

**Psychological preparedness for natural hazards- improving disaster
preparedness policy and practice**

Hannah Zulch,

School of Psychology, Griffith University, Brisbane, Australia

Introduction

Natural hazards negatively impact on public health world-wide. Earthquakes, hurricanes, cyclones, tsunamis and floods have shaped and modified human behaviour, changing the way people live with, and respond to, the environment (Woolf, Schneider, and Hazelwood, 2013). Disasters can cause loss of life, injury and lead to the development of psychological problems. In the aftermath of disasters, the spread of diseases also be promoted due to damaged infrastructure, in particular loss of clean drinking water and sanitation. The most severe disasters in 2011 alone saw an earthquake overwhelm New Zealand, an earthquake and tsunami destroy large parts of north-eastern Japan, and Cyclone Yasi impact Queensland, Australia. In 2016 and 2017, hurricanes devastated parts of the southern United States and the Caribbean, and in 2017 and 2018 wildfires erupted in southern Europe and in California, USA. Increasingly, individuals will have to prepare for the eventuality of being affected physically and psychologically by a disaster impact or warning situation, due to recurring natural hazards, as well as the effects of anthropogenic climate change (Adger, Arnell, and Thompkins, 2005; Ayers and Huq, 2013; Brooks and Adger, 2003; Pecl, et al, 2017; Woolf, Schneider, and Hazelwood, 2013).

The global climate continues to change rapidly with far-reaching consequences, altering the distributions of species (flora and fauna), affecting the functioning of ecological natural systems and biodiversity, and also negatively impacting public health, food security, and patterns of disease transmission (Altizer, et al, 2013; IPCC, 2014; Manzello, et al, 2013; Michalet, et al, 2013; Pecl, et al, 2017; Sorte, et al, 2013). Ecosystems and human communities, particularly in lower-income populations and regions, are vulnerable to the effects of climate change-facilitated natural hazards and will have to prepare physically and psychologically for the potential public health impact (Ebi, 2010; Houghton, 2004; Pecl, et al, 2017). Consequently, continuous research on disaster preparedness and disaster risk reduction is vital to reduce the detrimental effect on well-being. Indeed, half of the world's largest cities are currently vulnerable to floods, storms and earthquakes, with 14 of the world's 19 megacities situated in coastal zones (Gaiha, et al, 2014). In addition, estimated 40% of the world's population will live in river basins that experience severe water stress by 2050 (UNISDR, 2015).

Current state of disaster preparedness measures

Disaster preparedness aims to help individuals avoid impending disaster threats, and to put plans, resources and mechanisms in place to ensure that those affected receive adequate assistance (Coppola, 2015;

Twigg, 2004). One of the guiding principles of the Sendai Framework for Disaster Risk Reduction is the management of risk of disasters, aimed at protecting persons and their health. This research aims to make a significant contribution to disaster management theory and practice, specifically, to improve the effectiveness of disaster management and disaster policies at the pre-disaster stage. Disaster preparedness strategies have thus far been unsuccessful in preparing individuals for the psychological stress that a natural hazard threat or impact can cause. Current policies and research are mostly focused on how to prepare individuals physically for natural hazard impacts, and there seems to be an absence of psychological preparedness in disaster preparedness theory and practice (Guterman, 2005; McCabe, et al, 2012; McCabe, et al, 2013). Individuals need to be psychologically prepared to successfully manage a disaster warning situation or disaster impact, and to reduce the resulting psychological distress. Psychological preparedness prior to disaster may enable individuals to anticipate and identify their feelings, and to manage their emotional responses, resulting in the engagement of better coping mechanisms.

Practitioners and policy-makers need to acknowledge the role psychological preparedness can play in the disaster preparedness context. In order to improve overall disaster preparedness, psychological preparedness needs to be implemented as a fundamental component in disaster preparedness policies, initiatives and training by governments at a federal, state and local community level, as well as by international and national organisations, non-governmental organisations, and agencies. Psychological preparedness aspects to be integrated have to be tailored to different natural hazards, regional requirements and challenges, as well as available resources. In addition, these aspects must be culturally appropriate and pay special attention to marginalised or disadvantaged groups to provide guidance on capacity building to better cope with a disaster. Once psychological preparedness has been integrated, programs should be evaluated and successes and obstacles should be shared among practitioners, policy-makers, and organisations across national and international platforms. In addition, a research agenda on psychological preparedness must to be established, with academic and non-academic research disseminated among shareholders.

In order to integrate psychological preparedness into policy and practice, psychological preparedness must be defined and measured. This paper presents an operationalised definition of psychological preparedness, relevant literature, and details the development, as well as application, of a valid and reliable measure of psychological preparedness, the Psychological Preparedness for Disaster Threat Scale (PPDTS).

The mental health impact of disasters

Although early warning systems are in place for cyclones, storms, and floods, which act to decrease the casualty rate, some people exposed to disaster are impacted psychologically (Ebi, 2010; Norris and Elrod, 2006). Exposure to disasters can lead to long-term health effects and risks, such as substance abuse, insomnia, phobias, amnesia, and anxiety (including Generalised Anxiety Disorder). Other health effects include post-traumatic stress disorder (PTSD), hyper arousal, acute stress disorder (ASD), depression and at times suicide, and other mental illnesses (Adams and Boscarino, 2006; Cassidy, 2013; Gibbs, 1989; Hussain, Weisaeth, and Heir, 2011a; Hussain, Weisaeth, and Heir, 2011b; Keskinen-Rosenqvist, et al, 2011; Liu, et al, 2016; Neria, Nandi, and Galea, 2008; Nomura, et al, 2016; Norris, 1992, 2001; Schmuckler, 2004; Yehuda, 2002; Young, 1997). Preparing individuals psychologically for a disaster impact has the potential to decrease the psychological impact of disasters (Bryant, 2009; Reser and Morrissey, 2005).

Disaster workers, such as firefighters and police officers, repeatedly have to navigate areas of severe destruction, deceased and severely injured individuals (Centers for Disease Control and Prevention, 2014). Some researchers have shown that disaster workers experience less psychological distress due to desensitisation. However, others have discovered that individuals repeatedly exposed to disaster situations show higher rates of mental illness, and often continue to show high-prevalence of PTSD symptoms, other mental illnesses, or general psychological distress, long after exposure (e.g., Adams and Boscarino, 2005; Cassidy, 2013; Chang, et al, 2008; Dougall, et al, 2000; Fullerton, Ursano and Wang, 2004; Kang, et al, 2015; Wagner, McFee, and Martin, 2009). Interestingly, disaster workers who had received disaster mental health training reported lower levels of post-traumatic stress disorder (Kang, et al, 2015). This research indicates that psychologically preparing individuals to cope with disaster impacts may reduce their chances of developing symptoms of psychological distress, again making the case for an integration of psychological preparedness into disaster preparedness policies and training.

Even relatively mild exposure to disasters can lead to the development of psychological distress and the aforementioned range of symptoms (Reser and Morrissey, 2005; Gifford, 2007). Furthermore, others, such as grieving relatives and friends of the primary victims may also be affected by association. Indirect exposure effects can include vicarious traumatisation and compassion fatigue or burnout (Galea, Nandi, and Vlahov, 2005; Jones, et al, 2008; Prati, Pietrantonio, and Cicognani, 2011; Thormar, et al, 2014). Hurricane Katrina, for example, caused not only mass displacement and homelessness, but overall extreme trauma. Recent reports suggest that the toll on individuals may continue to rise for many years following the disaster, in relation to both adults and children

(e.g., Carr, et al, 1997; Dass-Brailsford, 2008, 2010; Gifford, 2007; Kessler, et al, 2008; Moore and Varela, 2010; Weisler, Barbee, and Townsend, 2006). Hence, the physical and mental health problems experienced by individuals impacted by a disaster may persist long-term, even years post-disaster (Agustini, Asniar, and Matsuo, 2011; Bryant, 2009; Guo, et al, 2014; Lamond, Joseph, and Proverbs, 2015; Marthoenis, et al, 2016; Nomura, et al, 2016; Salzer and Bickmann, 1999).

Subjective factors can also determine the extent to which an individual may or may not develop symptoms. These factors include the general perception of disaster risk; the intensity of harm caused; the perceived control over the event; and the perceived support (social and other) to manage the event (Meichenbaum, 1997). Some subjective factors, such as the perception of risk, as well as perceived control over the event, may be modified through training (Paton, 1994). In addition, prior experience with a natural hazard can also influence the ways in which individuals respond to hazards, and hazard risks, physically and psychologically (Anderson-Berry and King, 2005; Bell, et al, 1990; Comfort, et al, 2010; Coppola, 2015; DiClemente and Jackson, 2017; Henrich, McClure, and Crozier, 2015; Leiserowitz, 2010; Loewenstein, et al, 2001; Slovic, et al, 2002; Wachinger, et al, 2013). Several studies, for example, suggest that prior experience with natural hazards influences risk perception and the degree of preparedness measures adopted, with the most recent memory of disaster experience being the most influential factor (Gifford, 2007; Nicolopoulos and Hansen, 2009; Norris, Smith, and Kaniasty 2000; Peacock, et al, 2005; Siegrist and Gutscher, 2008; Wachinger, et al, 2013; Whitmarsh, 2008). Other researchers have concluded that people's previous exposure to disasters generally do not affect preparedness (Basolo, et al, 2009; Mulilis, et al, 2003; Norris, et al, 2000).

Stress and coping in the disaster context

Impending disaster situations and actual disaster experiences are stressful situations. The World Health Organisation (WHO) defines a disaster as a "severe disruption, ecological and psychological, which greatly exceeds the coping capacity" of the affected individual or community (WHO, 1992, p. 2). In the disaster context, models of stress and coping (e.g., Lazarus and Folkman, 1984) provide conceptual and theoretical frameworks to understand preparedness and response, with particular focus on which coping strategies individuals employ post-disaster. Research has identified three different coping styles: *avoidance coping*, *adaptive emotion coping*, and *task-focused coping* (Pooley, et al, 2013). Adaptive coping strategies after a disaster impact include acceptance and tolerance, emotion regulation, and seeking assistance. Maladaptive coping strategies, on the

other hand, include the suppression of emotion and thoughts relating to the event, as well as substance abuse (Schmuckler, 2004). Coping behaviour thus facilitates the impact of stress on mental health (Lazarus and Folkman, 1984). Psychological distress after experiencing a disaster has been associated with less frequent problem-focused coping in general (Freedy, et al, 1992; Stratta, et al, 2013; Stratta et al, 2014).

Several studies have also shown avoidance coping to be problematic, leading to heightened psychological distress and adaptive emotion coping (Asarnow, et al, 1999; Norris and Elrod, 2006). Providing individuals with skills to employ adaptive coping strategies pre- and post-disaster could lower the possibility of these individuals subsequently developing mental health problems. Thus, psychologically preparing individuals for natural hazards and disaster impacts may foster the use of adaptive coping strategies (Morrissey and Reser, 2003).

Similarly, disaster warning situations are stressors. For some individuals, a warning situation itself may be as distressing as an actual disaster event, and can lead to both psychological stress and lasting psychosocial impacts (Kiser, et al, 1993; Morrissey, and Reser, 2003, 2007; Wahlström, 2010). Wahlström (2010) discovered a sample of Swedish tourists visiting Thailand during the 2004 tsunami perceived threats to life, even if they were not actually at risk, leading them to experience long-term psychological distress. Consequently, an individual's coping response in the disaster context can have substantial implications for this individual's future mental health, leading to a resilient response or the potential development of mental illness. Psychologically preparing individuals for disasters or disaster warning situations may thus increase the use of adaptive coping strategies and a resilient response to the event, and foster long-term resilience.

