

"I laugh and say I have 'Earthquake Brain!': Resident responses to the September 2010 Christchurch Earthquake

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This paper reports on a qualitative analysis of 191 Christchurch residents' written responses to the September earthquake of 2010. The data comes from Wave II of the New Zealand Attitudes and Values Survey (NZAVS) collected in November and December of 2010. When completing the NZAVS, participants in the Canterbury region were given the opportunity to provide open-ended responses about how the earthquake affected them. Qualitative responses were analysed using inductive thematic analysis, and common themes in participant's responses were identified. Four main themes emerged: *psychological impacts; material/financial impact; coping strategies; and "the silver lining"*. These themes are presented and discussed alongside their implications for disaster research. A series of recommendations for future disaster relief are provided. We hope that this research may provide a voice for some of the participants in the broader NZAVS project who experienced the 2010 Christchurch earthquake. These are voices that need to be heard.

KEY WORDS. disaster relief, psychological impacts, Christchurch earthquake 2010, residents' responses, thematic analysis.

On September 4, 2010 at 4:34am, a 7.1 magnitude earthquake hit the city of Christchurch in New Zealand. There was no loss of life as a result of this earthquake, however many people were seriously injured and countless more left homeless. There was widespread damage to property and local infrastructure. Thousands of aftershocks of varying intensity were recorded in the following months (Kuijer, Marshal, & Bishop, 2014). Geonet records showed 780 aftershocks in the first week alone, and most of these were 4.0 in magnitude (Roome, n.d). This paper reports on a qualitative analysis of Christchurch residents' open-ended, written responses to the September earthquake of 2010 provided as part of a larger ongoing national survey (the New Zealand Attitudes and Values Study, or NZAVS).

The psychological outcomes of natural disasters have been extensively investigated. We know that natural disasters affect people in a number

of ways, resulting in a range of short-term and long-term stressors that affect individuals' health and well-being (Bonanno, Brewin, Kaniasty & La Greca, 2010). Given the right resources and responses to need, most people return to a reasonably stable level of mental health (Mooney et al., 2011). A small minority, however, will experience long-term and persistent psychological distress (Bonanno et al., 2010; Freedy, Saladin, Kilpatrick, Resnick, & Saunders, 1994). Pervasive and significant mental health difficulties are more likely to occur when a natural disaster results in large-scale injuries or mortality, mass devastation and property damage, interruption in the provision of social services, and continued economic turmoil within the community (Shultz, Marcelin, Madanes, Espinel, & Neria, 2011). Psychosocial difficulties linked to the aftermath of different natural disasters include: Post-traumatic Stress Disorder (PTSD), depression, anxiety, suicidal ideation, substance use, sleep

disturbances, various psychosomatic ailments, domestic violence and divorce, cognitive impairment and diminished task performance (Bonanno et al., 2010; Kemp, Helton, Richardson, Blampied, & Grimshaw., 2011; Helton & Head, 2012; Morrissey & Reser, 2007; Freedy, Shaw, Jarrell, & Masters, 1992).

Psychological Impacts

a) Post-traumatic Stress Disorder (PTSD)

PTSD is a severe anxiety disorder commonly found following a traumatic experience or event (APA, 2000). Features of PTSD include intense fear resulting in vivid recollections or reliving of an event; avoidance of people, thoughts, feelings, or places associated with the triggering event; and long-lasting periods of increased autonomic arousal (APA, 2000). Two of the strongest predictors of PTSD, and ongoing psychological distress, are physical injury and perceived threat to one's life (Schultz et al, 2011). Research found high incidences of acute and chronic PTSD in adults following the 2004 Indian Ocean Tsunami (Kreamer et al., 2009), and following the Iceland earthquakes in 2000 (Bödvarsdóttir & Elklit, 2004). However Bonanno and colleagues (2010) report that high incidences of severe psychological difficulties are only observed in a relatively small percentage of the population and rarely exceed the 30% mark.

High rates of PTSD are often reported in studies where the participants have been recruited following the disaster. This may result in a sampling bias which risks overestimating PTSD. Bonanno et al., 2010 argue that a major

limitation of most research assessing PTSD is the use of "convenience samples" which have been found to report higher figures of difficulty than those found in community or population based samples. Kuijer and colleagues (2014) found that, in a sample of Christchurch residents recruited prior to the earthquakes as part of a longitudinal study, only 15% scored at or above the cut-off score for being at risk for PTSD after the earthquake (cf. Osborne & Sibley, 2013). Proximity to the epicentre of an earthquake has been identified as a significant predictor of PTSD, with higher levels of PTSD being reported in individuals with greater degrees of disaster exposure when compared to non-exposed individuals (Shultz et al., 2011; Kiliç & Ulusoy, 2003; Bonanno et al., 2010; Suar, Mandal & Khuntia, 2002).

b) Fear

Fear is common both during and following a natural disaster (Berginnaki, Psarros, Varsou, Paparrigopoulos & Soldatos, 2003; Bødvarsdóttir & Elklit, 2004; Verela, Koustouki, Davos, & Elini, 2008). Research on earthquakes has highlighted accounts of fear for one's own life and the lives of family members (Berginnaki et al., 2003; Bødvarsdóttir & Elklit, 2004), fear during tremors in the aftermath, and fear of subsequent larger earthquakes (Bødvarsdóttir & Elklit, 2004). Major earthquakes are often accompanied by ensuing aftershocks which may result in recollections of the initial quake and elicit fear and anxiety (Bødvarsdóttir & Elklit, 2004; Verela et al., 2008).

