -.04 | .19** | .05 | - | | | | | | | |
| 6. Information Media | -.26** | .05 | .12* | .08 | .21** | - | | | | | | |
| 7. Information Community services | -.00 | -.05 | .12* | .10 | .30** | .21** | - | | | | | |
| 8. Social Support | -.06 | .01 | .04 | .04 | .25** | .07 | .29** | - | | | | |
| 9. Social connectedness | .05 | .04 | .03 | -.06 | .12* | .06 | .20** | .18** | - | | | |
| 10. Trust | .04 | .01 | -.05 | -.15* | .06 | .07 | -.03 | .06 | .27** | - | | |
| 11. Self-efficacy | -.02 | .13* | .07 | .10 | -.04 | .00 | .09 | .10 | .21** | .26** | - | |
| 12. Preparatory behaviour | -.04 | .13* | .18** | .12 | .01 | .15* | .23** | .10 | .27** | .09 | .31** | - |

* Significant at .05 level, ** Significant at .01 level.

Note: Due to missing data, the number of participants in each cell varies from 259 to 275. The significance levels shown take these differences into account.

blocks, with the data split by the ‘experience of damage’. Due to insufficient numbers within the ‘no’ group (n = 61), only the ‘yes’ group (n=213) regression is discussed. Table 6 displays the R², R² change, unstandardised regression coefficients (B), and the standardised regression coefficients (β). For those who had experienced damage, 19 per cent of the variance in ‘preparatory behaviour’ was explained by the final model of predictors with ‘information from the media’ being the only non-significant predictor.

Discussion

This study aimed to identify factors that predict preparatory behaviour of individuals within a cyclone- and flood-prone community. Previous research suggested that an individual’s perception of a threat, high levels of self-efficacy and high levels of social connectedness and trust would facilitate preparatory behaviours. The results from this study partially support this. Findings indicated that if individuals *perceived* they were susceptible to a future weather event, felt connected to the community and were confident in their ability to manage challenges, then they were more likely to endorse more preparatory behaviours. However, perceived susceptibility weakly predicted preparatory behaviour in both the general sample as well as those with a prior experience of property damage; with the strongest predictors in both cases being social connectedness and self-efficacy. As such, planning that targets both social connectedness and self-efficacy may be most effective in enhancing preparatory behaviours. This could be achieved through designing campaigns for cyclone- and flood-prone communities that encourage individuals to check on their neighbours or hold community

preparation days (e.g. working bees) before weather events. This could help increase individual perception of social connectedness. Furthermore, emphasising the preparatory behaviours that individuals can do themselves and how to do them effectively can help increase individual self-efficacy.

Previous research regarding the importance of experience was conflicting. In this study, prior experience of damage was not found to predict the endorsement of preparatory behaviours. Given that most of the sample reported experience with an event suggests there was not enough variance within the sample to determine the predictive validity of experience with past events. Nonetheless, given that three-quarters of the sample had undertaken 18 of the 20 recommended preparatory actions indicates that communities that experience a high frequency of extreme weather events are likely to engage in a high number of preparatory behaviours. This is also supported by results that indicate the same predictors were present for preparatory behaviours for those who had experienced damage compared with predictors for the total sample.

Interestingly, perceived severity was not correlated with preparatory behaviour. This is in contrast to previous findings where the importance of both perceived susceptibility and perceived severity is noted (Maloney, Lapinski & Witte 2011, Witte 1992). This suggests that within cyclone- and flood-prone communities, the severity of the event may not influence preparatory behaviour. This may be due to the nature of the weather event with similar preparatory behaviours required regardless of the predicted severity of the event. Further, the unpredictability of potential outcomes may mean that individuals feel the need to prepare for the worst probable outcome.

Of the preparatory behaviours, having an evacuation plan and sandbagging internal drains were not endorsed by the majority of participants suggesting they did not perceive them as necessary to perform before a cyclone or flood. The low frequency of engaging in evacuation planning may be due to perceived difficulties in escaping the path of the cyclone or area of flooding, taking into consideration the relative distance of the Hinchinbrook Shire to major urban centres outside of Far North Queensland. Therefore, residents may require more information supporting the need for or importance of these behaviours to reduce adverse outcomes.

Conclusion

The results of this study suggest that increasing the perception of susceptibility, social connectedness and self-efficacy is one avenue that facilitates

Table 5: Regression of experience, susceptibility, information, social connectedness and self-efficacy on preparatory behaviour.

| Variables Entered | R ² | R ² Change | B | β |
|--|----------------|-----------------------|--|--|
| 1. Experience damage | .00 | .00 | .39 | .07 |
| 2. Experience damage Susceptibility | .03 | .03** | .26 .55 | .04 .18** |
| 3. Experience damage Susceptibility Information - Media | .04 | .01 | .25 .51 .36 | .04 .17** .11 |
| 4. Experience damage Susceptibility Information - Media Information - Community services | .07 | .03** | .35 .46 .26 .32 | .06 .15* .08 .16** |
| 5. Experience damage Susceptibility Information - Media Information - Community services Social Connectedness | .12 | .05*** | .29 .46 .26 .23 .23 | .05 .15* .08 .12* .23*** |
| 6. Experience damage Susceptibility Information - Media Information - Community services Social connectedness Self-efficacy | .19 | .07*** | .09 .43 .31 .20 .17 .11 | .02 .14* .09 .10 .17** .27*** |

* Significant at .05 level, ** Significant at .01 level, *** Significant at .001 level.

an individual's preparation for a severe weather event. Additionally, increasing access to emergency preparedness information from emergency and community services organisations may increase preparation. These suggestions can be easily implemented targeting the factors that facilitate individual preparatory behaviours for future weather events thus increasing the likelihood of positive outcomes. These findings are limited by the sample size and effect sizes. Future research is required that explores the predictive validity of these factors.

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Table 6: Regression of susceptibility, information, social connectedness and self-efficacy on preparatory behaviour of participants with experience of damage.

| Variables Entered | R ² | R ² Change | B | β |
|---|----------------|-----------------------|---------------------------------|--|
| 1. Susceptibility | .02 | .02* | .49 | .16* |
| 2. Susceptibility Information - Media | .04 | .02* | .47 .45 | .15* .14* |
| 3. Susceptibility Information - Media Information - Community services | .08 | .04** | .46 .33 .39 | .15* .11 .21** |
| 4. Susceptibility Information - Media Information - Community services Social Connectedness | .14 | .06*** | .46 .34 .31 .22 | .15* .11 .17* .23*** |
| 5. Susceptibility Information - Media Information - Community services Social Connectedness Self-efficacy | .19 | .05*** | .46 .36 .25 .21 .09 | .15* .11 .14* .22** .23*** |

* Significant at .05 level, ** Significant at .01 level, *** Significant at .001 level.

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