Resilience

A large amount of research has investigated resilience in the natural hazard context (Bonanno, et al, 2006; Bryant, 2009; Forbes and Creamer, 2009; Paton and Johnston, 2001; Paton, Smith, and Violanti, 2000; Ronan and Johnston, 2002; Prati, Pietrantonio, and Cicognani, 2011), however, there seems to be a lack of conceptual clarity, with researchers defining resilience in the natural hazard context in different ways (Aldunce, et al, 2015; Platt, Brown, and Hughes, 2016). Furthermore, research is highly contested as to which attributes, situations or resources must be present, for a person to exhibit a resilience response after disaster (Bonanno, et al, 2007; Cutter, et al, 2008; Federal Emergency Management Agency, 2015; Galea, Nandi, and Vlahov, 2005; Neria, Nandi, and Galea, 2008).

Until recently, it was suggested that all individuals exposed to a disaster were in need of psychological care to fully recover from the traumatic experience and avoid the development of symptoms of psychological illnesses. However, it is now recognised that most individuals show resilient reactions to traumatic events, capable of recovering by their own means, even if they initially display symptoms of stress during their coping process (Bonanno, et al, 2006; Bonanno, et al, 2007; Bonanno, 2008; Bourque, et al, 2007; Bryant, 2009; Norris and Elrod, 2006; Pfefferbaum, et al, 2014). Some researchers suggested that resilience can even lead to the development of positive cognitive and emotional growth (Post-Traumatic Growth) out of an adverse situation (Kilmer, 2006; Paton, Smith, and Violanti, 2000).

Many researchers view community resilience as a fundamental part of disaster preparedness, focusing their research on identifying factors that can aid the development or improvement of community resilience, including families (Khalili, Harre, and Morley, 2015; Paton and Jang, 2010; Pfefferbaum, Pfefferbaum, and van Horn, 2014). An individuals' social environment can also help foster resilience, in children, for example through interactive education programs and interventions (e.g., Ronan, et al, 2008), and in adults. Indeed, studies have shown that perceived sense of community can make a disaster experience more tolerable and less threatening (Silver and Grek-Martin, 2015).

Research on psychological preparedness

While the term *psychological preparedness*, coined by Reser, has been referred to in the disaster literature for more than 15 years (Reser and Morrissey, 2005, 2008, 2009; Reser 1996) only recently has an attempt been made to operationalise this term. In 2012, a preliminary operationalised definition of psychological preparedness, and a preliminary and different version of the PPDTS scale were published. Since this publication, a number of other researchers have utilised the operationalised definition of psychological preparedness and the newly developed PPDTS scale. One researcher has adapted the definition to bushfires and other researchers have translated the PPDTS scale.

The first study (published before 2012) addressing psychological preparedness for disasters was conducted by Reser and Morrissey in 1996 in Cairns, northern Queensland. The results of this study showed that participants who received a psychological awareness guide were better able to predict, identify and manage their feelings and levels of concern during the cyclone season, and showed twice the level of confidence in dealing with threats, than participants who did not (Morrissey and Reser, 2003). While this study showed promising results, and

was the first of its kind to incorporate psychological preparedness, this study did not use an operational definition or a reliable and valid measure of psychological preparedness.

Situational and psychological preparedness

Disaster preparedness guidelines and policies often emphasize situational preparedness, physically preparing the household for the impending disaster or disaster season. This might include easy access to emergency phone numbers, drinking water, first aid kits, canned food and medicines, candles, as well as special needs for infants, the elderly and people with disabilities (Bryan, 2005; Cannon, Twigg and Rowell, 2003; Reser and Morrissey, 2005; Twigg, 2004). Yet, until recently, very little reference has been made to psychological preparedness for disasters in disaster preparedness policies, initiatives or training programs (Morrissey and Reser, 2003). Psychological and situational preparedness, however, can be seen as complementing one another. This preparedness prior to and during a disaster season may enable individuals to anticipate and identify their feelings and to manage these cognitive and emotional responses, so that they can better focus on situational preparedness and thus reduce the risk of injury or death (Morrissey and Reser, 2003). In turn, once an individual has engaged in situational preparedness, such as preparing the household by storing water and food, the individual may feel calmer and more able to deal with the forthcoming disaster, establishing a feeling of overall preparedness and ability to cope with the impending disaster (Lamond, Joseph, and Proverbs, 2015; Reser and Morrissey, 2003).

Mental health and psychological preparedness

Good mental health, while varying in its exact definition, has been associated with the use *good* coping mechanisms, resilience (to specific situations), as well as overall resilience to everyday hassles (hardiness), high general self-efficacy, and low psychological strain and anxiety (Heady et al., 1993). The definition and sub-domains of psychological preparedness, also include aspects of the constructs that are associated with good mental health, such as general self-efficacy, and employing good coping mechanisms. Because of this overlap between mental health and psychological preparedness, it was decided to investigate whether mental health can significantly impact psychological preparedness.

Psychological strain is a mental health indicator which has been linked to physiological stress responses and mental illness such as anxiety disorders and depression, while life satisfaction can have a positive impact on mental health. Research on hardiness has shown individual improvement in performance and health despite stressful events having occurred (Maddi, 2006). General self-efficacy has been identified as an important influence on an individual's coping response to disasters and has linked self-efficacy to long-term adaptation to challenging situations (Benight, et al., 1999; Shoji, et al, 2014). Generalised self-efficacy is also associated with good mental health and successful health behavioural changes, as well as negatively correlated with anxiety, depression and neuroticism (e.g., Benight and Harper, 2002; Bandura, 1986; Lazarus, 1991; Schwarzer and Jerusalem, 1995; Strecher, et al, 1986). Self-efficacy and hardiness also play an important role in Post-Traumatic Growth (Almedom, 2005; Pooley, et al., 2013). The construct self-efficacy may thus play an important role in achieving successful disaster preparedness (Pooley et al., 2013). Neuroticism has been linked to mental health problems, such as anxiety, major depression, generalised anxiety disorder and panic disorder, and even self-reported lifetime mental disorder (Jylhä and Isometsä, 2006). In addition, it has been shown to be a risk factor in the development of symptoms of post-traumatic stress of developing a psychological illness following exposure to a disaster (Jakšić, et al, 2012; Young, 1997).

Defining and measuring psychological preparedness for disasters

Australia as a Site for Investigation

Annually, over 500,000 Australians are affected by natural hazards, with the annual cost of natural hazards expected to rise to US\$39 billion by 2050 (Australian Business Roundtable for Disaster Resilience and Safer Communities, 2017). Australia's population is especially vulnerable to severe storms, cyclones and floods, with 81% of people living within 50 km of the coast line, near rivers or creeks, a percentage that continues to rise (Australian Government Department of the Environment and Energy, 2011; Clark and Johnston, 2016; Harvey and Woodroffe, 2008). Tropical cyclones pose a regularly occurring threat to Australians living in cyclone-prone regions. Approximately 4.7 cyclones a year threaten Queensland during the annual *cyclone season* and these communities are exposed to many cyclone warning situations and some actual cyclone events (Australian Bureau of Meteorology, 2008; Australian Bureau of Statistics, 2007; Australian Bureau of Statistics, 2008; Australian Government, 2013). Since 1839, tropical cyclones have caused over 2,100 deaths in Australia and affected more than 250,000 people.

Research strategy and methodology

This research used a mixed-methods approach to first explore the construct of psychological preparedness through an extensive review of relevant literature and identifying themes that emerged in relation to this literature on, or related to, psychological preparedness, employing basic thematic analysis (Owen, 1984). Then, based on the themes identified, an operationalised definition of this new construct was developed, and a new instrument to measure psychological preparedness was constructed. This new instrument was then validated on a university sample (Study 1) and subsequently refined, and then tested on a sample of residents living in a cyclone-prone region of northern Queensland (Study 2). The relationship between mental health and psychological preparedness was examined through a statistical model (Study 2). The rationale for using both qualitative and quantitative data was that an encompassing instrument of psychological preparedness could only be constructed after an in-depth literature exploration, basic thematic analysis, and subsequent definition of this construct (Hair, et al, 2006; Howitt and Cramer, 2011).

Defining psychological preparedness

As such, in the context of a serious threatening event or disaster warning situation, psychological preparedness is a heightened state of awareness, anticipation, and readiness for: (1) the uncertainty and emotional arousal in expectation of the possible occurrence of the threat; (2) one's own psychological response to the unfolding threat situation; and (3) the ability to manage the demands of the situation.

Three sub-domains were found to contribute to psychological preparedness. These sub-domains are:

- 1** Awareness and anticipation of one's own probable psychological responses to the uncertainty and stress of a disaster warning situation and impending event, including ability to recognise particular stress-related thoughts and feelings. This also includes an individual's perception, appraisal, and understanding of the risk communication and threatening event.

This sub-domain includes knowledge of and sensitivity to one's own psychological responses to stressful, challenging, and anxiety-inducing circumstances. Such anticipation of one's own likely response requires an ongoing mindfulness and particular attentive focus with respect to one's own psychological responses in the context of a highly arousing situation. Psychological awareness also involves an awareness of other's likely response in an emergency context. This sub-domain also includes an appraisal of the risk to self and one's personal vulnerability, and an appraisal of the likelihood of the threat being realised.

- 2** Capacity, confidence, and competence to manage one's psychological response to the unfolding and stressful warning situation and possible event, and to manage one's social environment (if applicable).

The second sub-domain refers to the skills for emotional management, self-strategies such as realistic and helpful self-talk, and skills to recognise other people's distress and /or the needs of others in their social community.

- 3** Perceived knowledge, perceived responsibility, and confidence and competence to manage one's external physical situation and circumstances in the context of the warning situation or threatening event

The third sub-domain refers to knowledge of the natural hazard of consideration, including the magnitude and seriousness of the threatening event, and the knowledge and ability to manage the demands of the unfolding external situation. This includes knowledge about and achievement of reasonable situational preparedness; also perceived responsibility to self and social environment to act responsibly.

There are several factors that likely mediate or moderate psychological preparedness in a disaster context. These individual, or dispositional factors, include past experience with disasters, self-efficacy, perceived responsibility and situational preparedness.

In developing and validating a scale for psychological preparedness the following possible moderators or mediators are considered:

- A. Individual difference or dispositional factors which arguably enhance individual ability to perform well and maintain psychological equilibrium to the extent possible in a disaster context or emergency situation: resilience/hardiness, low to moderate trait anxiety and self-efficacy.
- B. Situational or life circumstance factors which arguably enhance individual ability to perform well and maintain psychological equilibrium to the extent possible in a disaster context or emergency situation. These include adequate situational preparedness, available social and psychological support networks, active participation and engagement with others in addressing the emergency situation, residence in and membership of a self-reliant community characterised by collective coping responses in the case of periodic emergencies.

Study 1: Psychological preparedness scale development and validation

Method

An initial item pool of 51 items was constructed by the researcher to tap into the three sub-domains of psychological preparedness based on the extensive literature review and thematic analysis results, and a 4-point Likert format was chosen. Experts and university students, native and non-native English speakers, reviewed the initial 51-item version of the PPDS to determine both face and content validity. Experts had to identify which sub-domain they believed the item belonged to and rate each item's fit with that particular sub-domain, rating the fit from 1 poor to 4 excellent. Items were considered to match the sub-domain sufficiently well if at least at least 66% of raters agreed upon the sub-domain for a particular item. Items were also re-worded or discarded if they were rated below 3, leaving a 40-item version of the PPDS. After revising the PPDS in light of recommendations by experts and university students, a pilot test, consisting of the entire survey used in Study 1, was conducted.

