

Does a disaster worsen anxiety when you are already anxious? Psychological consequences following exposure to a M7.1 earthquake in an outpatient anxiety disorder population

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Abstract

Research of clinical patients with a pre-existing psychological disorder involved in a disaster is limited. This study investigated relationships between pre- and post-earthquake psychopathology (i.e., anxiety, depression, and posttraumatic stress), peritraumatic distress, work and social impairment, perceived support post-earthquake, and personality dimensions in an outpatient, anxiety disorder population. Thirty-seven patients with pre-existing anxiety disorders completed standard clinical assessments pre-earthquake. They then completed a second set of questionnaires 3 months after exposure to the 2010 Christchurch, Aotearoa New Zealand, earthquake. Bivariate correlations on the

variables determined what relationships were present, and paired samples t-tests assessed differences in pre- and post-earthquake anxiety, depression, and alcohol and drug consumption as well as relationships with peritraumatic distress, posttraumatic stress, and personality variables. Significant relationships were found between pre-earthquake psychopathology, peritraumatic distress, post-earthquake psychopathology, and impairment. Paired samples t-tests demonstrated anxiety and depression scores were significantly lower post-earthquake. However, prior anxiety and depression, as well as peritraumatic distress, were significantly associated with post-earthquake psychopathology, including posttraumatic stress and impaired work and social functioning. There were no differences between pre- and post-event alcohol and drug consumption. The personality dimensions of harm avoidance, self-directedness, and persistence significantly associated with post-disaster anxiety and depression. Promisingly, post-earthquake perceived support was significantly negatively correlated with depression and posttraumatic stress.

Keywords: Anxiety, depression, posttraumatic stress, peritraumatic distress, personality temperament, earthquake

The negative effects of a disaster triggered by a natural hazard event (hereafter termed disaster) on psychological functioning include risk for posttraumatic stress disorder (PTSD), depression, generalised anxiety disorder (GAD), panic disorder, and elevated levels of distress (Dorahy & Kannis-Dymand, 2012; Morganstein, & Ursano, 2020; Neria et al., 2008; Norris et al., 2002; Reifels et al., 2017; Warsini et al., 2014). Prevalence of mental health issues can be two to three times higher in disaster-affected populations than that of the general population (Math et al., 2015). Research on the psychological sequelae of disasters has predominantly examined effects on the general population and only a limited number of studies have investigated the impact of disasters on those with pre-existing psychological disorders.

To date, limited evidence suggests that pre-existing mental health problems increase the risk of developing post-trauma psychopathology following a disaster. For example, Hurricane Katrina (2005) survivors who were outpatients of a psychiatric clinic ($N = 156$) experienced significantly increased depressive symptoms 1 month post-hurricane (McLeish & Del Ben, 2008). Variables that predicted depressive symptoms included exposure to television coverage of the looting that occurred in New Orleans post-hurricane and the duration without electricity. Posttraumatic stress disorder symptoms following the hurricane were predicted by using television as a coping strategy and time spent watching televised looting.

An investigation of male veterans with ($n = 249$) and without ($n = 250$) pre-existing psychological disorders prior to Hurricane Katrina showed that those with pre-existing disorders were 6.8 times more likely to develop a new psychological disorder in contrast to those without pre-existing disorders (Constans et al., 2012). Those with pre-existing PTSD, schizophrenia, or affective disorders (depression or bipolar) were 11.9, 9.1, and 4.4 times more likely, respectively, to develop new disorders. Seventy-two percent of those with a pre-existing disorder developed a new psychological disorder following the hurricane, in contrast to only 31% of those with no pre-existing disorder. Of those with pre-existing disorders who developed a new disorder post-hurricane, 32% developed depression and 23% developed PTSD.

In contrast, Bystritsky et al. (2000) reported that patients with panic disorder ($n = 22$) and obsessive-compulsive disorder (OCD; $n = 19$) did not experience acute worsening of their panic disorder or obsessive-compulsive symptoms in the week following the Northridge Earthquake (California, 1994, M6.9). However, patients in the panic disorder group experienced significantly increased general anxiety and depression scores compared to the OCD group. That is, core diagnostic OCD or panic symptoms did not worsen but general anxiety and depressive symptoms did for the panic disorder patients.