Long-term effects have also been identified by researchers (Akason, Ólafson & Sigbjörnson, 2006; Lazaratou et al., 2008; Kraemer et al., 2009). There was evidence of earthquake induced fear and anxiety two and a half years after the South Iceland earthquakes in 2000 (Akason et al., 2006) and even as long as three decades after the 1958 Cephallonia earthquake on the western coast of Greece (Lazaratou et al., 2008).

c) Stress and Anxiety

Stress and anxiety are also frequently experienced by survivors of natural disasters with death anxiety, phobia and panic disorders being reported (Bonanno et al., 2010; Aslam & Tariq,

2010). Stress can arise as a result of ongoing aftershocks following the 'main' earthquake or fear of another earthquake occurring which has been shown to be more emotionally taxing than a single event (Shultz et al., 2011; Varela et al., 2008). In an important and insightful study, Dorahy and Kannis-Dymand (2012), conducted a study comparing two different suburbs of Christchurch after the 2010 earthquakes. They found significantly higher levels of anxiety and symptoms of depression in residents of the most extensively impacted suburb, compared to their peers from a less affected suburb. Both groups, however, showed elevated levels of acute stress resulting from the ongoing aftershocks. The authors also reported a strong association between resident's anxiety and their perceptions of being unable to control their responses to the aftershocks.

d) Depression

The devastation and destruction caused by natural disasters can result in a number of symptoms associated with mood disorders, a sense of helplessness, exhaustion and withdrawal (Bonanno et al., 2010). Displacement or forced relocation due to property damage further increases the risk of psychological distress with research showing higher levels of depression, anxiety, hostility and sleep disorders due to a disruption in social networks and relationships (Kiliç et al., 2006; Bland, O'Leary, Farino, Jossa & Trevisan, 1996). Research conducted following the 2010 Christchurch earthquake found higher levels of depression in the more affected areas characterised by major damage, prolonged loss of utilities and displacement of residents (Dorahy & Kannis-Dymand, 2012). The persistent aftershocks that characterised the Christchurch earthquake were also identified as impacting on the psychological recovery of the residents, by prolonging the impact of the initial event and causing elevated levels of mood disorders (Garwith, 2013).

e) Sleep Disturbance

Another commonly reported impact of earthquakes is sleep disturbance (Varela et al., 2008; Wood, Bootzin, Rosenhan, Nolen-Hoeksema, & Jourden, 1992), with insomnia and

nightmares being the most commonly cited difficulties. Garwith (2011), reported that, at the time of her writing there were still reports of a lack of quality, deep sleep following the 2010 Christchurch Earthquake.

Individual Differences

Individuals respond differently to natural disasters based on a number of factors. Prior exposure to disasters, the individual's psychological disposition, susceptibility to psychological distress, resilience, as well as their mental preparedness all impact the individual's coping ability during and after the event (Morrissey & Reser 2007; Suar et al., 2002; Bergiannaki et al. 2003; Benight et al., 1999; Mooney et al., 2011). Research has indicated that community engagement following an earthquake has an important role in individual's psychosocial recovery as well as the recovery of the community (Collins, Glavonic, Johan & Johnston, 2011). Such engagement gives people a sense of being active participants in the rebuilding of their community, along with a sense of control and purpose. The coming together of people, the sharing of feelings and experiences, and communal coping may act as a safeguard against the negative outcomes of uncertainty in natural disasters, which has been shown to be related to increased psychological distress (Afifi, Felix & Afifi, 2012). Deterioration of social networks and support in the aftermath of a disaster has been shown to increase the prevalence of psychological difficulties (Shultz et al., 2011).

Post-Trauma Growth

Research also suggests that trauma has the potential to increase positive psychological growth which reduces anxiety and produces an enhanced quality of life in the future (Kraemer et al, 2009; Sattler et al., 2000; Tang, 2006). Positive responses following a disaster include a sense of greater resilience and spirit, a more balanced and greater appreciation for life, stronger family and community bonds and an enhanced sense of self-efficacy (Sattler et al., 2000; Tang, 2006). Positive adjustment and outcomes following a disaster are thought to be the product of an active coping style and support-

seeking behaviours, which counteract the impact of negative affect and arousal (Tang, 2006).

