Psychological impact of the Canterbury earthquakes on university staff

Caroline Bell, Frances Carter, Joseph Boden, Tim Wilkinson, Jan McKenzie, Anthony Ali

**ABSTRACT**

**AIM:** To assess the impact of the Canterbury earthquakes on the psychological functioning of university staff, to identify predictors of adverse psychological functioning and to survey how different aspects of work roles (academic, teaching, clinical, administrative) were affected.

**METHODS:** Eighteen months following the most severe earthquake, 119 staff from the University of Otago based in Christchurch completed a retrospective survey. This included demographic information, a measure of earthquake exposure, standardised and self-rated measures to identify psychological distress and measures of how people perceived different aspects of their work roles were impacted.

**RESULTS:** A substantial minority of staff reported moderate-extreme difficulties on the Depression, Anxiety and Stress Scale (DASS) subscales 18 months following the most severe earthquake (Depression=9%; Anxiety=3%; Stress =13%). Predictors of distress were higher levels of exposure to earthquake-related stressors, neuroticism and prior mental health disorders. There was an association between impact and work roles that was hierarchical; academic and administrative roles were most affected, followed by teaching with the least impact on clinical roles.

**CONCLUSIONS:** This study shows that psychological symptoms following a disaster are common, but in a retrospective survey most people report that these improve with time. A minority however, continue to report difficulties which persist even 18 months post disaster. It also gives insights into how different work roles were impacted and from this makes suggestions for how organisations can support staff over difficult times.

In 2010 and 2011, the region of Canterbury, New Zealand, was struck by a series of powerful earthquakes and aftershocks. The first earthquake (4 September, 2010) measured 7.1 on the Richter scale and resulted in relatively minimal physical damage to buildings and infrastructure. The second major earthquake (22 February 22, 2011) measured 6.3 on the Richter scale, but was situated closer to Christchurch city and had more devastating effects. Despite its relatively moderate magnitude, it generated some of the highest peak ground accelerations ever recorded, and resulted in 185 deaths, multiple injuries and widespread damage to property and infrastructure. There were further earthquakes in June 2011 (magnitude 6.3) and December 2011 (magnitude 6.0) which resulted in more damage, but no loss of life. In addition, there were more than 10,000 aftershocks over 2010–2011.

As has been previously described after natural disasters, the earthquakes set off a train of complex adverse events for many people. Effects included not only exposure to the earthquakes and aftershocks, but also significant secondary stressors (damage to homes and workplaces, difficulties with insurance and delays in rebuilding). Previous research has assessed the personal, emotional and social consequences of natural disasters, and has shown that exposure to a disaster, and the life events that follow, may lead to adverse consequences, including increased rates of mental health problems and psychological distress. Studies which have focused particularly on the impact of disasters on working populations have reported similar findings with increased rates of mental health difficulties and distress. These studies have also suggested that although being employed is often considered a
measure of resilience, this may not actually be the case, and people at work may also have unmet mental health needs after a disaster. This research is important in order to inform employers of their staff's needs and for future disaster planning in order to support workers to continue to function.

This study aimed to assess the impact of the Canterbury earthquakes on the psychological functioning of university staff, to identify predictors of adverse psychological functioning and to survey how different aspects of work roles (academic, teaching, clinical and administrative) were affected. Staff in this study all worked at a medical school which was significantly damaged by the earthquakes. This resulted in the relocation of many facilities, with the main building remaining closed for almost 18 months after the February 2011 earthquake. In addition, clinical facilities, where many staff worked, also suffered damage resulting in loss of space and changing venues for teaching and clinical work.

Methods
Participants and survey administration
All 394 university staff at the Christchurch campus, University of Otago, were emailed inviting them to participate in an electronic survey asking about their experiences relating to the earthquakes. Surveys were sent in August 2012, which was 18 months following the most significant earthquake (February 2011). If staff did not respond, three email reminders were sent over the course of the next month. Staff were given relevant information about the study and gave consent to participate in the survey. The study was approved by the University of Otago Ethics Committee.