An earlier study (Stout & Knight, 1989) explored the emotional and cognitive impact of a serious flood on 121 psychiatric inpatients who were evacuated and relocated for 2 weeks. At 2 months post-evacuation, of those patients who returned a follow-up "flood impact" survey ($n = 19$), only three experienced ongoing fears or dreams about the flood. Based on qualitative survey responses from these patients, Stout and Knight reported that post-flood the emphasis in therapy on developing

coping skills, as well as patients' sense of unity with staff and other patients, appeared to buffer an exacerbation of symptoms. However, the low follow-up response rate limits the conclusions of the study.

One study on the impact of the Great East Japan earthquake (2011) on psychiatric patients found that only 5.4% of the 294 outpatients demonstrated a change in symptoms at 2 months post-event: 4.1% had worse symptoms and 1.4% improved (Funayama & Mizushima, 2013). A further study on the same event investigating 1,273 psychiatric outpatients at 1 month post-earthquake found that most patients experienced minimal change in their psychological disorder; however, those with bipolar (23.4%), anxiety, or somatoform disorders (13.8%) were more likely to experience increased symptoms (Matsumoto et al., 2014).

In a review of 33 patients with a severe mental illness who were exposed to the Canadian Ice Storm (1998) and endured several days without power and displacement from their homes, those with existing psychological disorders were no more likely to be admitted to hospital during the storm than at other times, with only one person requiring hospitalisation due to storm-related distress (McMurray & Steiner, 2000). The remainder of the patients reported that they experienced no significant distress. The authors suggested that psychiatric patients may not have experienced significant difficulties during and after the crisis because the integrity of the service delivery structure was maintained, and patients were assured continued access to psychiatric care. However, there may have been more complex situational factors responsible for this outcome (e.g., access to support and/or food).

In summary, research exploring the psychological impact of disasters on mental health patients demonstrates that pre-existing psychopathology increases symptom severity in some situations, although not uniformly. Likewise, some diagnostic groups may be more likely to have elevated distress compared to others. Many of the previous studies have relied on data obtained well after the disaster event, with very few investigating the impact immediately following the event. Further, there is very little known about the effects of disasters on patients with pre-existing psychological disorders who were receiving psychological treatment at the time of the event, particularly an earthquake.

Research in the general population (Ozer et al., 2003) as well as with survivors of the 2010 Canterbury, Aotearoa

New Zealand, earthquake demonstrated *peritraumatic distress* (distress experienced during and immediately after a traumatic event) as a factor in post-trauma outcomes (Dorahy & Kannis-Dymand, 2012). Similarly, Thomas et al. (2014) noted that personality traits may play a complex role in the development of posttraumatic symptomology following trauma and peritraumatic distress. Specifically, temperament appeared to be more related to the intensity of symptomology, whereas the interpersonal component related more to the duration of experiencing distress. Further, a recent review suggested that personality temperaments such as harm avoidance, behavioural inhibition, hypervigilance, and trait anxiety contribute to PTSD symptomology following trauma (Allen et al., 2019).

The Current Study

At 4.35 a.m. on September 4th, 2010, the New Zealand city of Christchurch was struck by a M7.1 earthquake (i.e., the Darfield earthquake). This earthquake caused significant physical damage to the city's buildings, including loss of homes and businesses, but no deaths occurred. In the period following the earthquake, power and water were unavailable for many days (Dorahy & Kannis-Dymand, 2012). Between September 2010 and February 2011, Christchurch experienced a further 4,000 aftershocks, including a M5.9 earthquake on December 26th, 2010 (GeoNet, 2011; Stramondo et al., 2011). Previous investigations of the Christchurch community following the September 2010 earthquake documented elevated levels of depression, GAD, and acute stress disorder (Kannis-Dymand et al., 2015).

This exploratory study examined the effects of the 2010 Darfield earthquake on outpatients attending a specialist anxiety disorder service, who had a diagnosis of at least one primary anxiety disorder at the time of the disaster. In addition, the study investigated the relationships between pre-earthquake psychopathology (i.e., anxiety and depression), distress during the earthquake (i.e., peritraumatic distress), psychopathology following the event (i.e., anxiety, depression, and posttraumatic stress symptoms), and impairment following the event. We also evaluated the relationship between personality and post-earthquake psychopathology, as well as situational factors including support immediately following the earthquake, perceived threat of the earthquake/aftershocks, and concern over the uncontrollable nature of the earthquake/aftershocks. Substance and alcohol use pre- and post-earthquake was also evaluated.