This current research seeks to add to the literature on disaster research and specifically, Christchurch earthquake research. We analyse a group of participants' open-ended written responses to the 2010 Christchurch earthquake. The participants were part of an ongoing project that began before the 2010 earthquake. We hope that the presentation and analysis of these responses may contribute to understanding the outcomes of natural disasters (specifically earthquakes) on New Zealand residents. The open-ended nature of these responses allows analysis of the responses in the participants own words and for us to convey people's written responses, exploring their experiences, ideas and affective reactions to this natural disaster.

Method

Participants

Participants were residents in the Christchurch region, and ranged from 19 to 93 years of age, with mean age of 53 years. There were 132 female and 59 male respondents. Of these participants, 86% were European or Pakeha, 8.9% were Maori, 1.6% were Asian, 1.6% were "New Zealander", 1% were "other" and 0.5% were Pacific Islanders.

Data collection

The data analysed here were collected as part of the pre-planned 2010 wave of the longitudinal New Zealand Attitudes and Values Study (NZAVS) collected at the end of 2010 and early 2011. In total, 865 participants from the Time 1 (2009) sample resided in the Canterbury region, with 594 of these in the Christchurch City territorial authority. These 865 participants from the Canterbury region were contacted as part of the pre-planned 2010 wave of data collection. They were invited to also complete an additional open-ended response questionnaire about their experiences and opinions regarding the Christchurch earthquake of September 4th 2010. The open-ended response questionnaire was administered before the second major Christchurch earthquake of 22nd February 2011. Participant responses

thus reflect experiences in response to the first earthquake only.

A total of 540 from the Canterbury region responded to the Time 2 NZAVS questionnaire (62.4%), with 369 of these people specifically from the Christchurch City territorial authority. Of the total 540 respondents in the Canterbury region, 191 (35.4%) returned the completed open-ended response page along with their completed NZAVS questionnaire (140 of these were from participants in Christchurch city specifically). The open-ended page was included with the standard NZAVS questionnaire, and asked respondents "If you wish to include any comments about how the earthquake affected you or the people around you, then please add them below." The full text and pre-ambule for the open-ended page is included in the Appendix. The typed responses from these 191 respondents yielded 53 pages of typed data and 20,402 words.

The central aim of the current project was to summarise and report back on the responses provided regarding the experiences of NZAVS participants during the Christchurch earthquake of September 4th 2010. Our analysis focused on the accounts of people's own experiences, ideas and affective reactions to a natural disaster (in this case an earthquake) in their own words.

Mode of Analysis

Data was analysed using thematic analysis (Braun & Clarke, 2006) from a realist epistemological position, assuming a direct relationship between language, meaning, events and the implications of this for individuals (Braun & Clarke, 2006). Themes were identified in an inductive manner, which means they were closely tied to the data, without seeking to fit them into pre-defined categories. Themes were analysed at the semantic level, involving a surface reading of the data, identifying the explicit meanings and significance of what has been said with minimal interpretation and expansion beyond what was stated.

The process of analysis involved repeated reading of the data, which was coded by the first author, focusing on recurring issues and ideas within the text. Once the data had been coded, candidate themes were identified and a

thematic map developed. At this stage the codes were sorted into possible candidate themes. Once candidate themes had been identified, themes were reviewed and refined in relation to the entire data corpus and an initial thematic map developed, and additional subthemes coded and identified. Themes were then defined and named. The entire process of analysis was carried out in consultation with the second author.

Data are reported using direct quotes from the responses received, [...] denotes removal of unrelated data.

Results and Discussion

Four key themes were identified across the entire data corpus: *Psychological Impacts*; *Material/Financial Impact*; *Coping Strategies*; and *"The Silver Lining"*. All themes, apart from theme two, had a number of subthemes that will also be discussed.

Psychological Impacts

Responses detailed a number of negative psychological impacts on the residents of Christchurch and those close to them. These impacts were described in a number of different ways, including accounts of mental and emotional strain. Many responses indicated on-going difficulties, reporting that even though a number of months had passed since the earthquakes people were still struggling. Several key subthemes were identified within the broad theme of Psychological Impacts. These were: (a) Fear; (b) Anxiety; (c) Sleep Disturbances; (d) Hypervigilance; (e) being in limbo; (f) guilt; and (g) tending to the needs of others. These are discussed in turn.

a) Fear

Intense fear is common following traumatic events (Foa, Stein & McFarlane, 2006). Respondents describe immediate terror as the earthquake struck, along with longer term fear in response to the aftershocks. Accounts of the initial fear centred on being woken with a shock, and the sensory experiences of the earthquakes such as the ground shaking and the sound of glass breaking:

All I could hear was things crashing and breaking. It was pitch black as the power went off [...] my neighbour arrived and we huddled and shook with shock.