Measures
The survey was designed to assess a broad range of variables to enable evaluation of the impact of the earthquakes on the psychological functioning of staff. This included demographic information, a measure of earthquake exposure, standardised and self-rated measures to identify psychological distress and symptoms, and measures of how participants perceived different aspects of their work roles had been impacted. It took 20-30 minutes to complete. The following outlines the information collected.

Demographics
Age, gender, ethnicity (New Zealand European, Māori, Samoan, Chinese, Indian, Malay, Middle Eastern, other), relationship status (single, in a relationship, or married/de facto/civil union) and years spent living in New Zealand were reported by participants. The survey also asked about other factors that may have impacted on demands on staff, such as whether they had dependent children or others (such as elderly parents). Participants were asked to best describe their job (identifying one category from academic, joint academic/clinical, clinical, information technology, library, secretarial, other).

Measure of exposure to earthquake-related stressors
The vast majority of earthquake-related stress was related to one event (the February 2011 earthquake) and the vast majority of respondents in the sample (>90%) had been present for this, with the result being that mere presence during the earthquake would not be an appropriate measure of exposure to this major earthquake. Furthermore, previous research has indicated that when attempting to measure exposure to a natural disaster such as an earthquake, it is necessary to take into account not only exposure to the event itself, but also exposure to the sequelae of the event including lingering disruption and difficulties related to repairs and rebuilding and effects on members of the individual’s social network. Previous studies have used different approaches to measuring exposure, such as the number of stressful exposures as used in scoring for life stress scales, or ordinal measures about the relative severity and impact of different components of a disaster. In the current survey, earthquake exposure was measured using a method from a previous study of the effects of earthquake exposure on a longitudinal sample in which the general principles of the validity of using such a scale were established. Participants were asked whether they were in Christchurch for each of the major earthquakes (yes/no) and also about their exposure to other stressors in order to assess stress burden.
This included questions such as whether they knew anyone who had been killed or seriously injured by the earthquakes, whether their home had been damaged and whether they had been affected by uncertainty about insurance issues in relation to this. The questions concerning home damage and insurance problems were rated on a five-point scale ranging from “not at all” to “a great deal”, while the question concerning whether the respondent had known someone who had been killed or injured in the earthquake was answered using a dichotomous response format (yes/no). In order to examine associations between psychological distress and exposure to these issues arising from the earthquake sequence, questions about home and interpersonal issues were used to create an overall measure of exposure to severe stressors in the following manner. First, the two five-point measures (home damage, insurance difficulties) were converted into dichotomous measures in which those who endorsed the highest rating (“a great deal”) were given a score of 1, while those who endorsed any lower level of rating were given a score of 0. These dichotomous measures were then summed along with the dichotomous measure of whether the respondent knew anyone who had been killed or injured in the earthquake. The result of this summation was a count measure of the number of different severe stressors reported by respondents, ranging from 0 to 3. Because only three participants received scores of 3 on this measure, the count measure was then altered such that scores ranged from 0 to 2+ severe stressors.

Depression, Anxiety and Stress Scale
The Depression, Anxiety and Stress Scale (DASS) measures symptoms of depression, anxiety and stress in the past week. The current study used the 21-item version of the scale, which produces comparable results to the longer version. The DASS yields a total score indicating overall severity of symptomatology (all domains combined) plus subscale totals for depression, anxiety and stress. Subscale totals are categorised as normal, mild, moderate, severe and extreme. To ease interpretation, these categories were dichotomised as normal-mild and moderate-extreme. For the depression subscale, normal-mild was 0–13 and moderate-extreme 14–28. For the anxiety subscale, normal-mild was 0–9 and moderate-extreme 10–28. For the stress subscale, normal-mild was 0–18 and moderate-extreme 19–28.

Work and Social Adjustment Scale
The Work and Social Adjustment Scale assesses current self-rated impairment attributable to an identified problem (earthquakes and aftershocks in this case). Impact on five areas (work, home management, social leisure activities, private leisure activities and family and relationships) are rated on a 0 to 8 scale. Total scores range from 0–40.