Method

Participants

The sample ($N = 37$) comprised 67.6% females, aged 21 to 63 ($M = 36$ years, $SD = 13.29$). The mean age of male participants was 38 years (range 18-63, $SD = 13.91$). Fourteen (37.8%) participants were single, 19 (51.4%) were married or in committed relationships, and four (10.8%) were divorced or separated. Thirty-five percent were parents. All participants had a diagnosis of at least one DSM-IV-TR disorder (American Psychiatric Association, 2013) and were under the care of the Anxiety Disorders Service (ADS), Canterbury District Health Board, Christchurch, New Zealand, before the earthquake. Specifically, 51.4% of the sample was diagnosed with GAD, 13.5% were diagnosed with depression, 10.8% were diagnosed with OCD, 10.8% were diagnosed with a specific phobia, 5.4% were diagnosed with bi-polar disorder, 2.7% were diagnosed with panic disorder (with agoraphobia), and 5.4% were diagnosed with multiple disorders.

Measures

Peritraumatic distress. The *Peritraumatic Distress Inventory* (PDI; Brunet et al., 2001) is a 13-item self-report measure which quantifies emotional distress during and immediately after a traumatic event. Instructions for the PDI include rating the extent to which each item (e.g., "I felt sadness and grief") was experienced on a 5-point Likert-type scale (0 = Not at all to 4 = Extremely true), resulting in a total score between 0 and 52, with higher scores indicative of elevated distress. The PDI has good internal consistency ($\alpha = .83$), test-retest reliability, and convergent and divergent validity (Brunet et al., 2001; Cénat & Derivois, 2014). The instructions for the PDI were modified to ask participants specifically about their experience during the earthquake.

Depressive symptoms. The *Beck Depression Inventory* (BDI-II; Beck et al., 1996) is a 21-item self-report measure for screening and assessing the severity of depressive symptoms over the past fortnight. Responses to each item consist of four statements ranging in score from 0 to 3, arranged in increasing severity about a particular symptom of depression (e.g., "I do not feel sad"; "I am so sad and unhappy that I can't stand it"). The 21 items are summed to obtain a total score. A total score of 0 to 13 is considered minimal range, 14 to 19 is mild, 20 to 28 is moderate, and 29 to 63 is severe. The BDI-II has been reported to be highly reliable with strong psychometric properties (Beck et al., 1996; Segal et al., 2008).

Anxiety symptoms. The *Beck Anxiety Inventory* (BAI; Beck et al., 1988) is a 21-item scale for measuring the severity of self-reported anxiety. Participants rated the extent to which each item (e.g., “unable to relax”) was experienced during the previous week, using a scale ranging from 0 to 3 (0 = Not at all to 3 = Severely). A total score is obtained by summing all items; scores of 0 to 7 are considered minimal range, 8 to 15 is mild, 16 to 25 is moderate, and 26 to 63 is severe. The BAI is psychometrically sound and has high internal consistency (ranges from .92 to .94) and test-retest (1 week interval) reliability (.75; Beck et al., 1988).

Posttraumatic stress. The *PTSD Checklist – Civilian version* (PCL-C; Blanchard et al., 1996) is a 17-item questionnaire measuring posttraumatic stress symptomology. Participants rated the extent to which they had been bothered in the last month by items (e.g., “repeated disturbing memories, thoughts or images of a stressful experience from the past”) using a 5-point Likert-type scale (1 = Not at all to 5 = Extremely). The PCL-C has demonstrated good psychometric properties, validity, and excellent internal consistency ($\alpha = .90$; Gelaye et al., 2017).

Personality factors. The *Temperament and Character Inventory* (TCI-R; Cloninger et al., 1994) is a 240-item self-report questionnaire measuring seven dimensions of personality, including four temperament dimensions (i.e., novelty seeking, harm avoidance, reward dependence, and persistence) and three character dimensions (i.e., self-directedness, cooperativeness, and self-transcendence). Participants rated the degree to which each item was true or false, using a Likert-type scale ranging from 0 to 5 (0 = Definitely false to 5 = Definitely true); scores were obtained for each subscale. The factorial structure of the TCI-R is well-defined (Cloninger et al., 1994). All dimensions have consistently obtained high internal consistency (α ranging from .79 to .91; Martinotti et al., 2008).