(Participant 5)

Some participants also expressed a fear of dying:

Very scared when the earthquake struck. Thought I was going to die. (Participant 32).

Fear of dying may possibly be linked with the subjective sense of helplessness experienced by individuals during an earthquake, which is associated with increased risk of psychological distress and PTSD symptomology (Bödivarsdóttir & Elklit, 2004).

After the main earthquake, accounts of ongoing trepidation related to the aftershocks and concern of another earthquake happening were reported:

Daily fear deep down in stomach, another jolt may hit us. (Participant 13).

Responses indicate terror during the main earthquake, however, there was a sense that on-going aftershocks were more devastating and difficult to bear. Both elderly parents and young children were mentioned in these accounts, highlighting fear as a common response across all age groups.

b) Sleep Disturbances

A large proportion of the responses indicated difficulties with sleep in the weeks following the earthquake. Sleeplessness was related to fear (ostensibly in anticipation of another earthquake or aftershock):

I went to the Doctor after about 10 days and got some sleeping pills, but they did not make me sleep as I was afraid to sleep. (Participant 182)

The earthquake happened in the early hours of the morning while most people were still asleep, which might explain this difficulty in going to sleep. Other participants attributed their sleep difficulties to the on-going aftershocks and being woken up during the night with a “jolt”:

Many, including myself, felt very tired through being woken with aftershocks and taking ages to get back to sleep (Participant 51).

Accounts of sleep disturbances in family members, particularly children, were also very common:

The biggest impact at home

was that our 6 year old boy was traumatised by the whole thing [...] for about a month he was out of bed every 45-60 minutes and this impacted on the whole household. (Participant 161)

In children, sleep disturbances may be linked to frequent dreams and nightmares about the earthquake as well as fears of the dark (Miller, Kraus, Tatevosyan, & Kamenchenko, 1993). Sleep disturbances may have multiple implications with regards to well-being and recovery after a traumatic event and is linked to increased anger, irritability, distractibility, difficulty concentrating and general worry (Miller et al, 1993). Responses indicated the pervasive nature of the sleeping difficulties and the toll it was taking on residents.

c) Anxiety

Another key psychological impact that was common across the responses was reports of anxiety. Anxiety in these accounts largely occurred as a result of the continuing aftershocks in the weeks following the initial earthquake, and the uncertainty around when or where more aftershocks (or another earthquake) might occur:

Every aftershock in the first three weeks or so was strong and I was in an almost permanent state of anxiety and fear of it being another huge quake and could not sleep or relax at all. (Participant 182)

Aftershocks are a continuous reminder of the initial earthquake, often elicit flashbacks and recollections of the event, and bring to the surface all the physiological reactions experienced during the initial earthquake (Shultz et al., 2011). The constant feeling of ‘dread’ around the potential of a reoccurrence of an earthquake or aftershocks also increases anxiety (Bödivarsdóttir & Elklit, 2004; Dorahy & Kannis-Daymond, 2012).

Participants also indicated anxiety around being in unfamiliar places or buildings during aftershocks:

You didn't enter a room or building without first casing it to see where you would go if a big one hit. (Participant 130)

I do have a brief moment of apprehension if one hits when

I am in an unfamiliar building. (Participant 76)

Before an earthquake individuals may hold a firm belief in the strength and stability of buildings. Witnessing buildings collapse during natural disasters causes people to re-evaluate this belief and leads to anxiety around being in unfamiliar places, sometimes impacting on an individual’s ability to function in their everyday life (Bödivarsdóttir & Elklit, 2004).

Separation from family members during aftershocks also caused anxiety among participants. Participants commented on the fact that they wanted to know where family members were at all times:

I am now neryv and always need to know where both of my children are at any given moment. (Participant 115)

Separation from family members during, or after, the earthquake or aftershocks has been shown to increase overall distress and is linked to persistent mental health difficulties (Shultz et al., 2011). Responses indicated that being surrounded by family lessened the effects of the anxiety and gave a sense of comfort.

d) Hypervigilance

Hypervigilance was another common feature mentioned in a majority of the responses. Most participants reported that even when there were no ‘shakes’ or aftershocks, they were constantly on edge waiting for the ‘next one’:

Every bang or drumming noise [...] now sounds like an earthquake coming so you're constantly on edge. (Participant 22)

My mind is subconsciously waiting for movement to happen all the time, no matter how trivial and then analysing it, finding likely causes. (Participant 15)

Following an earthquake survivors often expect (and dread) additional earthquakes and aftershocks, and as a result are likely to experience tension and anxiety (Varela et al., 2008). This is likely to manifest in individuals being hypersensitive and alert to the slightest

sounds, sensations and movement. Respondents gave the sense of this experience of vigilance being pervasive and disruptive leaving them feeling drained and exhausted from constantly 'being on edge'.

e) 'Being in Limbo'