Eysenck Personality Questionnaire (Brief Version)
The Eysenck Personality Questionnaire (Brief Version) assesses self-rated personality characteristics in adults on a 1–5 scale (1=not at all, 5=extremely). The scale consists of 24 items (12 extroversion, 12 neuroticism) and scores range from 12–60 for extroversion and 12–60 for neuroticism. In the current study, staff were asked to retrospectively rate their characteristics prior to the earthquakes. Scores for the extroversion and neuroticism subscales are reported here.

Connor-Davidson Resilience Scale
The Connor-Davidson Resilience Scale assesses resilience over the past month. The scale consists of 25 items rated on a 0–4 scale. The total score is a sum of the items with a range of 0–100.

Other self-rated questions
Health problems before and after the earthquakes
Participants rated the presence (yes/no) of health problems (mental and physical) prior to the earthquakes and currently.

At worst and current ratings: symptoms and substance use
Participants rated the severity of impact of the earthquakes, both at their worst and currently, on the following variables which were not described above: sleep, concentration, alcohol, and cigarette use. Severity of impact was originally rated as being none, mild, moderate or severe. These
ratings were dichotomised as none-mild and moderate-severe.

Impact on work roles

Participants rated on a 0–5 scale the extent that practical aspects of their job had been disrupted, for example by having to move offices or teach in unfamiliar venues. They also rated the severity of impact of the earthquakes, at worst and currently, on their ability to work in the following aspects of their jobs: academic, teaching, administrative and clinical, whichever were applicable to them. Many staff identified having multiple roles, including administrative and library staff, who identified as having roles in teaching, academic and clinical work. Degree of impact was rated as being none, mild, moderate or severe. These ratings were dichotomised as none-mild and moderate-severe.

Additional questions were asked about the impact on teaching and academic roles. Impact on teaching responsibilities were rated on a 1–4 scale (1=strongly agree, 4=strongly disagree) on questions about having less time to spend on teaching, the quality of their teaching, their accessibility and responsiveness as a teacher, the quality of the clinical experience they provided, the way in which the course was delivered and whether home/personal obligations had impacted. The impact on academic work was rated on a 1–4 scale on questions about writing papers, doing presentations, reviewing, taking on extra responsibilities, forming research collaborations, taking on studentships, taking on research students, attending meetings, participating in informal interactions with colleagues and continuing collection of data on existing projects.

Positive outcomes

Participants were asked whether anything positive had come out of the earthquakes on a dichotomous variable (yes/no) and by a question asking them to describe these positive outcomes as a free text answer.

Statistical analyses

Data were entered into the statistical analysis package SPSS (Version 20). Descriptive statistics were performed initially. In some cases, scales were converted into dichotomous measures because the distribution of responses were bimodal (almost none/a great deal) which meant that the use of full scales was superfluous and created difficulties for model estimation by inflating standard errors. Ratings before and after the earthquakes were compared using Chi-square and paired t-tests for categorical and continuous variables respectively.

Multiple regression models were fitted to the data for overall distress scores (DASS), earthquake exposure and covariate factors in two steps. In the first step, a model was fitted of the following form:

\[ Y = B_0 + B_1X_1 + e \] (EQ1)

where \( Y \) was the overall measure of distress on the DASS, \( X_1 \) was the count measure of exposure to severe earthquake-related stressors and \( e \) was an error term.

In the second step of the analyses, the covariate factors that were significantly (\( p<.05 \)) related to the overall measure of distress (Eysenck neuroticism; prior mental health disorders) were entered into the model EQ 1 in order to examine whether the associations between earthquake exposure and overall distress could be accounted for by neuroticism and prior mental health disorders. This model was of the form:

\[ Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + e \] (EQ2)

where \( X_2 \) was the continuous measure of neuroticism, and \( X_3 \) was the dichotomous measure of prior mental health disorders. Model fitting was conducted using SAS V9.3.