Work and social impairment. The *Work and Social Adjustment Scale* (WSAS; Mundt et al., 2002) is a five-item self-report questionnaire measuring the degree of impairment individuals were currently experiencing at work and socially. Each item (e.g., “Because of my mental health, my ability to work is impaired.”) is rated on an 8-point scale (1 = Not at all to 8 = Very severely), with higher scores indicating higher levels of impairment. However, for this study items were reworded to target the mental responses to the earthquake, rather than general mental health (e.g., “Because of my reactions

to the earthquake and aftershocks, my ability to work is impaired.”). The WSAS has good internal consistency ($\alpha = .70$ to .94), test-retest reliability ($r = .73$), and associations with existing measures and psychopathology (e.g., depression, obsessive-compulsive symptoms; Mundt et al., 2002).

General information. Age, gender, marital status, and the number of children were included. Further items evaluated were: the support they perceived they received after the earthquake, rated using a 5-point scale (1 = Not at all to 5 = Excellent); how concerned they were by the uncontrollable nature of the earthquakes and aftershocks (1 = Not at all to 5 = Extremely); their level of perceived threat during the earthquakes and aftershocks (1 = Not at all to 5 = Extremely); and pre- and post-earthquake consumption of alcohol and illicit drugs per week (1 = None to 5 = 20+ drinks/drugs).

Procedure

Clinical assessments were completed by the ADS multidisciplinary clinicians, as per standard practice, when the patients were accepted to the outpatient service for treatment prior to the earthquake. This included the diagnosis of a present psychological disorder and additional assessment through self-report questionnaires (i.e., the BDI-II and the BAI). All participants were under the care of an ADS clinician when the earthquake occurred on September 4th, 2010. Following institutional ethics committee approval, participants were invited to complete a second set of self-report questionnaires (i.e., BDI-II, BAI, PDI, TCI-R, PCL-C, WSAS, and general information items) in December 2010, 3 months post-earthquake. This occurred during planned appointments with patients in December 2010. Patients without scheduled appointments during this period were contacted by their clinician, informed about the research, and invited to participate by completing the questionnaires, returning via a prepaid envelope. Patients were informed that participation in the study would not affect their treatment at the ADS, that participation was voluntary, and they could withdraw from the study at any time.

Data analyses. Data were analysed using SPSS (Version 23). All variables were checked for normality, linearity, and spread. To investigate relationships between the BDI-II, BAI, PDI, TCI-R, PCL-C, WSAS, and general information items (i.e., concern over uncontrollably and threat; alcohol and substance use), bivariate correlations were performed. Pairwise cases were excluded except for the correlations involving the TCI-R, as cases had

missing data exceeding 10% (Osborne & Overbay, 2004); a listwise removal procedure was used. The small sample size was considered when planning the analysis; sample sizes of 25 (David, 1938) and 30 (Field, 2013) are adequate for correlational analyses, with consideration to the limitation of detecting smaller effects. To investigate differences between drug and alcohol consumption and psychopathology (anxiety, depression) between pre- and post-earthquake scores, four paired sample *t*-tests were performed. Correlations were interpreted using Cohen's (1988) suggestions (.10 = *small*, .30 = *medium*, .50 = *large*).

Results

Descriptive statistics showed that all variables were of appropriate normality, linearity, and spread (see Table 1). Of note, post-earthquake, 11 participants had PCL-C scores indicating PTSD, 6 participants had BAI scores in the severe range, and 6 had BDI-II scores in the severe range.

Relationships between Psychopathology, Peritraumatic Distress, and Impairment

All data conformed with assumption tests, and pairwise cases were excluded due to non-random data removal. Bivariate correlations showed that pre-earthquake anxiety had a significant medium-to-strong positive relationship with pre-earthquake depression ($r = .54$), peritraumatic distress ($r = .46$), post-earthquake anxiety ($r = .72$), and post-earthquake depression ($r = .40$). Pre-earthquake depression had a significant medium-to-strong relationship with post-earthquake anxiety ($r = .42$), post-earthquake depression ($r = .64$), and PTSD ($r = .52$). Peritraumatic distress strongly and positively related to post-earthquake anxiety ($r = .59$), posttraumatic stress ($r = .66$), and impairment following the earthquake ($r = .59$). Finally, post-event psychopathology factors (anxiety, depression, and posttraumatic stress) were significantly

correlated and had a moderate positive relationship with impairment ($r_s = .50, .40$, and $.44$ respectively). The means, standard deviations, internal consistency, and bivariate correlations can be found in Table 1.