Participants

The 40-item PPDS scale and overall survey was administered to students and staff members of several universities in Queensland¹. Overall 1,494 students and university staff members from six Universities in Queensland, Australia, responded to the survey. Participants completed demographic questions on gender, age, highest level of education, whether English was their first language or not, and their type of accommodation (rented or owned). Participants who did not complete the survey were excluded from the sample. The final sample of Survey 1 contained 1159 participants.

¹ Prior to the commencement of the study, ethical approval was obtained from Griffith University's Human Research Ethics Committee (protocol number: PSY/27/10/HREC).

Materials

The survey included the newly developed PPDS scale, the Balanced Index of Psychological Mindedness (BIPM; Nyklícek and Denollet, 2009), one sub-scale of the Kentucky Mindfulness Scale (KIMS; Baer, et al, 2004), the Generalised Self-Efficacy Scale (GSES; Schwarzer and Jerusalem, 1995), the Short Dispositional Resilience Scale (DRS-15; Bartone, 1995), and the Eysenck Personality Questionnaire Revised (EPQ-R; Eysenck, Eysenck, and Barrett, 1985) Neuroticism sub-scale². Participants were asked to indicate whether they have previously experienced a cyclone, cyclone warning situation, other natural hazard or other natural hazard warning situation, and if so, to rate the emotional impact of the experience on a 4-point Likert scale, ranging from 1 (not at all) to 4 (severe).

Results

Examination of the Factor Structure of the PPDS (EFA)

Prior to factor analysis, the data set was examined for accuracy of data entry and assumptions for all planned analyses (i.e. normal distribution, complete data and collinearity).³ The final sample of 1159 participants was randomly split to provide two samples for the two different factor analysis procedures: sample 1 with 579 participants, and sample 2, with 580 participants respectively. A series of exploratory factor analyses were conducted to determine the best fitting factor structure for the scale, using Principal Axis Factoring (PAF) and oblique rotation (direct oblimin).

The final factor structure consisted of 26 items, which loaded onto four factors. Factor 1 (*Knowledge and Management of the External Situational Environment*) contained items 3, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40. This factor focused on the perceived knowledge, perceived responsibility and the confidence of managing one's

² All measures utilised in this study were previously established and published scales.

³ All data were analysed using the Statistical Package for Social Sciences (SPSS) version 22.0 and AMOS version 22.0.0. Unless otherwise stated, all significance tests were analysed using an alpha level of .05.

external situation. Factor 2 (*Management of one's Emotional and Psychological Response*) consisted of items 16, 17, 18, 19, 20, 25, 27. This factor assessed the capacity and the confidence to manage one's own psychological response to the unfolding situation. Factor 3 (*Management of one's Social Environment*) contained items 21, 22, 26. This factor assessed the person's competence and confidence to manage the external social environment, such as family, friends and neighbours. Lastly, Factor 4 (*Anticipatory Coping with Emotional Response*) contained items 9, 12, 13. This factor assessed an individual's ability to employ anticipatory coping mechanisms in regard to the person's emotional response in a disaster threat situation. All factors correlated at a moderate level, indicating that the factors were part of the same construct.

Confirmatory factor analyses

Confirmatory factor analyses were conducted, testing a unidimensional model, a three-factor model based on the three sub-domains of the psychological preparedness definition, and the four-factor model derived from the EFA. The EFA model of four factors and 26 items provided the best model fit for sample 1 (Table 1). Scale reliability for the final factor structure was assessed and confirmed excellent scale reliability. Subsequently, a confirmatory factor analysis was conducted using the independent data sample 2, for cross-validation purposes (Byrne, 2001). The results of this CFA confirmed excellent fit for the four-factor and 26-item EFA model. The recommended key fit indices were consulted to assess model fit (Hair, et al, 2006).

Measurement invariance testing was conducted using two independent samples, as suggested by Byrne (2001, 2004; Byrne and van de Vijver, 2010). The chi-square difference test found the difference to be non-significant ($\Delta \chi^2 (36) = 27.20, p = 0.85$) confirming the model to be invariant across samples.

Table 1 CFA model fit for EFA and CFA models

Model	Factors	Items	χ^2	Df	χ^2/df	TLI	CFI	RMSEA	Lo90	Hi90
1 Factor	1	32	3434.85	464	7.40	.67	.71	.11	.10	.11
3 Factors	3	32	2215.02	461	4.81	.81	.83	.08	.08	.09
EFA solution	4	26	880.81	130	2.01	.90	.96	.06	.06	.06
CFA 2	4	26	617.48	268	2.30	.95	.96	.05	.04	.05

Scale reliability

The four factor 26-item PPDTS scale showed excellent internal consistency, with a Cronbach's alpha value of $\alpha = .93$. The reliability of the four separate sub-scales of the PPDTS was investigated and confirmed that all sub-scales showed good reliability separately⁴. While the Cronbach's alpha value of Factor 4 was not above the recommended .70 threshold, some researchers argue that a reliability coefficient above .60 is sufficient (Kline, 2000). As the overall scale showed excellent scale reliability, the reliability coefficient for Factor 4 was accepted as sufficient and retained for conceptual reasons.

Convergent and discriminant validity

Convergent and discriminant validity were examined by calculating correlations between the PPDTS total score and scores from the other measures included in the study. The PPDTS showed convergent validity with self-efficacy (GSES) and mindfulness (KIMS). Convergent validity could not be established with psychological mindedness (BIPM) and dispositional resilience (DRS-15)⁵. The DRS-15 showed extremely low scale reliability, invalidating the convergent validity calculation. The PPDTS showed discriminant validity with the EPQ-R Neuroticism sub-scale⁶.

Scoring the PPDTS

The PPDTS can be scored as a whole scale to arrive at an indication of how psychologically prepared an individual is for a cyclone impact or warning situation, with a maximum score of 104 and a minimum score of 26. Separate scores can be calculated for each sub-scale, Knowledge (maximum 52, minimum 13), Management of own emotional response (maximum 28, minimum 7), Management of others' response (maximum 12, minimum

⁴ PPDTS Factor 1 $\alpha = .94$, Factor 2 $\alpha = .90$, Factor 3 $\alpha = .75$, and Factor 4 $\alpha = .64$.

⁵ GSES $r = .62$ ($p = .000$), KIMS $r = .32$ ($p = .000$), BIPM $r = .01$ ($p = .832$).

⁶ EPQ-R Neuroticism sub-scale $r = -.32$ ($p = .000$).

3), and Awareness and identification of own feelings (maximum 12, minimum 3). The separate sub-scale scores can indicate in which areas (knowledge, management of own emotional response, management of others' response, awareness and identification of own feelings) the individual could improve their preparedness. The final version of the PPPTS corresponds to the three sub-domains of the definition of psychological preparedness, with Factors 2 and 3 of the PPPTS together corresponding to one sub-domain, Factor 1 corresponding to one sub-domain and Factor 4 corresponding to one sub-domain.

Study 2: Measuring psychological preparedness and mental health

As the definition and sub-domains of psychological preparedness also include aspects of the constructs that are associated with good mental health, the relationship between the newly developed PPPTS scale and measures of mental health was investigated through a statistical model (Figure 1). It was hypothesised that mental health indicators psychological strain (GHQ-12), life satisfaction (SWLS), and hardiness (DRS-15) each would show a significant effect on psychological preparedness (PPPTS) (Hypothesis 1). Furthermore, it was hypothesised that generalised self-efficacy (GSES), coping (Brief COPE) and neuroticism (EPQ-R N) each would show a significant effect on psychological preparedness (PPPTS) (Hypothesis 2).

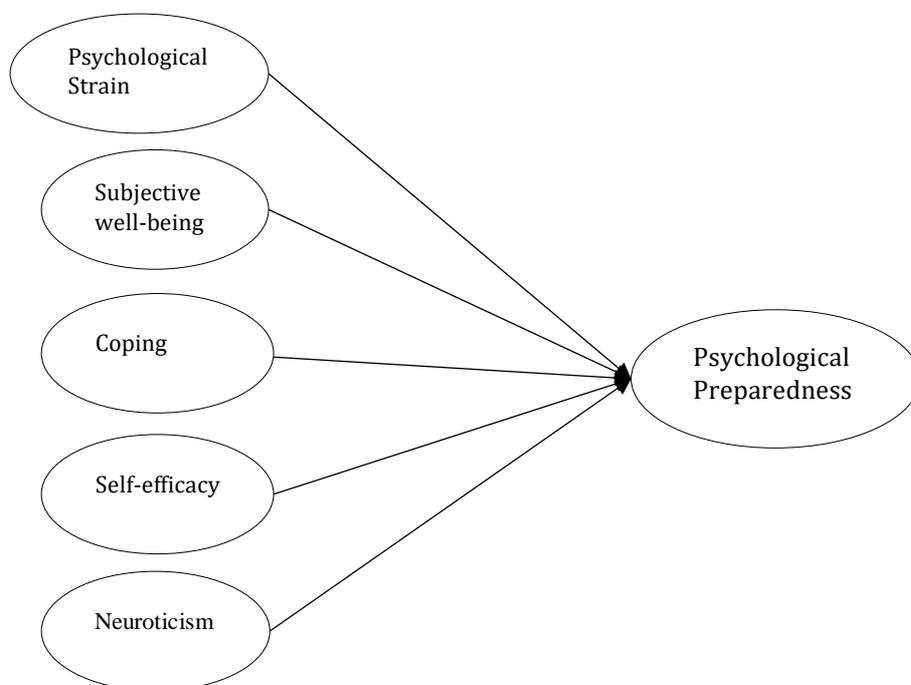


Figure 1 *Psychological Preparedness and Mental Health Model. Arrows indicate impact.*

Method

Participants

The survey was administered to residents living in northern Queensland, as this region experiences an annual cyclone season⁷. Participants completed the same demographic questions as in Study 1. While 432 participants commenced the online survey, 170 participants logged off prior to completing the survey. The final sample of Survey 2 contained 273 participants.

Materials

The survey included the newly developed and validated PPDS scale, the General Health Questionnaire (GHQ-12; Goldberg, 1972), the Satisfaction with Life Scale (SWLS; Diener, et al, 1985), the Brief COPE (Carver, 1997), the Generalised Self-Efficacy Scale (GSES; Schwarzer and Jerusalem, 1995), the EPQ-R (Eysenck, Eysenck, and Barrett, 1985) Neuroticism sub-scale and the Dispositional Resilience Scale (DRS-15; Bartone, 1995)². As in Study 1, participants were asked to indicate and rate their prior natural hazard experiences.

Data Cleaning and Missing Data Analysis

The data set met assumptions for all planned analyses (i.e., normal distribution, complete data, collinearity)³. Missing data analysis was carried out using the missing data analysis feature in SPSS and in accord with best practice guidelines (Jeličić, Phelps, and Lerner, 2009; Schlomer, Bauman, and Card, 2010).

⁷ Prior to the commencement of the study, ethical approval was obtained from Griffith University's Human Research Ethics Committee (protocol number: ENV/27/10/HREC).