Results

Response rate

119 of the 394 staff (30%) invited to participate gave consent and completed the survey either partially or fully.

Participant characteristics

Participants were predominantly female (74%), with a mean age of 48.9 years (S.D 10.3, range 25–71 years). Most were of New Zealand European ethnicity (82%) with 5% identifying as Māori. The mean number of years lived in New Zealand was 38 years (S.D 17.9, range 1–71 years). Most were in a long-term relationship (77%), 45% had dependent children and 24% had others (such as elderly people) dependent on them. 36% of participants described their
job as academic, 27% as secretarial, 18% as combined clinical/academic (doctors, nurses, psychologists, social workers with joint appointments with the University and District Health Board), 5% as either involved with the library or information technology and 13% as other. Demographic or other information was not available about staff who chose not to participate in the survey.

Earthquake and other exposure

Most participants (92%) were in Christchurch for the most severe earthquake in February 2011 (78% for September 2010, 85% for June and 87% for December 2011). Fifty-nine per cent were in Christchurch for all four major earthquakes.

Thirty-four per cent of respondents knew somebody who had been killed or badly injured in the earthquakes. Most participants’ homes had been damaged (92%), and in 28% this damage was rated as moderate (14%) or severe (14%). 40% reported being affected by uncertainty about house/land/insurance claims, and in 20% this was rated as being at least moderately affected.

Psychological effects

Table 1 shows scores on the self-report psychological scales. Mean (SD) scores are presented for scale totals and for DASS subscales, total and category subscale scores and the percentage in each category.

### Depression, Anxiety and Stress Scale (DASS)

The mean DASS total score was 14.7 (SD 16.0, range 0–84). Nine per cent of participants reported moderate-extreme difficulties on the DASS depression subscale, 3% on the DASS anxiety subscale and 13% on the DASS stress subscale. The vast majority of staff were in the normal-mild category on all three subscales (87–97%).

### Work and Social Adjustment Scale

The mean score was 9 (SD 8.7, range 0–36: higher scores reflect more impairment). Ten per cent of participants scored above 20, suggesting moderate or severe impairment in functioning. Twenty-nine per cent of participants scored between 10 and 20, suggesting significant functional impairment.

### Connor-Davidson Resilience Scale

The mean score was 68.9 (SD 12.8, range 36–98: lower scores reflect lower resilience).

### Eysenck Personality Questionnaire (brief version)

The extroversion mean score was 33.8 (SD 7.6, range 19–49). The neuroticism mean score was 23 (SD 7.5, range 12–49).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (SD), range or percentage in each dichotomous category</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DASS Total</strong></td>
<td>14.7 (16.0), range 0–84</td>
</tr>
<tr>
<td><strong>DASS Depression</strong></td>
<td></td>
</tr>
<tr>
<td>Categories</td>
<td></td>
</tr>
<tr>
<td>Normal-Mild</td>
<td>5.2 (6.5), range 0–34</td>
</tr>
<tr>
<td>Moderate-Extreme</td>
<td>90.8%</td>
</tr>
<tr>
<td></td>
<td>9.2%</td>
</tr>
<tr>
<td><strong>DASS Anxiety</strong></td>
<td>2.7 (4.3), range 0–20</td>
</tr>
<tr>
<td>Categories</td>
<td></td>
</tr>
<tr>
<td>Normal-Mild</td>
<td>96.7%</td>
</tr>
<tr>
<td>Moderate-Extreme</td>
<td>3.3%</td>
</tr>
<tr>
<td><strong>DASS Stress</strong></td>
<td>6.9 (7.1), range 0–2</td>
</tr>
<tr>
<td>Categories</td>
<td></td>
</tr>
<tr>
<td>Normal-Mild</td>
<td>87.5%</td>
</tr>
<tr>
<td>Moderate-Extreme</td>
<td>12.5%</td>
</tr>
<tr>
<td><strong>Connor-Davidson Resilience Scale</strong></td>
<td>68.9 (12.8), range 36–98</td>
</tr>
<tr>
<td><strong>Work and Social Adjustment Scale</strong></td>
<td>8.6 (8.7), range 0–36</td>
</tr>
<tr>
<td><strong>Eysenck Personality Q: Extroversion</strong></td>
<td>33.8 (7.6), range 19–49</td>
</tr>
<tr>
<td><strong>Eysenck Personality Q: Neuroticism</strong></td>
<td>23.1 (7.5), range 12–49</td>
</tr>
</tbody>
</table>
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Table 2: Associations between earthquake-related stressors and overall DASS Score, before and after adjustment for covariate factors (Eysenck neuroticism, prior mental health disorder).