The feeling of uncertainty and 'being in Limbo' in the aftermath of an earthquake is a common experience (Bödvarsdóttir & Elklit, 2004). Many of the participants reported feeling insecure and uncertain about the future:

There is a feeling of uncertainty about the future. The quake has also meant I have had to delay important life decisions and may ultimately influence these decisions. (Participant 31)

The accounts indicate the sense of being unable to move forward, prolonging and increasing the stress. This sense of uncertainty about the future may have affected residents' sense of efficacy. Diminished perceptions of coping ability have been shown to prolong and add to distress, increasing the risk of PTSD (Benight et al, 1999). Some of this 'limbo' was related to awaiting property evaluations and possible insurance reimbursements. Participants report feeling 'stuck' and unable to proceed with repairs, some even being unsure of whether they would be able to continue living in their homes.

f) Guilt

Reports of guilt were also quite common among participants, and largely related to feelings of having 'gotten off lightly'. Many participants reported feeling guilty over suffering such 'minor' damage and negligible loss whereas others seemed to have lost a lot more:

I felt guilty that I hadn't suffered as much as a lot of other people. (Participant 5)

I was not affected at all. I felt some guilt about that for a number of weeks. (Participant 134)

Guilt was also experienced in cases where participants had not been present when the earthquake occurred and not being there to support or help friends and family:

I was in hospital at the time so feel as though I left my family and friends to cope on their own which has left me feeling guilty at not being able to help. (Participant 28)

In events where there is a perceived lack of control and fear, such as natural disasters, there may be guilt around the failure to protect those close to you or for surviving the event (O'Connor et al., 2000). Survivor guilt has been linked to feeling better off than others or having a greater degree of health and wellbeing and has been shown to increase rates of depression, pessimism, low self-esteem and addiction (O'Connor et al., 2000).

g) Tending to others

One psychological impact of the earthquake related to the emotional and mental demands placed on individuals by family members. Many participants gave accounts of having to tend to the needs of others and needing to provide increased emotional support whilst still struggling to come to terms with the impacts themselves:

Stress initially personally then having to stay with daughter at her home until she coped (solo mum with two boys) with damaged home... and providing support for neighbours who weren't coping. (Participant 33)

Earthquakes can significantly affect a person's perception of their capabilities, reducing confidence in even the most independent of people (Tang, 2006). This can increase people's reliance on others for day-to-day needs and emotional encouragement. The constant provision of support without the reciprocal offering of support could be argued to increase the risk of individuals "burning out" (Tang, 2006). Where people are providing increased support to others it is important to ensure that they themselves have a support network.

h) Other responses

While almost all the participants reported feeling impacted by the earthquake in some manner, there were a small number who felt unaffected or had positive responses. Some participants felt that the earthquake had been "exciting":

Was an awesome experience, a great thing to live through. (Participant 7)

Time off Uni-Yeah Boi! (Participant 187)

Overall, the earthquake had a significant psychological effect on the residents who responded to our study. Intense fear, stress and anxiety, uncertainty, as well as complaints of sleep disturbances were frequently discussed. Guilt and the burden of supporting loved ones also contributed to distress. While a vast majority of the participants commented on the psychological impact of the earthquake, not all reported negative reactions or experience significant distress.

Material costs and financial impact

The second key theme that was identified related to the financial and material repercussions of the earthquake. Participants reported on the significant financial implications on an economy already affected by the economic recession and the global financial crisis:

I have a number of friends and associates who have been significantly financially affected by the quake, especially those with retail businesses who were affected by the city cordon. This has led to stress and weight-loss and insomnia. (Participant 147)

Economic turmoil and unemployment are significant risk factors for psychological disorders (Toukmanian, Jadaa, & Lawless, 2000). Decline in trade and industry is common in the aftermath of a natural disaster as most of the major infrastructure 'grinds to a halt'. Job losses as a result of business closures can have serious implications on resource availability. Literature shows that resource loss or shortage can reduce an individual's coping ability and increase distress (Freedy et al., 1992). A number of participants commented on the financial consequences for the elderly community and for those who did not have comprehensive insurance:

Many people have been financially ruined, particularly in my experience, the elderly and retired. (Participant 122)

There are still a lot of people worrying whether they have enough insurance to repair the damage to their properties (Participant 188)

While the financial implications have been identified as a separate theme from the psychological impacts of the earthquake, there is an important link between the two. Financial loss and ongoing difficulties following a natural disaster are recognized as contributing to as well as escalating the risk of psychological morbidity (Foa et al., 2006). Resource loss has a direct impact on the emotional well-being of an individual and influences their perceptions of efficacy (Freedy et al., 1992; Benight et al., 1999). Financial losses could potentially take a long time to recoup and therefore psychological distress as a result of this could be quite long-lasting.