Results

Measurement Model

Model fit of the full CFA measurement model was assessed. As the previously published factor solutions did not provide good model fit for some of the measures, factor structures of all measures were examined separately through exploratory and confirmatory factor analyses. During this process items were deleted from the Brief COPE and EPQ-R N measures and the Cronbach's alpha coefficients were calculated for these revised scales (Brief Cope_R $\alpha = .89$, EPQ-R N_R $\alpha = .82$). The modified measurement model achieved excellent model fit (Table 2). The CFI fit index (CFI = .96) was above the recommended value of CFI = .95, which is a particularly good fit considering the complexity of the model (Hair, et al, 2006).

Structural Model

The model was converted into a structural model and again confirmed good model fit (Table 2). In the complex model of mental health and psychological preparedness, only general self-efficacy showed a significant main effect on psychological preparedness. This was unexpected, as psychological strain is considered to be a standard mental health indicator, and life satisfaction has been linked to positive mental health. The significant main effect of the GSES was expected, as elements of self-efficacy are included in the definition of psychological preparedness and some PPDS scale items. The Brief COPE did not show a significant main effect on psychological preparedness. This was not expected, since the extent of coping with a situation was thought to influence psychological preparedness. EPQ-R Neuroticism scale did not show a significant main effect on psychological preparedness. This was unexpected, since neuroticism is related to anxiety, which is negatively related to psychological preparedness and can impair preparedness efforts.

Single indicator variable models were also tested, to ascertain whether these scales interacted differently with the PPDS in a simple model, without the influence of other measures. All single indicator variable models showed good fit (Table 2). Mental health indicators psychological strain, life satisfaction, self-efficacy, and neuroticism all showed significant main effects on psychological preparedness ($p = .000$). Coping did not show a significant main effect on psychological preparedness ($p = .201$), however, this might be due to the fact that the Brief COPE scale was altered because of the aforementioned validity problems with the scale. Therefore, the results in relation to the Brief COPE scale and thus coping as a construct may not be representative of the

relationship with psychological preparedness. These results indicate that while the individual constructs may significantly predict psychological preparedness, the interplay between constructs in a complex model affects their impact on psychological preparedness. These results confirmed Hypothesis 1 and partially confirmed Hypothesis 2.

Table 2 Psychological Preparedness and Mental Health model fit

Model	χ^2	Df	χ^2/df	RMR	TLI	CFI	RMSEA	Lo90	Hi90
Measurement Model	690.54	466	1.48	.02	.96	.96	.04	.04	.05
Structural Model	622.94	395	1.58	.03	.95	.95	.05	.04	.06
SWLS	475.39	295	1.61	.02	.95	.96	.05	.04	.06
GHQ	494.38	295	1.68	.02	.95	.95	.05	.04	.06
GSES	493.53	295	1.67	.02	.95	.96	.05	.04	.06
EPQRN	495.12	295	1.68	.02	.95	.95	.05	.04	.06
COPE	480.38	295	1.63	.02	.95	.96	.05	.04	.06

Internal Consistency

All scales showed good internal consistency⁸, except for the DRS-15 ($\alpha = .55$) measuring dispositional resilience. This scale was again included in Study 2, because the internal consistency of a scale can vary from sample to sample. Due to the low internal consistency score, the DRS-15 was excluded from all further analyses. The newly developed PPDTs showed excellent internal consistency ($\alpha = .93$). The reliability of the four separate

⁸ GHQ-12 $\alpha = .90$, SWLS $\alpha = .91$, GSES $\alpha = .91$, Brief COPE $\alpha = .89$, EPQ-R Neuroticism $\alpha = .82$.

sub-scales of the PPDTS was also confirmed⁹.

A confirmatory factor analysis confirmed that the earlier established four-factor and 26-item structure provided a very good fit for the PPDTS scale, as well as good internal consistency. These results provided ecological validity and confirmed that the PPDTS is applicable to the situation and population it was intended for.

Previous experience with natural hazards

The relationship between psychological preparedness and cyclone, or other natural hazard warning or impact situations seems to be complex. Participants in Study 1 who had previously experienced cyclone warning or impact situations, and/or other natural hazard warning or impact situations showed significantly higher scores of psychological preparedness than those who had no experience. In Study 2, on the other hand, only participants who had previously experienced a cyclone impact scored significantly higher on the PPDTS. Previous experience with cyclone warning situations, or other natural hazard impact or warning situations did not influence the PPDTS score. A very interesting finding was that participants who had lived in the area affected by a cyclone impact three years prior to the study (Cyclone Yasi, 2011), showed significantly higher psychological preparedness than those who had not lived in the area. This is in line with previous research, which had found that individuals who had recently experienced a natural hazard impact showed more risk awareness for that particular threat and were also better prepared (e.g., Gifford, 2007; Nicolopoulos and Hansen, 2009; Wachinger, et al, 2013). Since this effect was not present for any of the other natural hazards mentioned in the survey of Study 2, it seems that only fairly recently experienced disaster impacts can increase psychological preparedness. Future disaster preparedness workshops conducted in disaster-prone areas with recent disaster impacts should take this finding into account and tailor workshops or interventions according to prior recent disaster experience or lack thereof.

⁹ PPDTS Factor 1 $\alpha = .90$, Factor 2 $\alpha = .93$, Factor 3 $\alpha = .90$, and Factor 4 $\alpha = .73$.

Conclusion and discussion

Disaster preparedness, while forming an integral part of disaster management practices, today is still far from ideal. Current disaster preparedness practices are unable to prevent some individuals from developing psychological distress and illness due to disaster exposure. More individuals are likely to be affected by the impacts of natural hazards in the future, both physically and psychologically, due to annually occurring disaster seasons, increased coastal vulnerability and environmental changes caused by anthropogenic climate change. A more holistic approach to disaster preparedness is essential in order to improve the successful preparation for disasters. Thus far, psychological preparedness has neither been incorporated into disaster preparedness policies or practices, nor is it currently included in preparedness training provided to individuals at risk of disaster exposure. Efficient disaster preparedness includes not only a physical, but also a psychological component. Incorporating psychological preparedness into existing disaster preparedness policies and practices has the potential to help individuals cope with the psychological distress experienced during or after a disaster, and to foster long-term resilience. The incorporation of aspects of psychological preparedness into disaster preparedness measures will strengthen disaster management practices overall. The operationalised definition of psychological preparedness, the newly developed PPDS scale and the results of the present research can inform disaster preparedness policies and practices.

Potential limitations

The question formatting and wording in both surveys could have impacted the results. In Survey 1 participants were asked whether they had previously experienced a disaster impact or warning situation, and a cyclone impact or warning situation, and no distinction was made between the actual impact and the warning situation. Statistical analyses showed that individuals who had previously experienced a cyclone impact or warning situation were significantly more psychologically prepared than those who had not (Study 1). These results, however, cannot ascertain whether this significant difference is due to the experience of a cyclone impact, or of a cyclone warning situation, or a combination of both. In the second study, a distinction between impact and warning situations was made to avoid confusion.

The *third variable problem*, constituting the uncertainty that the relationship between two variables might be better explained by a third variable, can occur in psychology research (Howitt and Cramer, 2011). While there is a small possibility that a third variable can better measure the relationship between psychological

preparedness and any of the other variables included in the two studies, future research involving the construct psychological preparedness will lead to a decreased likelihood of the third variable problem occurring.

A recent study (Every, et al, 2018) has found that some participants in a small sample felt uncomfortable with the term *psychological preparedness* or viewed this type of preparedness as irrelevant to them personally, identifying potential problems when communicating psychological preparedness. This potential problem, as well as potential stigmata attached to any form of psychological guidance should be taken into account when incorporating psychological preparedness into disaster preparedness practices.

Implications and future directions for research

This research on psychological preparedness constitutes a significant contribution to the disaster management field. The clear and operationalised definition of psychological preparedness can help to improve existing mental preparedness initiatives. Research has shown that a lack of a clear definition of mental preparedness in disaster risk situations caused an inability to assess mental preparedness in this context (Eriksen and Prior, 2013). The PPDS scale can also be used as a tool to evaluate the effectiveness of disaster preparedness materials and interventions distributed populations facing natural hazards, since there is no measure to evaluate these programs so far. Training programs for emergency workers or personnel should also include psychological preparedness aspects, which could help foster the use of adaptive coping strategies in these individuals, who are constantly exposed to a variety of disasters. Recent research has shown that disaster workers who had received mental health training prior to work reported less psychological distress symptoms (Kang, et al, 2015). In addition, the results of the current research indicated that individuals who had previously experienced a natural hazard impact scored significantly higher on the PPDS scale and were thus more psychologically prepared, than those without prior experience.

Individuals with mental health problems may require specifically tailored psychological preparedness training, so that they can then better prepare mentally for a disaster situation. Indeed, the results of study 2 showed that psychological strain, life satisfaction, general self-efficacy, and neuroticism can significantly impact psychological preparedness, which should be taken into account when designing disaster preparedness materials and training. Finally, this research helps to raise awareness of the need for the incorporation of psychological preparedness in disaster preparedness policy, training and interventions by governments, organisations and stakeholders in a regionally and culturally appropriate manner.

The operationalised definition of psychological preparedness and the first valid and reliable measure (PPDTS) of the construct provide a strong foundation for future studies and can be used to advance the research on psychological preparedness. Indeed, several researchers have conducted and published research based on the operationalised definition of psychological preparedness and the PPDTS scale by Zulch, et al. (2012) and this present research. In addition, researchers in Russia, Indonesia and the Philippines have translated the PPDTS scale, and researchers in Indonesia, the Philippines, and Japan are currently undertaking research using the PPDTS scale. This continued research which will further validate the PPDTS scale on geographically and culturally diverse samples.

Psychological Preparedness for Disaster Threat Scale (PPDTS)

This section is interested in how you might think, feel or respond in the face of **severe weather events such as severe storms, cyclone warnings or actual cyclones**. Choose your answers thoughtfully and honestly. Please respond to every statement. There are no right or wrong answers. We are interested in what **you think would be true for** and **not what you think 'most people' would say or do**. Please indicate **the extent to which each of the following statements would be true for you**.

		Not at all true of me	Hardly true of me	Moderately true of me	Exactly true of me
1	I can assess the likelihood of a cyclone crossing the coast.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	I regularly monitor news bulletins and Met Bureau advice during storm season.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	I am confident that I know what to do and what actions to take in a severe weather situation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4	I would be able to locate the severe storm or cyclone preparedness materials in a cyclone warning situation easily.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5	I know how to adequately prepare my home for the forthcoming storm or cyclone season.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6	I know where I can quickly find the emergency contact information in a severe weather situation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7	I am familiar with the severe storm or cyclone preparedness materials available to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8	I know which household preparedness measures are needed to stay safe in a very severe storm or cyclone situation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9	I am familiar with the weather signs of an approaching storm or cyclone.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10	I know what to look out for in my home and work place if an emergency weather situation should develop.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11	I am familiar with the disaster warning system messages used for extreme weather events.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12	I know what the difference is between a cyclone warning and a cyclone watch situation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13	I am knowledgeable about the impact that very severe storms or cyclones can have on my home.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14	I feel reasonably confident in my own ability to deal with stressful situations that I might find myself in.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15	In a severe storm or cyclone situation I would be able to cope with my anxiety and fear.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16	I think I am able to manage my feelings pretty well	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	in difficult and challenging situations.				
17	When necessary, I can talk myself through challenging situations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18	I seem to be able to stay cool and calm in most difficult situations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19	I know which strategies I could use to calm myself in a severe storm or cyclone situation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20	If I found myself in a severe storm or cyclone situation I would know how to manage my own response to the situation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21	I would be able to tell easily if those/ others around me are in distress.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22	If others are in distress, I would know how to calm them down.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23	I know which strategies I could use to calm others in a severe storm or cyclone warning situation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24	I am able to identify my feelings pretty well in challenging situations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25	During severe storms or cyclones I would notice if I am feeling anxious or stressed.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26	I usually prepare mentally for situations that might be difficult or stressful.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Copyright Notice: Please note that this is a Research Copy and that the scale and individual items are copyrighted, in any future format, including any translations you may wish to undertake. The author has to be acknowledged and adequately referenced whenever the scale or any of its items are copied or used in any way.