<table>
<thead>
<tr>
<th>Measure</th>
<th>Model 1 (earthquake-related stressors only)</th>
<th>Model 2 (earthquake-related stressors; Eysenck neuroticism; prior mental health disorder)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unstandardised regression coefficient</td>
<td>SE</td>
</tr>
<tr>
<td>Earthquake-related stressors</td>
<td>2.07</td>
<td>1.03</td>
</tr>
<tr>
<td>Eysenck neuroticism</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Prior mental health disorder</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Associations between exposure to earthquake-related stressors and overall distress

An overall measure of exposure to earthquake-related stressors was created. This was used in multiple regression models to examine the associations between earthquake-related distress and overall distress, as measured by the DASS. In the first step of the analysis, a regression model was used to estimate the bivariate association between exposure to earthquake-related stressors and overall DASS score. In the second step of the analyses—in order to examine the extent to which linkages between exposure to earthquake-related stressors and overall DASS score could be accounted for by statistically significant (p<.05) covariate factors—the regression model was extended to include terms representing: a) scores on the measure of Eysenck neuroticism; and b) the dichotomous measure of prior mental health disorder. Results of these analyses are shown in Table 2, which depicts the unstandardised regression coefficients, standard errors, standardised regression coefficients and tests of statistical significance for each model. Table 2 shows:

1. Before adjustment, there was a statistically significant (p<.05) association between exposure to earthquake-related stressors and DASS score, with those experiencing higher levels of stress having higher scores on the DASS measure.

2. Adjustment for Eysenck neuroticism and prior mental health disorder did not materially alter the association between exposure to earthquake related stressors and DASS score which remained statistically significant (p<.05). In addition, both Eysenck neuroticism and prior mental health disorder were independently related to DASS score, with those reporting higher levels of neuroticism having higher DASS scores, and those reporting prior mental health disorder having higher DASS scores. The overall R² for the final fitted model was 0.26.

Results of these analyses suggest that those individuals who reported higher levels of exposure to earthquake-related stressors also reported higher levels of distress on the DASS. This association could not be explained either by neuroticism, or by prior mental health disorders. However neuroticism and/or prior mental health disorders independently contributed to higher DASS scores alongside the earthquake-related stressors.

Before and after the earthquakes: health problems, symptoms, substance use, mental and physical health problems

Participants reported an increase in mental health problems after the earthquakes (prior to earthquakes = 11%; following the earthquakes = 16%). Examples of mental health problems following the earthquakes included stress and other anxiety, mood or sleep-related difficulties. Participants also reported an increase in physical health problems following the earthquakes (prior to earthquakes = 27%; following the earthquakes = 37%). Examples of physical health problems following...
the earthquakes included a worsening of asthma and cardiac problems.

Table 3 shows the self-rated severity of impact of the earthquakes on a range of variables not covered in the psychological scales (sleep, concentration, alcohol and cigarette use) at worst and currently and whether treatment was received for these difficulties.

At worst, more than half of respondents reported moderate-severe effects on sleep (61%) and concentration (70%). A substantial minority also reported at worst moderate-severe effects on alcohol use (19%). There was no increase in cigarette use. Many of these impacts did not persist, i.e., were rated highly at their worst, but were lower by the time of the survey 18 months after the earthquakes.