Relationships with Temperament and Characteristic Dimensions

Regarding personality dimensions, all data conformed with assumption tests and listwise cases were excluded due to randomised missing data attributed to the length of the TCI-R, leaving a sample of 25 participants for the analysis. As per classifications suggested by Gutiérrez-Zotes et al. (2004), the mean scores for harm avoidance ($M = 122.74$) were considered very high, novelty seeking ($M = 97.66$), reward dependence ($M = 96.60$) self-directedness ($M = 65.37$) and persistence ($M = 106.37$) were average, and self-transcendence ($M = 126.69$) and cooperativeness ($M = 127.56$) were low. Bivariate correlations showed that harm avoidance was significantly and positively correlated with post-earthquake anxiety ($r = .58$), persistence was negatively correlated with post-earthquake anxiety ($r = -.41$), and self-directedness was negatively related to post-earthquake depression ($r = -.64$). Posttraumatic stress did not significantly correlate with any of the temperament and characteristic dimensions. Table 2 shows the means, standard deviations, internal consistency, and bivariate correlations.

Relationships with Threat, Uncontrollability, and Support

Bivariate correlations showed that threat perception of the earthquake was significantly and positively correlated with peritraumatic distress during the earthquake ($r = .67$) and post-earthquake impairment ($r = .42$). Concern over the earthquake's uncontrollability was significantly and positively correlated with post-earthquake anxiety ($r = .34$) and peritraumatic distress ($r = .59$). Threat perception

Table 1
Descriptive Statistics and Bivariate Correlations of Psychopathology, Distress, and Impairment Variables

Variable	<i>M</i>	<i>SD</i>	<i>N</i>	α	Pre-BAI	Pre-BDI-II	PDI	Post-BAI	Post- BDI-II	PCL-C
Pre-BAI	20.68	13.07	28	-						
Pre-BDI-II	20.71	13.34	28	-	.54*					
PDI	16.05	10.24	37	.89	.46*	.22				
Post-BAI	15.28	11.87	36	.94	.72**	.42*	.59**			
Post-BDI-II	15.49	14.07	35	.96	.40*	.64**	.27	.54**		
PCL-C	32.52	11.88	25	.95	.27	.52*	.66**	.55*	.64**	
WSAS	4.65	7.98	37	.94	.29	.29	.59**	.50*	.40*	.44*

Note. * $p < .05$; ** $p < .001$; reliability coefficients for pre-earthquake anxiety/depression not available, due to data loss in February 2011 earthquake. BAI = anxiety; BDI-II = depression; PDI = peritraumatic stress; PCL-C = posttraumatic stress; WSAS = work and social impairment

of the aftershocks was significantly and positively related to posttraumatic stress ($r = .50$), peritraumatic distress ($r = .63$), and impairment ($r = .46$). Concern over the aftershocks' uncontrollability was positively related to peritraumatic distress ($r = .51$). Support following the earthquake was negatively related to post-earthquake depression ($r = -.39$), posttraumatic stress ($r = -.71$), and peritraumatic distress ($r = -.37$). Table 3 shows the means, standard deviations, and bivariate correlations.

Changes in Alcohol/Drug Consumption and Psychopathology

All data met the appropriate assumptions for the analyses. Four paired samples t -tests results showed no significant differences in mean scores for alcohol ($t(36) = 0.62, p = .539$) and drug consumption ($t(36) = 1.43, p = .160$). However, this was not the case for psychopathology, as both anxiety ($t(36) = 3.30, p = .003$)

and depression ($t(36) = 2.14, p = .042$) scores were lower post-earthquake. The means of each group, along with t -scores, are presented in Table 4.