References

- Adams, R. E. and Boscarino, J. A. 2005. Differences in mental health outcomes among Whites, African Americans, and Hispanics following a community disaster. *Psychiatry*. Vol. 68: 250–265. doi: 10.1521/psyc.2005.68.3.250
- Adams, R. E. and Boscarino, J. A. 2006. Predictors of PTSD and Delayed PTSD After Disaster. The Impact of Exposure and Psychosocial Resources. *Journal of Nervous Mental Disorders*. Vol. 194: 485–493. doi: 10.1097/01.nmd.0000228503.95503.e9
- Adger, W. N. Arnell, N. W. and Tompkins, E. L. 2005. Successful adaptation to climate change across scales. *Global environmental change*. Vol. 15: 77–86.
- Agustini, E. N. Asniar, I. and Matsuo, H. 2011. The prevalence of long-term post-traumatic stress symptoms among adolescents after the tsunami in Aceh. *Journal of psychiatric and mental health nursing*. Vol. 18: 543–549. doi: 10.1111/j.1365-2850.2011.01702
- Aldunce, P. Beilin, R. Howden, M. and Handmer, J. 2015. Resilience for disaster risk management in a changing climate: Practitioners' frames and practices. *Global Environmental Change*. Vol. 30: 1–11. doi: 10.1016/j.gloenvcha.2014.10.010
- Almedom, A. M. 2005. Resilience, hardiness, sense of coherence, and posttraumatic growth: all paths leading to “light at the end of the tunnel”? *Journal of Loss and Trauma*. Vol. 10: 253–265. doi: 10.1080/15325020590928216
- Altizer, S. Ostfeld, R. S. Johnson, P. T. J. Kutz, S. and Harvell, C. D. 2013. Climate change and infectious diseases: From evidence to a predictive framework, *Science*. Vol. 341: 514–519. doi: 10.1126/science.1239401
- Anderson-Berry, L. and King, D. 2005. Mitigation of the Impact of Tropical Cyclones in Northern Australia Through Community Capacity Enhancement. Section 1. In: *Mitigation of natural hazards and disasters: international perspectives*. Haque, C. E. New York, NY. Springer.
- Asarnow, J. Glynn, S. Pynoos, R. S. Nahum, J. Guthrie, D. Cantwell, D. P. and Franklin, B. 1999. When the earth stops shaking: Earthquake sequelae among children diagnosed for pre-earthquake psychopathology. *Journal of the American Academy of Child & Adolescent Psychiatry*. Vol. 38: 1016–1023. doi: 10.1097/00004583-199908000-00018

- Australian Bureau of Meteorology. 2008. Digital cyclone database. Retrieved from <http://www.bom.gov.au/catalogue/data-feeds.shtml>
- Australian Bureau of Statistics. 2007. *Household preparedness for emergencies: NSW, Vic, Qld, ACT, Australia* (Catalogue No. 4818.0.55.001). Retrieved from <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4818.0.55.001Main+Features1Oct%202007>
- Australian Bureau of Statistics. 2008. *Yearbook Complete, 2008, Australia* (Catalogue No. 1301.0). Retrieved from <http://www.abs.gov.au/ausstats/abs@.nsf/mf/1301.0>
- Australian Business Roundtable for Disaster Resilience and Safer Communities. 2017. Natural Disaster cost to reach \$39 billion per year by 2050. Retrieved from <http://australianbusinessroundtable.com.au/assets/reports/media-release-nov-11.pdf>
- Australian Government Department of the Environment and Energy. 2011. *State of the environment 2011 (SoE 2011) (DSEWPaC). Independent report to the Australian Government Minister for Sustainability, Environment, Water, Population and Communities*. Commonwealth of Australia. Canberra, Australia. Retrieved from <http://www.environment.gov.au/node/22889#ss2-7-2>
- Australian Government. 2013. Australian weather and seasons – a variety of climates. Retrieved from <http://www.australia.gov.au/about-australia/australian-story/austn-weather-and-the-seasons>
- Australian Government. 2015. Natural disasters in Australia. Retrieved from <http://australia.gov.au/about-australia/australian-story/natural-disasters>
- Ayers, J. and Huq, S. 2013. Adaptation, development and the community. Chapter 19. In: *Climate adaptation futures*. Palutikof, J. Parry, M. Stafford Smith, M. Ash, A. J. Boulter, S. L. and Waschka, M. Chichester, UK: Wiley-Blackwell.
- Baer, R. A. Smith, G. T. and Allen, K. B. 2004. Assessment of mindfulness by self-report: The Kentucky inventory of mindfulness skills, *Assessment*. Vol. 11: 191–206. doi: 10.1177/1073191104268029
- Bandura, A. 1986. The explanatory and predictive scope of self-efficacy theory. *Journal of Social and Clinical Psychology*. Vol. 4: 359–373. doi: 10.1521/jscp.1986.4.3.359
- Bartone, P. T. 1995. *A short hardiness scale*. Paper presented at meeting of the American Psychological Society. New York, NY, United States of America. Retrieved from www.hardiness-resilience.com/docs/APS95HAN1.pdf

- Basolo, V. Steinberg, L. J. Burby, R. J. Levine, J. Cruz, A. M. and Huang, C. 2009. The effects of Confidence in Government and Information on Perceived and Actual Preparedness for Disasters. *Environment and Behaviour*. Vol. 41: 338–364. doi: 10.1177/0013916508317222
- Bell, P. A. Fisher, J. D. Baum, A. and Greene, T. E. 1990. *Environmental psychology*. Third Edition. Orlando, FL. Holt, Rinehart and Winston.
- Benight, C. C. and Harper, M. L. 2002. Coping self-efficacy perceptions as a mediator between acute stress response and long-term distress following natural disasters. *Journal of Traumatic Stress*. Vol. 15: 177–186. Retrieved from <http://hstrial-jzadina.homestead.com/Benight.pdf>
- Benight, C. C. Ironson, G. Klebe, K. Carver, C. S. Wynings, C. Burnett, K., ... and Schneiderman, N. 1999. Conservation of resources and coping self-efficacy predicting distress following a natural disaster: A causal model analysis where the environment meets the mind. *Anxiety, Stress and Coping*. Vol. 12: 107–126. doi: 10.1080/10615809908248325
- Bonanno, G. A. 2008. Loss, trauma, and human resilience: Have we underestimated the human capacity to thrive after extremely aversive events? *Psychological Trauma: Theory, Research, Practice, and Policy*. Vol. 1: 101–113. doi: 10.1037/1942-9681.S.1.101
- Bonanno, G. A. Galea, S. Bucciarelli, A. and Vlahov, D. 2006. Psychological resilience after disaster. New York City in the aftermath of the September 11th terrorist attacks. Research report. *Association for Psychological Science*. Vol. 17: 181–186. doi: 10.1111/j.1467-9280.2006.01682.x
- Bonanno, G. A. Galea, S. Bucciarelli, A. and Vlahov, D. 2007. What predicts psychological resilience after disaster? The role of demographics, resources, and life stress. *Journal of Consulting and Clinical Psychology*. Vol. 75: 671–682. doi: 10.1037/0022-006X.75.5.671
- Bourque, L. B. Siegel, J. M. Kano, M. and Wood, M. M. 2007. Morbidity and Mortality Associated with Disasters. Chapter 6. In: *Handbook of Disaster Research. Handbooks of Sociology and Social Research*. Rodriguez, H. Quarantelli, E. L. and Dynes, R. R. New York, NY: Springer.
- Brooks, N. and Adger, W. N. 2003. *Country level risk measures of climate-related natural disasters and implications for adaptation to climate change*. Norwich, UK. Tyndall Centre for Climate Change Research.
- Brown, J. M. Ciavola, P. Masselink, G. McCall, R. and Plater, A. J. 2016. Preface: Monitoring and modelling to guide coastal adaptation to extreme storm events in a changing climate, *Natural Hazards and Earth System Sciences*. Vol. 16: 463–467. doi: 10.5194/nhess-16-463-2016

- Bryant, E. 2005. *Natural hazards*. Second Edition. Cambridge, UK. Cambridge University Press.
- Bryant, R. 2009. The impact of natural disasters on mental health. Special report. *InPsych. The Bulletin of the Australian Psychological Society Ltd.* 8-9. Retrieved from <http://search.informit.com.au/documentSummary;dn=753505392048843;res=IELAPA>
- Byrne, B. 2001. *Structural equation modeling with AMOS: Basic concepts, applications, and programming*. New York, NY. Routledge.
- Byrne, B. M. 2004. Testing for multigroup invariance using AMOS graphics: A road less traveled. *Structural Equation Modeling*. Vol. 11: 272-300. doi: 10.1207/s15328007sem1102_8
- Byrne, B. M. and van de Vijver, F. J. R. 2010. Testing for Measurement and Structural Equivalence in Large-Scale Cross-Cultural Studies: Addressing the Issue of Nonequivalence. *International Journal of Testing*. Vol. 10: 107-132. doi: 10.1080/15305051003637306
- Cannon, T. Twigg, J. and Rowell, J. 2003. *Social vulnerability, sustainable livelihoods and disasters*. Report to DFID Conflict and Humanitarian Assistance Department (CHAD) and Sustainable Livelihoods Support Office. Retrieved from <http://www.proventionconsortium.net/themes/default/pdfs/CRA/DFIDSocialvulnerability.pdf>
- Carr, V. J. Lewin, T. J. Webster, R. A. Kenardy, J. A. Hazell, P. L. and Carter, G. L. 1997. Psychological sequelae of the 1989 Newcastle earthquake: II. Exposure and morbidity profile during the first 2 years post-disaster. *Psychological Medicine*. Vol. 27: 167-178.
- Carver, C. 1997. You want to measure coping but your protocol' too long: Consider the brief cope. *International Journal of Behavioral Medicine*. Vol. 4: 92-100. doi: 10.1207/s15327558ijbm0401_6
- Cassidy, T. 2013. *Environmental psychology. Behaviour and experience in context*. Hove, UK. Taylor & Francis.
- Centers for Disease Control and Prevention. 2014. Emergency preparedness and response, social media: Hurricanes. Retrieved from: <http://emergency.cdc.gov/socialmedia/>
- Chang, C. M. Lee, L. C. Connor, K. M. Davidson, J. R. and Lai, T. J. 2008. Modification effects of coping on post-traumatic morbidity among earthquake rescuers. *Psychiatry research*. Vol. 158: 164-171. doi: 10.1016/j.psychres.2006.07.015
- Clark, G. F. and Johnston, E. L. 2016. *Coasts: Population growth and urban development: Coastal development and land use*. In Australia state of the environment 2016, Australian Government Department of the Environment and Energy, Canberra, Australia. doi: 10.4226/94/58b659bdc758b