At worst, 54% of participants reported that practical aspects of their job (e.g., having to move offices, working or teaching in unfamiliar venues) had been moderately to severely disrupted.

Different work roles were impacted differently. Eighty-seven per cent reported that at worst their ability in their academic role was moderately to severely affected. Eighty per cent reported that at worst their ability in their teaching role was moderately to severely affected. Seventy per cent reported that at worst their ability in their administrative role was moderately to severely affected. Sixty-one per cent reported that at worst their ability in their clinical role was moderately to severely affected. Many of these impacts were short lived, and at the time of the survey (18 months after the earthquakes) moderate to severe impacts were reduced. However, of those with academic roles, 53% reported that their ability to perform their academic role continued to be moderately to severely impacted, 40% their teaching roles, 33% their administrative roles and 19% their clinical roles.

Of participants with teaching responsibilities, the parts of their work identified as adversely affected were:
- Having less time to spend on teaching (47%); the quality of their teaching (15%); their accessibility and responsiveness as a tutor (19%); the quality of the clinical experience they provided (11%); and their responsiveness as a clinical teacher (8%). Twenty-two per cent identified that the way the course was delivered had changed and 13% reported that home/personal obligations had impacted on their ability to teach. Twenty-six per cent of participants reported that they felt that their ability to meet students’ needs had been moderately to severely affected. Of participants with

### Table 3: Severity of impact of earthquakes on symptoms, relationships and substance use at worst and currently (none-mild or moderate-severe), and whether treatment was received for these difficulties (percentage yes).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Severity percentage yes</th>
<th>Treatment received (either at worst or currently) percentage yes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At worst</td>
<td>Currently</td>
</tr>
<tr>
<td>Sleep</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None-Mild</td>
<td>39.3%</td>
<td>60.7%</td>
</tr>
<tr>
<td>Moderate-Severe</td>
<td>60.7%</td>
<td>39.3%</td>
</tr>
<tr>
<td>Concentration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None-Mild</td>
<td>30.3%</td>
<td>69.7%</td>
</tr>
<tr>
<td>Moderate-Severe</td>
<td>69.7%</td>
<td>30.3%</td>
</tr>
<tr>
<td>Alcohol Use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None-Mild</td>
<td>81.1%</td>
<td>18.9%</td>
</tr>
<tr>
<td>Moderate-Severe</td>
<td>18.9%</td>
<td>81.1%</td>
</tr>
<tr>
<td>Cigarette Use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None-Mild</td>
<td>95.4%</td>
<td>4.6%</td>
</tr>
<tr>
<td>Moderate-Severe</td>
<td>4.6%</td>
<td>95.4%</td>
</tr>
</tbody>
</table>

### Impact on work

Fifty-four per cent of participants reported that practical aspects of their job (e.g., having to move offices, working or teaching in unfamiliar venues) had been moderately to severely disrupted.

Different work roles were impacted differently. Eighty-seven per cent reported that at worst their ability in their academic role was moderately to severely affected. Eighty per cent reported that at worst their ability in their teaching role was moderately to severely affected. Seventy per cent reported that at worst their ability in their administrative role was moderately to severely affected. Sixty-one per cent reported that at worst their ability in their clinical role was moderately to severely affected. Many of these impacts were short lived, and at the time of the survey (18 months after the earthquakes) moderate to severe impacts were reduced. However, for those with academic roles, 53% reported that their ability to perform their academic role continued to be moderately to severely impacted, 40% their teaching roles, 33% their administrative roles and 19% their clinical roles.

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academic responsibilities, the parts of their work identified as adversely affected were: writing papers (46%); taking on extra responsibilities (46%); taking on research students (40%); doing presentations (39%); applying for grants (38%); taking on summer students (36%); forming research collaborations (31%); and reviewing papers (26%). Aspects of clinical and administrative responsibilities adversely affected were not asked about in this survey.

Positive outcomes
66.7% of participants reported that positive things had come about from the earthquakes. These included themes involving: having a greater appreciation of the things that really mattered in life; having positive effects on relationships with colleagues, family and community; being less materialistic; and “living for the day”.