Discussion

The September 2010 earthquake in Canterbury presented the ADS with a unique opportunity to explore the impact of a disaster on their current clinical outpatients. To our knowledge, this is one of few studies exploring pre- and post-disaster measures, as well as relationships between temperament, character, and anxiety variables in an outpatient clinical population. The purpose of this exploratory study was to investigate: a) the relationships between pre-earthquake psychopathology (i.e., anxiety and depression), post-earthquake psychopathology (i.e., anxiety, depression, and posttraumatic stress), peritraumatic distress, impairment, personality dimensions (novelty seeking, reward dependence, harm avoidance, persistence, self-transcendence, cooperativeness, and self-directedness), and situational factors (i.e., support, perceived threat, concern over uncontrollability); and b) the differences between alcohol/drug consumption and anxiety and depression measurements before and after the earthquake.

Table 2
Descriptive Statistics for Temperament and Character Variables; Correlations with Psychopathology, Distress, and Impairment

Variable	M	SD	α	Post-BAI	Post-BDI-II	PCL-C
Novelty Seeking	97.66	15.16	.63	-.23	.16	.02
Reward Dependence	96.60	17.37	.77	.05	-.09	-.18
Harm Avoidance	122.74	18.47	.80	.58*	.37	.22
Persistence	106.37	21.30	.89	-.41*	-.27	-.04
Self-Transcendence	126.69	20.56	.76	-.27	-.17	.09
Cooperativeness	127.56	17.26	.74	-.17	-.34	-.33
Self-Directedness	65.37	14.25	.71	-.34	-.64*	-.33

Note. $N = 25$; * $p < .05$; ** $p \leq .001$; BAI = anxiety; BDI-II = depression; PCL-C = posttraumatic stress

Table 3
Descriptive Statistics of General Items and Bivariate Correlations with Psychopathology, Distress, and Impairment Variables

Variable	M	SD	N	Post-BAI	Post-BDI-II	PCL-C	PDI	WSAS
Initial EQ - Threat	3.27	1.45	37	.29	.10	.32	.67**	.42*
Initial EQ - Uncontrollable	3.27	1.31	37	.34*	-.06	.19	.59**	.12
Aftershocks - Threat	2.43	1.14	37	.25	.28	.50*	.63**	.46*
Aftershocks - Uncontrollable	2.70	1.08	37	.29	.08	.29	.51**	.17
Support	4.17	.89	37	-.31	-.39*	-.71**	-.37*	-.29

Note. * $p < .05$; ** $p \leq .001$; BAI = anxiety; BDI-II = depression; PDI = peritraumatic stress; PCL-C = posttraumatic stress; WSAS = work and social impairment

Table 4
Changes in Mean Alcohol/Drug Consumption and Psychopathology

Variable	Pre-Earthquake Mean	Post-Earthquake Mean	Mean Change	t	p
Alcohol Consumption	2.00	1.92	-0.08	0.62	.539
Illicit Drug Consumption	1.24	1.19	-0.03	1.43	.160
BAI	20.89	14.78	-6.11	3.30	.003
BDI-II	19.35	14.89	-4.46	2.14	.042

Note. BAI = anxiety; BDI-II = depression

Relationships Between Psychopathology, Peritraumatic Distress, and Impairment

Psychopathology before the disaster was associated with several post-disaster negative impacts. Pre-earthquake anxiety was shown to positively relate to peritraumatic distress experienced during the earthquakes and post-earthquake anxiety and depression. These relationships are consistent with the existing research and theory, as those with trait elevated levels of anxiety are more likely to experience higher levels of peritraumatic distress during a traumatic event (Schweizer et al., 2017). Similarly, pre-earthquake depression was positively associated with both post-earthquake anxiety and depression and posttraumatic symptomology. This may be due to depression often occurring comorbidly with posttraumatic stress (Adams et al., 2019; Rosebrock et al., 2019), because of the effect that trauma has on the individual or because of secondary factors such as loss, lack of support, or a reduction in cognitive resources.

Peritraumatic distress during the event was shown to be positively related to post-earthquake anxiety, posttraumatic stress, and impairment, supporting previous research on peritraumatic reactions (Kannis-Dymand et al., 2019; Sugar & Ford, 2012). Unsurprisingly, our results indicated that the more peritraumatic distress participants experienced during the earthquakes, the more psychopathology was present afterward. This relationship with post-earthquake psychopathology also appeared to increase work and social impairment, as evidenced by significant positive correlations between impairment and post-earthquake anxiety, depression, and posttraumatic stress. These results are consistent with earlier findings that peritraumatic distress is a strong predictor of peritraumatic symptomology (Marmar et al., 2006; Vance et al., 2018).