- Comfort, L. K. Oh, N. Ertan, G. and Scheinert, S. 2010. Designing adaptive systems for disaster mitigation and response. Chapter 3. In: *Designing resilience: Preparing for extreme events*. L. K. Comfort, A. Boin and C. C. Demchak. Pittsburgh, PA. University of Pittsburgh Press.
- Coppola, D. P. 2015. *Introduction to international disaster management*. Third Edition. Waltham, MA. Butterworth-Heinemann.
- Cutter, S. L. Barnes, L. Berry, M. Burton, C. Evans, E. Tate, E. and Webb, J. 2008. A place-based model for understanding community resilience to natural disasters. *Global Environmental Change*. Vol. 18: 598-606. doi: 10.1016/j.gloenvcha.2008.07.013
- Dass-Brailsford, P. 2008. After the storm: Recognition, recovery, and reconstruction. *Professional Psychology: Research and Practice*. Vol. 39: 24-30. doi: 10.1037/0735-7028.39.1.24
- Dass-Brailsford, P. 2010. Effective disaster and crisis interventions. Chapter 4. In: *Crisis and Disaster Counseling. Lessons learned from Hurricane Katrina and other disasters*. Dass-Brailsford, P. Washington, DC. Sage Publications.
- DiClemente, R. J. and Jackson, J. M. 2017. Risk communication. In: *International Encyclopedia of Public Health*. Quah, S. R. and Cockerham, W. C. Amsterdam, The Netherlands. Elsevier, Inc.
- Diener, E. D. Emmons, R. A. Larsen, R. J. and Griffin, S. 1985. The satisfaction with life scale. *Journal of personality assessment*. Vol. 49: 71-75. doi: 10.1016/j.gloenvcha.2004.12.005
- Dougall, A. L. Herberman, H. B. Delahanty, D. L. Inslicht, S. S. and Baum, A. 2000. Similarity of prior trauma exposure as a determinant of chronic stress responding to an airline disaster. *Journal of Consulting and Clinical Psychology*. Vol. 68: 290-295. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/10780129>
- Dow, K. and Cutter, S. L. 1998. Crying wolf: repeat responses to hurricane evacuation orders. *Coastal Management*. Vol. 26: 237-252. doi: 10.1080/08920759809362356
- Ebi, K. L. 2010. Human health. Chapter 11. In: *Climate change science and policy*. Schneider, S. H. Rosencranz, A. Mastrandrea, A. M. D. and Kuntz-Duriseti, K. Washington, DC. Island Press.
- Eriksen, C. and Prior, T. 2013. Defining the importance of mental preparedness for risk communication and residents well-prepared for wildfire. *International Journal of Disaster Risk Reduction*, Vol. 6: 87-97.

- Every, D. Reynolds, A. Keen-Dyer, H. Dyer, M. Miller-Rose, P. and Trigg, J. 2018. 'That psychological bulls**t': Surprising findings from community research are improving preparedness communication. *Australian Journal of Emergency Management*, Vol. 33: 57-61.
- Eysenck, S. B. G. Eysenck, H. J. and Barrett, P. 1985. A revised version of the psychoticism scale. *Personality and Individual Differences*. Vol. 6: 21-29. doi:10.1016/0191-8869(85)90026-1
- Federal Emergency Management Agency. 2015. *Community Emergency Response Team (CERT) Training Materials*. Federal Emergency Management Agency and Department of Homeland Security. Washington, DC.
- Forbes, D. and Creamer, M. 2009. Psychological support and treatment for victims of Victoria's bushfires. Special report. *InPsych. The Bulletin of the Australian Psychological Society Ltd*. 10-11. Retrieved from https://www.psychology.org.au/inpsych/support_bushfires/
- Freedy, J. R. Shaw, D. L. Jarrell, M. P. and Masters, C. R. 1992. Towards an understanding of the psychological impact of natural disasters: An application of the conservation resources stress model. *Journal of Traumatic Stress*. Vol. 5: 441-454. doi: 10.1002/jts.2490050308
- Fullerton, C. S. Ursano, R. J. and Wang, L. 2004. Acute stress disorder, posttraumatic stress disorder, and depression in disaster or rescue workers. [Comparative Study]. *The American Journal of Psychiatry*. Vol. 161: 1370-1376.
- Galea, S. Nandi, A. and Vlahov, D. 2005. The epidemiology of post-traumatic stress disorder after disasters. *Epidemiologic reviews*. Vol. 27: 78-91. doi: 10.1093/epirev/mxi003
- Gaiha, R. Hill, K. Thapa, G. and Kulkarni, V. S. 2014. Have natural disasters become deadlier? Chapter 23. In: *Sustainable economic development: Resources, environment, and institutions*. Balisacan, A. Chakravorty, U. and Ravago, M. L. Oxford, UK. Academic Press.
- Gibbs, M. S. 1989. Factors in the victim that mediate between disaster and psychopathology: A review. *Journal of Traumatic Stress*. Vol. 2: 489-514. doi: 10.1002/jts.2490020411
- Gifford, R. 2007. *Environmental psychology. Principles and practice*. Fourth Edition. Colville, WA. Optimal Books.
- Goldberg, D. 1972. The General Health Questionnaire. Chapter 5. In: *Measuring health: A guide to rating scales and questionnaire*. McDowell, I. and Newell, C. New York, NY. Oxford University Press.
- Guo, J. Wu, P. Tian, D. Wang, X. Zhang, W. Zhang, X. and Qu, Z. 2014. Post-traumatic Stress Disorder among adult survivors of the Wenchuan Earthquake in China: A repeated cross-sectional study. *Journal of anxiety disorders*. Vol. 28: 75-82. doi: 10.1016/j.janxdis.2013.12.001

- Guterman, P. S. 2005. *Psychological preparedness for disaster*. York University. Ontario, Canada. Retrieved from http://www.ceep.ca/resources/Guterman2005_Psychological_Preparedness_for_Disaster.pdf
- Haer, T. Botzen, W. W. and Aerts, J. C. 2016. The effectiveness of flood risk communication strategies and the influence of social networks—Insights from an agent-based model. *Environmental Science & Policy*. Vol. 60: 44-52. doi: 10.1016/j.envsci.2016.03.006
- Hair, J. F. Black, W. C. Babin, B. J. Anderson, R. E. and Tatham, R. L. 2006. *Multivariate Data Analysis*. Sixth Edition. Upper Saddle River, NJ. Pearson Prentice Hall.
- Harvey, N. and Woodroffe, C. D. 2008. Australian approaches to coastal vulnerability assessment. *Sustainable Sciences*. Vol. 3: 67-87. doi: 10.1007/s11625-008-0041-5
- Headey, B. Kelley, J. and Wearing, A. 1993. Dimensions of mental health: life satisfaction, positive affect, anxiety and depression. *Social Indicators Research*. Vol. 29: 63-82. doi: 10.1007/BF01136197
- Hearn, L. (2011, January 11). Flock to facebook for flood updates. *Sydney Morning Herald*. Retrieved from <http://www.smh.com.au/technology/technology-news/flock-to-facebook-for-flood-updates-20110111-19mfr.html>
- Henrich, L. McClure, J. and Crozier, M. 2015. Effects of risk framing on earthquake risk perception: life-time frequencies enhance recognition of the risk. *International journal of disaster risk reduction*. Vol. 13: 145-150. doi: 10.1016/j.ijdrr.2015.05.003
- Houghton, J. T. 2004. *Global Warming: the complete briefing*. Cambridge, UK. Cambridge University Press.
- Howitt, D. and Cramer, D. 2011. *Introduction to SPSS statistics in psychology: for version 19 and earlier*. Newmarket, ON. Pearson.
- Hussain, A. Weisaeth, L. and Heir, T. 2011a. Changes in religious beliefs and the relation of religiosity to posttraumatic stress and life satisfaction after a natural disaster. *Social Psychiatry and Psychiatric Epidemiology*. Vol. 46: 1027-1032. doi: 10.1007/s00127-010-0270-7
- Hussain, A. Weisaeth, L. and Heir, T. 2011b. Psychiatric disorders and functional impairment among disaster victims after exposure to a natural disaster: A population based study. *Journal of Affective Disorders*. Vol. 128: 135-141. doi:10.1016/j.jad.2010.06.018.
- IPCC. 2014. *Summary for Policymakers. Climate Change 2014: Impacts, Adaptation, and Vulnerability*. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. New York, NY.

- Jaksic, N. Brajkovic, L. Ivezic, E. Topic, R. and Jakovljevic, M. 2012. The role of personality traits in posttraumatic stress disorder (PTSD). *Psychiatr Danub.* Vol. 24: 256-266. Retrieved from <http://hrcak.srce.hr/file/156450>
- Jeličić, H. Phelps, E. and Lerner, R. M. 2009. Use of missing data methods in longitudinal studies: the persistence of bad practices in developmental psychology. *Developmental psychology.* Vol. 45: 1195. doi: 10.1037/a0015665
- Jones, R. T. Immel, C. S. Moore, R. M. and Hadder, J. M. 2008. Hurricane Katrina: Experiences of psychologists and implications for future disaster response. *Professional Psychology: Research and Practice.* Vol. 39: 100-106. doi: 10.1037/0735-7028.39.1.100
- Jylhä, P. and Isometsä, E. 2006. The relationship of neuroticism and extraversion to symptoms of anxiety and depression in the general population. *Depression and anxiety.* Vol. 23: 281-289. doi: 10.1002/da.20167
- Kang, P. Lv, Y. Hao, L. Tang, B. Liu, Z. Liu, X. ... and Zhang, L. 2015. Psychological consequences and quality of life among medical rescuers who responded to the 2010 Yushu earthquake: A neglected problem. *Psychiatry research.* Vol. 230: 517-523. doi: 10.1016/j.psychres.2015.09.047
- Keskinen-Rosenqvist, R. Michélsen, H. Schulman, A. and Wahlström, L. 2011. Physical symptoms 14 months after a natural disaster in individuals with or without injury are associated with different types of exposure. *Journal of Psychosomatic Research.* Vol. 71: 180-187. doi: <http://dx.doi.org/10.1016/j.jpsychores.2011.01.015>
- Kessler, R. C. Galea, S. Gruber, M. J. Sampson, N. A. Ursano, R. J. and Wessely, S. 2008. Trends in mental illness and suicidality after hurricane Katrina. *Molecular Psychiatry.* Vol. 13: 374-84. doi: 10.1038/sj.mp.4002119
- Khalili, S. Harre, M. and Morley, P. 2015. A temporal framework of social resilience indicators of communities to flood, case studies: Wagga wagga and Kempsey, NSW, Australia. *International Journal of Disaster Risk Reduction,* Vol. 13: 248-254. doi: 10.1016/j.ijdr.2015.06.009
- Kilmer, R. P. 2006. Resilience and posttraumatic growth in children. Chapter 14. In: *Handbook of posttraumatic growth: Research and practice.* Calhoun, L. G. and Tedeschi, R. G. Mahwah, NJ. Lawrence Erlbaum Publishers.
- Kiser, L. Heston, J. Hickerson, S. and Millsap, P. 1993. Anticipatory stress in children and adolescents. *American Journal of Psychiatry.* Vol. 150: 87-92. doi: 2205.05944.14543
- Klein, R. J. Nicholls, R. J. and Thomalla, F. 2003. Resilience to natural hazards: How useful is this concept?. *Global Environmental Change Part B: Environmental Hazards.* Vol. 5: 35-45. doi: 10.1016/j.hazards.2004.02.001