Damage to properties was also a significant issue raised in many of the responses. Responses indicated concerns around the financial cost of repairs and whether insurance settlements would be received efficiently:

Have had continual worry over getting my house repaired [...] still no contact from EQC (Earthquake Commission) as to what we are to do and whether we can go ahead and fix things up before winter hits. (Participant 25)

Many participants also commented on the demolition of landmarks and the changing landscape of Christchurch:

Christchurch and Canterbury will never be the same, the landscape in some areas has been totally altered [...] familiar buildings have gone or are in the course of demolition. (Participant 192)

Responses related to property damage gave the sense of participants grieving the loss of familiar surroundings and a sadness that Christchurch was forever changed. Widespread property damage has been associated with increased psychological distress as it serves as a reminder of the event itself as well as personal impacts and loss (Schultz et al., 2011). Concern over the well-being of one's property after each aftershock has been shown to increase levels of depression and

anxiety (Dorahy & Kannis-Dymand, 2012). People's homes represent, not only their dwelling place, but also their “financial security, their personal history and their place in the world” (Gawith, 2011, p. 125). Property damage could also increase individuals' sense of uncertainty as familiarity brings with it a sense of comfort and reassurance. Unfamiliar environments, combined with the disruption of services and social networks, have been shown to increase the likelihood of emotional distress following a natural disaster (Aslam & Tariq, 2010; Foa et al., 2006).

Coping Strategies

Literature has suggested that in the midst of a natural disaster, there are a host of tactics people employ as a means of handling impacts and regaining a sense of ‘normalcy’. A number of coping techniques were identified in our data: (a) Calling on Faith/Religion, (b) Being prepared, (c) Positive thinking, and (d) Sympathy for those worse off.

a) Faith/ Religion

About 10% of the participants identified their faith as being an asset in getting them through difficult times in the aftermath of the earthquake:

My faith in Jesus Christ was really my foundation in that time. He constantly reminded me that as out of control as the situation felt, He was in control and I could trust Him whatever the outcome. (Participant 130)

This is also consistent with Sibley and Bulbulia (2012), who reported in other quantitative analyses of NZAVS data that religious affiliation in the Canterbury region increased significantly following the earthquakes. Research indicates that faith and religious beliefs may tend to reduce stress and increase psychological well-being following a traumatic experience such as a natural disaster (Meisenhelder, 2002; Elliot & Pais, 2006). Religion may bring a sense of comfort as people seek God in making sense of the experience and obtain meaning for the event (Meisenhelder, 2002; Sibley & Bulbulia, 2012). Religious beliefs often imply that an individual is part of a faith community placing that person in a supportive environment where pain and

anguish can be shared (Meisenhelder, 2002; Elliot & Pais, 2006; Sibley & Bulbulia, 2012).

b) Being prepared

Feeling prepared by having an emergency kit and plans in place, often heightens people's sense of control and increases self-efficacy (Livanou et al., 2005) and this was evident in participant accounts:

Having a radio, batteries and emergency bottled water made me feel prepared and gave me the comfort that we would be okay for a few days. (Participant 19)

Still feel apprehensive about another earthquake but feel better prepared emotionally have emergency items gathered and safety systems in place. (Participant 137)

Self-efficacy and the belief that one can cope in traumatic experiences has been shown to enhance motivation for restoration, increasing the likelihood that an individual will engage in active coping strategies, such as intentionally seeking extra resources, thus reducing feelings of anxiety or helplessness and negative affect (Scott, Carper, Middleton, White, & Renk, 2010; Sumer et al., 2005). People who are more prepared for disasters are found to be more resilient and able to recover faster after the event (Collins et al., 2011).

c) Positive thinking

Optimism lessens the impact of severe stressors and negative life events and increases the subjective sense of well-being (Carver, Scheier & Segerstrom, 2010; Cruess et al., 2000). There were a number of different facets of positive thinking that were conveyed in the data. These were: (i) Minimal property damage or destruction, (ii) no deaths, (iii) comparisons with disasters overseas and (iv) sympathy for those worse off.

Despite the high magnitude of the September earthquake, damage to some properties was relatively small. Most participants conveyed surprise and relief that destruction was not on a larger scale:

Our family was largely unaffected by the earthquake, structurally we had no damage but found it an

amazing experience to be in such a large earthquake with limited building damage or injuries. (Participant 93)

In this instance, the relatively small scale of damage to some of the properties would act as a buffer and potentially counteract a great deal of trauma and negative affect. Some participants also expressed a sense of gratitude that the situation was not more severe:

Appreciative that the consequences of the quake have been a lot less than they potentially could have been. (Participant 10)

Focusing on the positive outcomes, rather than on the negative may enable residents to offset any potentially negative psychological outcomes of the earthquake.