Relationships with Temperament and Characteristic Dimensions

There was a positive relationship between post-earthquake anxiety and harm avoidance, and a negative relationship with persistence in line with previous research (Farmer et al., 2003; Jylha & Isometsa, 2006; Marteinsdottir et al., 2004; Matsudaira & Kitamura, 2006). Individuals who score highly on harm avoidance are characterised by excessive worrying, pessimism, fearfulness, doubtfulness, and being easily fatigued (Cloninger et al., 1993). It is therefore understandable that such people high on these traits in our sample, exposed to a primary earthquake event followed by unpredictable and recurrent aftershocks, experienced

higher anxiety post-earthquake. In contrast, persistent individuals have been shown to perceive frustration and fatigue as a personal challenge and do not give up easily (Rossi et al., 2011), as they are industrious and determined (Cloninger et al., 1997). This persistence may have allowed participants to re-engage with everyday life more effectively, therefore reducing their post-earthquake anxiety as indicated in the present sample.

Post-earthquake depression was negatively related to self-directedness, in alignment with previous research (Jylha & Isometsa, 2006; Lim et al., 2018). Self-directedness is a trait of self-determination involving “willpower” and the perception of an integrated organised self (Cloninger et al., 1993; 1994). Participants in the current study with more self-directedness appeared potentially more resilient to the adversity caused by the disaster and its aftermath. Posttraumatic stress was not significantly related to personality temperaments or characteristics.

Relationships with Threat, Uncontrollability, and Support

Peritraumatic distress during the earthquake was significantly, positively related to variables concerning the uncontrollability and threat of the earthquakes and aftershocks and post-disaster anxiety, posttraumatic stress, and impairment in work or social domains. Other than the expected relationships between the perceived threat and experienced peritraumatic distress, this finding suggests that concerns over the uncontrollability of the earthquake and aftershocks affect the amount of peritraumatic distress experienced, which is consistent with Dorahy and Kannis-Dymand’s (2012) results.

Peritraumatic distress was negatively related to social support. Support appears to play an important role in mitigating distress, possibly by altering patients’ retrospective, negative perceptions of the earthquake at the time of the research. Alternatively, those who received support may not have been as severely affected by the event. Support is known to increase self-efficacy, change coping perceptions, and provide distraction and an emotional outlet (House et al., 1988; Nurullah, 2012; Taylor, 2011). Anecdotally, the ADS staff contacted all patients under their care within days after the earthquake and provided ongoing support; however, support was not specifically quantified in this study regarding ADS clinical support versus family or community support.

Of the psychopathology variables, post-earthquake anxiety was related to concern about the uncontrollability of the initial earthquake, which is consistent with

research implicating a sense of loss of control in the maintenance and origins of anxiety (Mineka & Kelly, 1989). Posttraumatic stress was positively related to the perceived threat of the subsequent aftershocks, which is consistent with posttraumatic stress being maintained by an ongoing perception of threat. Support was negatively related to both depression and posttraumatic stress, indicating that more support was related to less symptomology. This is consistent with a multitude of literature surrounding social support and mental health (Wang et al, 2018). Finally, work or social impairment following the earthquakes was associated with perceptions of threat for both the earthquake and the aftershocks. This could possibly be from either the natural associated emergent psychological distress or from damage to participants' lives and/or property. Hobfoll's (1989) conservation of resources theory explains that people strive to attain and protect valued resources and perceive the loss of these resources as personally distressing.

Changes in Alcohol/Drug Consumption and Psychopathology

There were no significant differences in alcohol and drug intake between the two time points. This was unexpected, considering substance abuse is used by some as a method of coping with stress; however, in a study of 10 disasters it was found only 16% of the sample coped with the disaster by consuming alcohol (North et al, 2011). Given this is a clinical population with anxiety disorders who were in treatment, they may have utilised the coping strategies they had learnt in therapy to manage stress or employed their anxiety disorder-related, maladaptive strategies such as safety behaviours or avoidance.