- Kline, P. 2000. *The Handbook of Psychological Testing*. Second Edition. London, UK. Routledge.
- Lamond, J. E. Joseph, R. D. and Proverbs, D. G. 2015. An exploration of factors affecting the long term psychological impact and deterioration of mental health in flooded households. *Environmental research*. Vol. 140: 325-334. doi: 10.1016/j.envres.2015.04.008
- Lazarus, R. S. 1991. *Emotion and adaptation*. New York, NY. Oxford University Press.
- Lazarus, R. S. and Folkman, S. 1984. *Stress, appraisal and coping*. New York, NY. Springer Publishing Company.
- Leiserowitz, A. 2010. Risk perceptions and behaviour. Chapter 16. In: *Climate change science and policy*. Schneider, S. H. Rosencranz, A. Mastrandrea, M. D. and Kuntz-Duriseti, K. Washington, DC. Island Press.
- Liu, D. Fu, L. Jing, Z. and Chen, C. 2016. Post-Traumatic Stress Disorder and It's Predictors Among Tibetan Adolescents 3Years After the High-Altitude Earthquake in China. *Archives of Psychiatric Nursing*. Vol. 30: 593-599. doi: 10.1016/j.apnu.2016.01.005
- Loewenstein, G.F. Weber, E.U. Hsee, C.K. and Welch, N. 2001. Risk as Feelings. *Psychological Bulletin*. Vol. 127: 267-286. doi: 10.1037/0033-2909.127.2.267
- Maddi, S. R. 2006. Hardiness: The courage to grow from stresses. *The Journal of Positive Psychology*. Vol. 1: 160-168. doi: 10.1080/17439760600619609
- Manzello, D. Enochs, I. Musielewicz, S. Carlton, R. and Gledhill, D. 2013. Tropical cyclones cause CaCO₃ undersaturation of coral reef seawater in a high-CO₂ world. *Journal of Geophysical Research: Oceans*. Vol. 118: 5312-5321. doi: 10.1002/jgrc.20378
- Marthoenis, M. Yessi, S. Aichberger, M. C. and Schouler-Ocak, M. 2016. Mental health in Aceh-Indonesia: A decade after the devastating tsunami 2004. *Asian journal of psychiatry*. Vol. 19: 59-65. doi: 10.1016/j.ajp.2016.01.002
- McCabe, O. L. Marum, F. Semon, N. Mosley, A. Gwon, H. S. Perry, C. Moore, S. S. and Links, J. M. 2012. Participatory Public Health Systems Research: Value of Community Involvement in a Study-Series in Mental Health Emergency Preparedness. *American Journal of Disaster Medicine*. Vol. 7: 303-312. doi: 10.5055/ajdm.2012.0103
- McCabe, O. L. Perry, C. Azur, M. T. Gwon, M. S. Mosley, A. Semon, N. and Links, J. M. 2013. Guided Preparedness Planning with Lay Communities: A Systems-Based Model for Enhancing Capacity of Rural Emergency Response. *Pre-Hospital and Disaster Medicine*. Vol. 28: 1-8. doi: 10.1017/S1049023X12001483

- McCusker, G. 2011. *Surviving disaster with social media*. Retrieved from: <http://www.businessspectator.com.au/bs.nsf/Article/Surviving-disaster-with-social-media-pd20110121-DAQV?OpenDocument&src=srch>
- Meichenbaum, D. 1997. *Treating post-traumatic stress disorder. A handbook and practice manual for therapy*. Chichester, UK. John Wiley & Sons.
- Michalet, R. Schöb, C. Lortie, C. J. Brooker, R. W. and Callaway, R. M. 2014. Partitioning net interactions among plants along altitudinal gradients to study community responses to climate change. *Functional Ecology*. Vol. 28: 75-86. doi: 10.1111/1365-2435.12136
- Moore, K. W. and Varela, R. E. 2010. Correlates of long-term Posttraumatic Stress Symptoms in Children following Hurricane Katrina. *Child Psychiatry and Human Development*. Vol. 41: 239-250. doi: 10.1007/s10578-009-0165-6
- Morrissey, S. A. and Reser, J. P. 2003. Evaluating the effectiveness of psychological preparedness advice in community cyclone preparedness materials. *The Australian Journal of Emergency Management*. Vol. 18: 46-61. Retrieved from http://www.pacificdisaster.net/pdnadmin/data/original/Evaluat_effect_pshycological_Prepared_community.pdf
- Morrissey, S. A. and Reser, J. P. 2007. Natural disasters, climate change and mental health considerations for rural Australia. *Australian Journal of Rural Health*. Vol. 15: 120-125. doi: 10.1111/j.1440-1584.2007.00865.x
- Mulilis, J. P. Duval, T. S. and Rogers, R. 2003. The effect of a swarm of local tornados on tornado preparedness: A quasi-comparable cohort investigation. *Journal of Applied Social Psychology*. Vol. 33: 1716-1725. doi: 10.1111/j.1559-1816.2003.tb01971.x
- Neria, Y. Nandi, A. and Galea, S. 2008. Post-traumatic stress disorder following disasters: A systematic review. *Psychological Medicine*. Vol. 38: 467-480. doi: 10.1017/S0033291707001353
- Nicolopoulos, N. and Hansen, E. 2009. How well prepared are Australian communities for natural disasters and fire emergencies? *The Australian Journal of Emergency Management*. Vol. 24: 60-66. Retrieved from <http://search.informit.com.au/documentSummary;dn=675848854500461;res=IELAPA>
- Nomura, S. Parsons, A. J. Hirabayashi, M. Kinoshita, R. Liao, Y. and Hodgson, S. 2016. Social determinants of mid- to long-term disaster impacts on health: a systematic review. *International journal of disaster risk reduction*. Vol. 16: 53-67. doi: 10.1016/j.ijdrr.2016.01.013

- Norris, F. 2001. *50,000 disaster victims speak: An empirical review of the empirical literature*. Washington, DC. National Center for PTSD and the Center for Mental Health Services (SAMHSA).
- Norris, F. H. 1992. Epidemiology of trauma: frequency and impact of different potentially traumatic events on different demographic groups. *Journal of consulting and clinical psychology*. Vol. 60: 409-418. doi: 10.1037/0022-006X.60.3.409
- Norris, F. H. and Elrod, C. L. 2006. Psychosocial Consequences of Disaster. A Review of Past Research. Chapter 2. In: *Methods for disaster mental health research*. Norris, F. H. New York, NY. Guilford Press.
- Norris, F. H. Smith, T. and Kaniasty, K. 2000. Revisiting the experience-behavior hypothesis: The effects of Hurricane Hugo on hazard preparedness and other self-protective acts. *Basic and Applied Social Psychology*. Vol. 21: 37-47. doi: 10.1207/s15324834basp2101_4
- Nyklíček, I. and Denollet, J. 2009. Development and evaluation of the Balanced Index of Psychological Mindedness (BIPM). *Psychological Assessment*. Vol. 21: 32-44. doi: 10.1037/a0014418
- Owen, W. F. 1984. Interpretive Themes in Relational Communication. *The Quarterly Journal of Speech*. Vol. 70: 274-286. doi: 10.1080/00335638409383697
- Paton, D. 1994. Disaster relief work: An assessment of training effectiveness. *Journal of Traumatic Stress*. Vol. 7: 275-288. doi: 10.1002/jts.2490070208
- Paton, D. and Jang, L. 2010. Disaster Resilience: Exploring All -Hazards and Cross Cultural Perspectives. Chapter 5. In: *Community Disaster Recovery and Resiliency: Exploring Global Opportunities and Challenges*. D. Miller and J. Rivera. London, UK: Taylor & Francis.
- Paton, D. and Johnston, D. 2001. Disaster and communities: Vulnerability, resilience and preparedness. *Disaster Prevention and Management*. Vol. 10: 270 -277. doi: 10.1108/EUM0000000005930
- Paton, D. Smith, L. and Violanti, J. M. 2000. Disaster response: Risk, Vulnerability and Resilience. *Disaster Prevention and Management*. Vol. 9: 173 -180. doi: 10.1108/09653560010335068
- Peacock, W. G. Brody, S. D. and Highfield, W. 2005. Hurricane risk perceptions among Florida's single family homeowners. *Landscape and Urban Planning*. Vol. 4: 149-58. doi: 10.1016/j.landurbplan.2004.11.004
- Pecl, G. T. Araújo, M. B. Bell, J. D. Blanchard, J. Bonebrake, T. C. Chen, I. C. ... and Falconi, L. 2017. Biodiversity redistribution under climate change: Impacts on ecosystems and human well-being. *Science*. Vol. 355: 1-9. doi: 10.1126/science.aai9214

- Pfefferbaum, B. Newman, E. Nelson, S. D. Liles, B. D. Tett, R. P. Varma, V. and Nitiéma, P. 2014. Research methodology used in studies of child disaster mental health interventions for posttraumatic stress. *Comprehensive Psychiatry*. Vol. 55: 11-24. doi: 10.1016/j.comppsy.2013.08.014
- Pfefferbaum, B. Pfefferbaum, R.L. and Van Horn, R.L. 2015. Community resilience interventions: Participatory, assessment-based, action-oriented processes. *American Behavioral Scientist*, Vol. 59: 238-253.
- Pfefferbaum, B. and Shaw, J. A. 2013. Practice Parameter on Disaster Preparedness. *Journal of the American Academy of Child & Adolescent Psychiatry*. Vol. 52: 1224-1238. doi: 10.1016/j.jaac.2013.08.014
- Platt, S. Brown, D. and Hughes, M. 2016. Measuring resilience and recovery. *International Journal of Disaster Risk Reduction*. Vol. 19: 447-460. doi: 10.1016/j.ijdrr.2016.05.006
- Pooley, J. A. Cohen, L. O'Connor, M. and Taylor, M. 2013. Posttraumatic stress and posttraumatic growth and their relationship to coping and self-efficacy in Northwest Australian cyclone communities. *Psychological Trauma: Theory, Research, Practice, and Policy*. Vol. 5: 392-399. doi: 10.1037/a0028046
- Prati, G. Pietrantonio, L. and Cicognani, E. 2011. Coping strategies and collective efficacy as mediators between stress appraisal and quality of life among rescue workers. *International Journal of Stress Management*. Vol. 18: 181-195. doi: 10.1037/a0021298
- Reser, J. P. 1996. Coping with natural disaster warnings: The nature of human response and psychological preparedness. In: *United Nations Natural Disaster Reduction Conference, NDR96*. Heathcote, R. H. Cutter, C. and Koetz, J. EA Books. Sydney, Australia. Retrieved from <https://search.informit.com.au/document;dn=551777585082242;res=IELENG>
- Reser, J. P. and Morrissey, S. A. 2005. Situating psychology's multiple involvements in disaster research, mitigation and intervention: The need for a reflective and strategic disaster response. *InPsych. The Bulletin of the Australian Psychological Society Ltd.* 9-13. Retrieved from <https://www.psychology.org.au/publications/inpsych/involvements/>
- Reser, J. P. and Morrissey, S. A. 2008. Situating and framing Individual and Community experience in response to hazards: A psychological perspective. Chapter 4. In: *The Phoenix of Natural Disasters*. Gow, K. and Paton, D. New York, NY. Nova Science Publishers.
- Reser, J. P. and Morrissey, S. A. 2009. The crucial role of psychological preparedness for disasters. *InPsych. The Bulletin of the Australian Psychological Society Ltd.* 14-15.