One of the most remarkable features of the September 2010 Christchurch earthquake was that there were no fatalities. Many participants stated that even though the earthquake had been a traumatic experience and they were experiencing some distress, the fact that there were no deaths gave them comfort:

Thank God there was no loss of life is all we can say! Roll on the rebuild of Canterbury and our lives! (Participant 49)

The timing of the 7.1 was as ideal as it could be if we were going to have an earthquake. I am grateful I was at home with the family and that no one at all was fatally injured. (Participant 10)

Research has shown that bereavement and significant loss of life following a natural disaster is associated with increased psychological trauma, reduced well-being and is linked to a pervasive sense of helplessness (Xu & He, 2012; Osborne & Sibley, 2013). The lack of fatalities in this earthquake could also have worked as a buffer against severe and prolonged trauma. It would also reduce the likelihood of PTSD and complicated grief as a consequence (Xu & He, 2012).

A number of participants took comfort that support structures and systems were generally well developed in New Zealand, even though there has been little exposure to natural disasters

in recent years. Comparisons were made with other countries with less developed infrastructure and support services:

In general the support structures seemed to operate as well as could be expected in the circumstances [...], living in Christchurch NZ beats the hell out of living in Port-Au-Prince Haiti. (Participant 16)

Similarly, many participants expressed sympathy for those who were worse off than them. Participants referred frequently to those who had major house and property damage:

Personally it made feel very appreciative of what I have in life and my loved ones, but also very sorry for the less fortunate (Participant 157)

A number of participants also expressed gratitude that they still had a home to go home to. Accounts were given of friends and colleagues who had been forced to leave their homes because of severe damage:

We have family and friends whose homes have been written off because of damage and this makes me realise how lucky we are. (Participant 80)

A positive outlook following a natural disaster has been shown to reduce depression, overall distress and PTSD symptoms (Vázquez et al., 2005; Carver et al., 2010; Cruess et al., 2000). Optimism can strengthen an individual's sense of resiliency, producing better psychological functioning, less anxiety and stress, following a disaster (Aslam & Tariq, 2010). It could also be suggested that 'looking at the bright side' may also be a way in which individuals are able to make sense of the disaster experience and their circumstances in the aftermath. Research has suggested that people actively engage in meaning making and rationalising the negative events that occur. This is seen as critical to personal growth and the development of resilience (Vázquez et al., 2005). In empirical analyses of NZAVS data, Osborne and Sibley (2013), for instance, reported that the personality trait of emotional stability buffered people from experiencing psychological distress following the Christchurch earthquakes. Related to this, work by

Milojev, Osborne and Sibley (in press) using NZAVS data indicates that most core aspects of people's personality were remarkably stable following the Christchurch earthquakes of September 2010 and February 2012.

"The Silver Lining"

Besides optimism, a large number of responses focused on the positive outcomes of the earthquake and mentioned that despite the distress and devastation in the weeks following the earthquake, there was a general sense that some good had come out of it. Within this theme a number of subthemes were identified: (a) community spirit, (b) re-evaluating priorities, and (c) more paid work.

a) Community Spirit

A large majority of the participants commented that the earthquake gave the residents of Christchurch a "common experience" (participant 62) that brought them together and created a sense of connection between people that did not exist before. There were accounts of people sharing their grief and terror with neighbours and community members with a new found honesty and openness.

A surprisingly good outcome of the earthquake and subsequent aftershock was the degree of honesty and sharing of feelings among colleagues-way beyond what occurred earlier. (Participant 57)

People coming together and supporting each other has been shown to increase perceptions of control and self-esteem, lessening subjective feelings of helplessness and allows people to feel like they are active participants in the recovery of their communities (Collins et al., 2011; Sattler et al., 2000). Communal support and coming together can also enable discussion about changes that have taken place as a result of the event. Open and frank discussion about feelings and difficulties can allow for different perspectives to be offered and potential solutions devised (Tedeschi & Calhoun, 2004).

a) Re-evaluating priorities

Many participants also discussed how the earthquake changed the way they see the world:

The earthquake [brought] us closer together as a family and put the important things in life (family, love, caring for each other) in top priority. [It] literally shook us up and opened our eyes to the fact that life is short and precious (Participant 137).

Many residents reported that this 'shake up' led to a drastic change in priorities, bringing to the fore the importance of family and 'loved ones' over material assets.

"Family has become more important than money-how important is money vs a life that helps others?" (Participant 39).

A change in priorities and what one views as significant is a common outcome for many people who have experienced traumatic events. A closer and deeper relationship with others is also commonly reported following trauma (Tedeschi & Calhoun, 2004; Garwith, 2011) and can be seen as one of the positive outcomes of such events.

b) More paid work

A small number of participants also saw the earthquake as having a positive effect on the job market in Christchurch. The earthquake caused significant damage to roads and buildings which require repair and redevelopment:

The building and associated industries had ground to a halt pre-earthquake, so for all the business people in these industries it created a silver lining. Where there was high unemployment now the economy is starting to thrive again. (Participant 177)

An increase in employment opportunities would minimise the impact of resource loss following a disaster, as people would be in a better position financially to rebuild and replace lost possessions.