Anxiety and depression in this outpatient sample decreased significantly from pre- to post-earthquake. This is particularly interesting and contrary to our clinical expectations. However, it is consistent with the finding that acute inpatient psychiatric admissions in Christchurch following the February 2011 earthquake were reduced (Beaglehole et al., 2015). Notably, there is substantial empirical evidence that individuals with a psychological disorder may adjust well in the post-disaster period (Bromet et al., 1982; De Lisis et al., 2003; Frattaroli, 1991; Lachance et al., 1994; Sporty et al., 1979). Earlier studies have shown that clinical populations may have a higher threshold for, or improved resilience to, trauma (Lachance et al., 1994; Sporty et al., 1979). McMurray and Steiner (2000) and DeLisis et al. (2003) suggest that psychiatric patients may not

experience significant difficulties during a crisis and in the post-disaster period because the integrity of the service delivery structure was maintained, and patients were assured continued access to psychiatric care. This is consistent with the current patient sample as the ADS clinicians ensured they contacted their patients soon after the earthquake and provided continuity of care. However, there may be other reasons for resilience that were not directly evaluated in the current study but have been found to contribute in other research, such as socioeconomic advantage, employment status, and experiencing fewer disaster-related stressors in the aftermath of a disaster (Kukihara et al., 2014; Lowe et al., 2015).

Limitations

One limitation of this study is the small sample size which limits the generalisability of the results to the broader population. The small sample size combined with the high number of items on the primary measures produced a ratio of variables to cases that was less than statistically ideal; this means that more robust data analyses could not be achieved and there may have been difficulties identifying smaller effect sizes. Further, using self-report measures in place of objective measures such as structured clinical interviews means caution is required when interpreting our findings.

Of note, because the ADS building and its contents were destroyed in the February 2011 earthquake, staff only managed to salvage the present 37 participants' hardcopy de-identified surveys and there may in fact have been other surveys that were destroyed. Due to this loss of surveys and ADS's records, the exact number of patients invited to participate in this study and the documentation on who did, and who did not, take part were lost and not able to be reported here. However, considering the specificity of the clinical sample and challenging circumstances for both patients and ADS staff being involved in the disaster, the uniqueness of the sample provides significant utility for research and practitioners to consider.

Implications and Future Directions

The significant decrease in anxiety and depression after the disaster indicates that the type of psychological service provided in the aftermath and assumptions about increased distress and vulnerability need to be considered carefully. Disasters are not unusual events and often involve large numbers of people, which underscores the importance of clinicians working in post-disaster environments to accurately identify those who may have

increased risk of developing psychopathology. Doing so means that appropriately focused early intervention can be implemented to treat initial acute distress and potentially prevent long-term negative psychological consequences. Although the current study found that the intensity of pre-existing psychopathology (i.e., BAI and BDI-II scores) was associated with worse psychological functioning after the event for some participants, it also revealed that at a group level, those with a pre-existing psychiatric condition experienced less psychopathology after the traumatic event. This could potentially be due to some participants having developed effective tools for coping with stress, family support, ADS's integrity of continued care, or community or government responses that may be protective for mental health.

Identifying the key variables that influence responses to trauma in outpatients was beyond the scope of this study, but this would be an important focus for future studies. That is, what evidence-based strategies during the disaster and its aftermath (e.g., psychological first-aid, cognitive behavioural intervention) enhance resilience in outpatients under current care. Further, while we demonstrated that personality features should be considered, it is likely that a wider range of influences (e.g., social support, past experiences) are important for individuals with pre-existing psychiatric conditions who are in treatment at the time of a disaster.

In conclusion, our research demonstrated that outpatients with an anxiety disorder who experienced an earthquake and ongoing aftershocks had reduced anxiety and depression post-earthquake. However, those participants with higher anxiety and depression levels pre-earthquake were more likely to experience post-disaster anxiety, depression, and posttraumatic stress. Peritraumatic distress was also a significant factor in post-earthquake anxiety, posttraumatic stress, and work and social impairment. Personality temperaments, such as harm avoidance, self-directedness, and persistence were also demonstrated to be important in the development of PTSD symptomology, in that they may act as attenuating or agitating factors in the cognitive-affective reaction to stress. Promisingly, support and service integrity may have beneficially influenced post-earthquake depression and posttraumatic stress.

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