- Retrieved from <https://www.cambridge.org/core/journals/psychological-medicine/article/psychosocial-sequelae-of-the-1989-newcastle-earthquake-ii-exposure-and-morbidity-profiles-during-the-first-2-years-post-disaster/696A775DE5F6E81F9C0D19228EA2828E>
- Riad, J. K. Norris, F. H. and Ruback, R. B. 2006. Predicting Evacuation in Two Major Disasters: Risk Perception, Social Influence, and Access to Resources. *Journal of Applied Social Psychology*. Vol. 29: 918-934. doi: 10.1111/j.1559-1816.1999.tb00132.x
- Ronan, K.R. Crellin, K. Johnston, D.M. Finnis, K. Paton, D. and Becker, J. 2008. Promoting child and family resilience to disasters: Effects, interventions, and prevention effectiveness. *Children Youth and Environments*, Vol. 18: 332-353.
- Ronan, K. R. and Johnston, D. M. 2002. Correlates of Hazard Education Programs for Youth. *Risk analysis*. Vol. 21: 1055-1064. doi: 10.1007/s11069-009-9444-6
- Salzer, M. and Bickman, L. 1999. The short-and long-term psychological impact of disasters: Implications for mental health interventions and policy. Chapter 3. In: *Response to disaster: Psychosocial, community, and ecological approaches*. Gist, R. and Lubin, B. Philadelphia, PA. Routledge.
- Schlomer, G. L. Bauman, S. and Card, N. A. 2010. Best practices for missing data management in counseling psychology. *Journal of Counseling psychology*. Vol. 57: 1-10. doi: 10.1037/a0018082
- Schmuckler, E. 2004. Mental health considerations following a disaster. Chapter 4. In: *Managing traumatic stress risk*. Paton, D. Violanti, J. M. Dunning, C. and Smith, L. M. Springfield, IL. Charles C Thomas Publisher, Ltd.
- Schneider, S. K. 1990. FEMA, Federalism, Hugo and Frisco. *Journal of Social Problems*. Vol. 20: 97 -115. doi: 10.1093/oxfordjournals.pubjof.a037895
- Schwarzer, R. and Jerusalem, M. 1995. Generalized Self-Efficacy scale. Causal and control beliefs. In: *Measures in health psychology: A user's portfolio*. Weinman, J. Wright, S. and Johnston, M. Windsor, UK. NFER- Nelson.
- Shoji, K. Bock, J. Cieslak, R. Zukowska, K. Luszczynska, A. and Benight, C. C. 2014. Cultivating Secondary Traumatic Growth Among Healthcare Workers: The Role of Social Support and Self-Efficacy. *Journal of Clinical Psychology*. Vol. 70: 831-846. doi: 10.1002/jclp.22070
- Siegrist, M. and Gutscher, H. 2008. Natural hazards and motivation for mitigation behaviour: people cannot predict the affect evoked by a severe flood. *Risk Analysis*. Vol. 28: 771-778. doi: 10.1111/j.1539-6924.2008.01049.x

- Silver, A. and Grek-Martin, J. 2015. "Now we understand what community really means": Reconceptualizing the role of sense of place in the disaster recovery process. *Journal of Environmental Psychology*, Vol. 42: 32-41. doi: 10.1016/j.jenvp.2015.01.004
- Slovic, P. Finucane, M. Peters, E. and MacGregor, D. G. 2002. Risk As Analysis and Risk As Feelings: Some Thoughts About Affect, Reason, Risk, and Rationality. *Risk Analysis*. Vol. 24: 1-12. doi: 10.1111/j.0272-4332.2004.00433.x
- Sorte, C. J. B. Ibáñez, I. Blumenthal, D. M. Molinari, N. A. Miller, L. P. Grosholz, E. D. Diez, J. M. D'Antonio, C. M. Olden, J. D. Jones, S. J. and Dukes, J. S. 2013. Poised to prosper? A cross-system comparison of climate change effects on native and non-native species performance, *Ecology Letters*. Vol. 16: 261-270. doi: 10.1111/ele.12017
- Stratta, P. Capanna, C. Carmassi, C. Patriarca, S. Di Emidio, G. Riccardi, I. ... Rossi, A. 2014. The adolescent emotional coping after an earthquake: A risk factor for suicidal ideation. *Journal of Adolescence*. Vol. 37: 605-611. doi: 10.1016/j.adolescence.2014.03.015
- Stratta, P. Capanna, C. Patriarca, S. de Cataldo, S. Bonanni, R. L. Riccardi, I. and Rossi, A. 2013. Resilience in adolescence: Gender differences two years after the earthquake of L'Aquila. *Personality and Individual Differences*. Vol. 54: 327-331. doi: 10.1016/j.paid.2012.09.016
- Strecher, V. J. DeVellis, B. M. Becker, M. H. and Rosenstock, I. M. 1986. The role of self-efficacy in achieving health behavior change. *Health Education Quarterly*. Vol. 13: 73-92.
- Takahashi, B. Tandoc Jr, E. C. and Carmichael, C. 2015. Communicating on Twitter during a disaster: An analysis of tweets during Typhoon Haiyan in the Philippines. *Computers in Human Behavior*. Vol. 50: 392-398.
- Thormar, S. B. Gersons, B. P. Juen, B. Djakababa, M. N. Karlsson, T. and Olff, M. 2014. The impact of disaster work on community volunteers: the role of peri-traumatic distress, level of personal affectedness, sleep quality and resource loss, on post-traumatic stress disorder symptoms and subjective health. *Journal of anxiety disorders*. Vol. 28: 971-977. doi: 10.1016/j.janxdis.2014.10.006
- Twigg, J. 2004. *Disaster risk reduction: mitigation and preparedness in development and emergency programming*. London, UK. Humanitarian Practice Network, Overseas Development Institute.
- UNISDR (2015). *Making Development Sustainable: The Future of Disaster Risk Management*. Global Assessment Report on Disaster Risk Reduction. Geneva, Switzerland: United Nations Office for Disaster Risk Reduction (UNISDR).

- Wachinger, G. Renn, O. Begg, C. and Kuhlicke, C. 2013. The risk perception paradox—implications for governance and communication of natural hazards. *Risk analysis*. Vol. 33: 1049-1065. doi: 10.1111/j.1539-6924.2012.01942.x
- Wagner, S. L. McFee, J. A. and Martin, C. A. 2009. Effects of traumatic stress on firefighters' world assumptions. *Traumatology*. Vol. 15: 75-84. doi: 10.1177/1534765608323441
- Wahlström, L. 2010. *Disaster and recovery*. Center for Family and Community Medicine (PhD Thesis). Department of Neurobiology, Care Sciences and Society Karolinska Institutet. Stockholm, Sweden. Retrieved from: diss.kib.ki.se/2010/978-91-7409-971-3/thesis.pdf
- Weisler, R. H. Barbee, J. G. and Townsend, M. H. 2006. Mental health and recovery in the gulf coast after hurricanes Katrina and Rita. *JAMA*. Vol. 296: 585-588. doi: 10.1001/jama.296.5.585
- Whitehead, J. C. Edwards, B. Van Willigen, M. Maiolo, J. R. Wilson, K. and Smith, K. T. 2000. Heading for higher ground: Affecting real and hypothetical hurricane evacuation behavior. *Environmental Hazards*. Vol. 2: 133-142. doi: 10.1016/S1464-2867(01)00013-4
- Whitmarsh, L. 2008. Are flood victims more concerned about climate change than other people? The role of direct experience in risk perception and behavioural response. *Journal of Risk Research*. Vol. 11: 351-374. doi: 10.1080/13669870701552235
- Woolf, M. Schneider, J. and Hazelwood, M. 2013. Extreme event risk and climate change adaptation: improving the knowledge base and building capacity. Chapter 32. In: *Climate Adaptation Futures*. Palutikof, J. Parry, M. Stafford Smith, M. Ash, A. J. Boulter, S. L. and Waschka, M. Chichester, UK: Wiley-Blackwell.
- World Bank. 2010. *Natural disasters, unnatural disasters: The economics of effective prevention*. World Bank, United Nations. Washington, DC. Retrieved from <http://www.worldbank.org/en/news/feature/2010/11/15/natural-hazards-unnatural-disasters-the-economics-of-effective-prevention>
- World Health Organization. 1992. *Psychological Consequences of Disasters: Prevention and Management*. WHO Division of Mental Health. Geneva, Switzerland. Retrieved from www.who.int/iris/handle/10665/58986
- Yehuda, R. 2002. Post-traumatic stress disorder. *New England journal of medicine*. Vol. 346: 108-114. doi: 10.1056/NEJMra012941
- Young, E. 1997. *Dealing with hazards and disasters: risk perception and community participation in management*. National Centre for Development studies, Australian National University. Presented at the Putting the

Community into Emergency Risk Management workshop. Australian Emergency Management Institute. Bendigo, VIC, Australia.

Zulch, H. R., Morrissey, S. A., Reser, J. P., and Creed, P. 2012. *Psychological Preparedness for Natural Disasters*. In Proceedings of the First International Conference on Urban Sustainability and Resilience, UCL, London, UK.

Publications based on Hannah Zulch's research

Boylan, J. (2016). The development and validation of the bushfire psychological preparedness scale (BPPS) (Doctoral dissertation). Retrieved from http://research-repository.uwa.edu.au/files/12256083/THESIS_DOCTOR_OF_PHILOSOPHY_BOYLAN_Jessica_Louise_2016.pdf

Malkina-Pykh, I. G., & Pykh, Y. A. (2013). An integrated model of psychological preparedness for threat and impacts of climate change disasters. In C. A. Brebbia (Ed.), *Disaster Management and Human Health Risk III. Reducing risk, improving outcomes* (pp. 121-132). Southampton, UK: WIT Press. doi: 10.2495/DMAN130121

Malkina-Pykh, I. G., & Pykh, Y. A. (2015). Evaluating psychological preparedness for the threat and impacts of climate change disasters and its change after intervention: An integrated modelling approach. In S. M. Sener, C. A. Brebbia, & O. Ozcevik (Eds.), *Disaster management and human health risk IV. Reducing risk, improving outcomes* (pp. 159-170). Southampton, UK: WIT Press.

Marcelino, C. A. G., Medriano, K. K. S., Sampang, J. M. M., San Diego, A. M. V., To, J. C., Rigonan Tungol, J. (2016). Bahala Na Attitude and Psychological Preparedness for residents living in areas transected by west valley fault system [Thesis poster pdf]. Retrieved from <https://www.scribd.com/document/303169645/Thesis-Poster-Homework>

Ocampo, J. (2019). Psychological preparedness. Retrieved from <https://www.scribd.com/document/344559137/Chapter1-Edited>

Rahmi, F. (2016). Societies' psychological preparedness in the area of flood disaster at the Desa Sitarjo Sumbermanjing Wetan. *Jurnal Keperawatan*, 7. doi: 10.22219/jk.v7i2.3932

- Roudini, J., Khankeh, H. R., & Witruk, E. (2017). Disaster mental health preparedness in the community: A systematic review study. *Health Psychology Open*, 4, 1-12. doi: 10.1177/2055102917711307
- Rukmana, Ulil. (2015). Hubungan antara sense of community degan kesiapsiagaan psykologis dalam menghadapi bencana pada guru sekolah dasar di kota banda Aceh. Banda Aceh : Universitas Syiah Kuala. Retrieved from <http://etd.unsyiah.ac.id/baca/index.php?id=14526&page=1>

Acknowledgement

Acknowledgment of contribution to scale items: J.Reser and S.Morrissey