Strengths, Limitations and Future Research

A strength of this study is that the sample used in this research had already been recruited for separate research prior to the September 2010 earthquake. This reduces the risk of an overrepresentation of traumatised participants that can occur when recruitment is done post

disaster (Bonnano et al., 2010). Some of the practical limitations of this research included the data gathering method. Participant responses were received in written format and some were difficult to read due to the illegibility. Difficulty reading such responses lead to these being necessarily excluded during coding and analysis. Invitations for responses were sent out a number of months after the September 2010 earthquake, leaving room for perceptual and memory distortions to influence the responses provided. Participants may have over-reported on difficulties, if such memories were more salient, while under-reporting on examples of strengths and resilience (or vice versa). It is also likely that those who had strong feelings about the earthquake (in either direction) were more likely to respond than those with minimal distress or impact.

The Christchurch earthquakes are unique in that they occurred within six months of each other and had significantly different outcomes. Future research may also benefit from an in-depth analysis of the impacts of earthquakes and natural disasters on older children and adolescents using a similar method. Future research and a qualitative analysis of the outcomes for the elderly community would also be helpful in deciphering whether there are age differences in responses to natural disasters. Such research would benefit clinicians in providing the best support for specific age groups. We also wonder if a future research project interviewing Christchurch residents about their experiences with the Earthquake Commission and the links between such experiences and rates of recovery might be warranted.

Conclusions and Recommendations

This project has highlighted the impacts and effects of the September 2010 Christchurch earthquake on residents, as articulated by themselves in written responses. Key themes were identified and analysed, highlighting the significant psychological and financial impacts as well as outlining the coping strategies that emerged and positive outcomes of the earthquake for the residents of Christchurch. By analysing

these experiential accounts we aim to extend the breadth of understanding related to the outcomes of natural disasters, particularly in the New Zealand context.

Our analysis indicates that an emphasis on preparation would be beneficial in reducing negative psychological affect and outcomes following disasters. There have been efforts, through media and advertising, to encourage New Zealanders to have an emergency kits and plans in place. Additional strategies could also be useful here, including education around what to expect in various natural disasters and their associated disturbances (such as long-term aftershocks, and seismic instability following earthquakes). Preparedness can help individuals reduce initial levels of shock and stress. Individuals would thus be better equipped and prepared for how to respond and what they would need to manage in the days following the disaster. Furthermore, education around best safety practices during a disaster would be beneficial in minimizing physical injury. Preparation and strategies to minimize resource loss after a disaster will prevent undue distress and minimize the risk of depression and PTSD.

Self-efficacy and emotional stability are pivotal factors in a person's ability to respond adaptively in a disaster situation and in the aftermath. As such, strategies to enhance self-efficacy should be beneficial in reducing long term and persistent distress. This is a strong theme that we think runs through the discourse and commentary provided by Christchurch residents. Given the evidence of long-term impacts and distress following a natural disaster, it is important for clinicians and support services to ensure on-going support for residents.

Community spirit and cohesion also emerged as a strong buffer against prolonged distress, and initiatives aiming to increase community support networks and outreach interventions should, and are helping, to reduce negative psychological impacts for residents. More work assessing the efficacy and outcomes of such initiatives is definitely needed, however (cf. Sibley & Bulbulia, 2012). We hope

that summarizing and presenting the thoughts, feelings and experiences of NZAVS participants who weathered the September 2010 Christchurch earthquake and its immediate aftershocks may help with this. The striking thing to us as researchers is that people tended to have similar experiences, even if expressed or described in very different ways. There is a common voice to such experiences, and we hope this comes through in our summary of residents' responses. Finally, we hope that we have provided a voice for some of the participants in the broader NZAVS project who experienced the 2010 Christchurch earthquake. These are voices that need to be heard.

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- research team to track the resilience and psychological recovery of people affected by the Canterbury earthquake. Please note that a summary of any comments you offer may be included in a report summarizing people's experiences and recovery after the Canterbury earthquake. Any comments you offer will be protected in the same way as all other data in the study, and are subject to the conditions outlined on the information and consent forms.

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Appendix

Full text for the additional page included in the 2010 wave of the NZAVS inviting open-ended responses about the Christchurch earthquake.

You may have noticed that the New Zealand Attitudes and Values questionnaire did not ask about whether you or the people around you were affected by the recent earthquake in Canterbury.

The New Zealand Attitudes and Values study is planned and prepared a long time in advance. Because of this, the survey can miss asking about recent and unforeseen events. The Canterbury earthquake affected many people, and the New Zealand Attitudes and Values study may fail to pick up on this. This could have a big impact on the way the data from the study is interpreted unless care is taken.

If you were affected by the earthquake, and would like for this to be taken into account when considering your answers to the questionnaire, then please feel free to write any additional information about how the earthquake affected you below.

By responding you may help our