Discussion
The current study aimed to assess the impact of the Canterbury earthquakes on the psychological functioning of university staff, to identify predictors of adverse psychological functioning and to survey how different aspects of work roles (clinical, teaching, academic/research) were affected. The survey was completed approximately 18 months following the most severe Canterbury earthquake. This was at a time when secondary stressors, such as insurance difficulties and delays in rebuilding homes and workplaces, were a major factor. As described above, many participants reported having these issues in both their home and work environments.

Data were analysed for the 119 consenting respondents. This low response rate (30%) may limit the generalisability of the findings, but is similar to other surveys in post-disaster contexts. Demographic characteristics of the survey participants were not able to be compared to the non-responders, and it is therefore not possible to comment on whether there was a difference between these groups. There may also have been a bias in those who completed the survey. For example, it could be that those who responded were likely to have the strongest motivation because they felt less positive about how they were coping. Conversely, those who were most affected may have been feeling under too much stress to respond.

As has been commonly reported in community surveys, it was relatively common for participants to report psychological symptoms from the earthquakes which often improved over time. For example, at worst participants rated themselves as being moderately to severely affected on concentration (70%) and sleep (61%), but by the time of the survey (ie, 18 months after the most significant earthquake) many of these symptoms had reduced. A minority (6–9%) however, continued to report moderate to severe difficulties with these issues.

Mean scores on the DASS showed that at the time of the survey, staff reported similar levels of depression, but lower levels of anxiety and stress than found in a previous study of the general population in Christchurch 6 months following the September 2010 earthquake. Interestingly, a similar survey of medical students (although conducted 7 months after the earthquakes) showed similar results to those of the staff in our study. Because work is seen as being good for mental health, it might be expected that an occupational and medical student group would score lower on measures of depression than a general population sample. However, in the current study a minority of staff (9%) reported current moderate-extreme scores on the depression subscale of the DASS. These figures are higher than rates of major depression reported in the general population in New Zealand (3.7–5.2%) and by a cross-sectional study in Christchurch at a similar time post-earthquake (7.5%). This finding is similar to that from a previous study of university employees following Hurricane Katrina.

Despite employment often being seen as a proxy measure for functioning, 10% of participants scored above 20 on the Work and Social Adjustment Scale, suggesting moderate or severe impairment in functioning, and 29% scored between 10 and 20, suggesting significant functional impairment.

Staff reported an increase in both mental and physical health problems after the earthquakes. Interestingly, no increase in smoking was reported by staff in the current study, which differs from findings from previous post-disaster studies, and by
a longitudinal study of a cohort of adults in Christchurch post-earthquake. However, it is possible that medical school staff may have much lower rates of smoking than the general population.

The current study found that those who reported higher levels of exposure to earthquake-related stressors also reported higher levels of distress on the DASS. This association could not be explained, either by neuroticism or by prior mental health disorders, which was consistent with findings from a previous study. The current study also found that neuroticism and prior mental health disorders independently predicted symptomatology. Interestingly, neuroticism and prior mental health did not seem to impact on the reporting of stressors (this may be because stressors were quite objective in nature). This is important because although these factors would not be confounded with actual exposure to stressors, they could theoretically be confounded by reports of stress exposure (because those who are more distressed generally could interpret the same events as being qualitatively worse than those who are less distressed). Other studies have also examined predictors of distress, and reported that prior mental health, neuroticism and not being of New Zealand European ethnicity predicted symptomatology independent of earthquake exposure. Variation in the DASS score with the final model explained only about 25% of the variance. Other key factors, which were not assessed in the current study and which could be explored in further research, include the issue of prior exposure to traumatic stress and whether participants experienced other earthquake-related stress, for example, being in first responder or mental health roles providing vicarious exposure.

The current study found that academic and teaching roles were the most impacted work roles, followed by administrative roles, with clinical roles being the least impacted. It may be that this is explained by a hierarchy of roles, such that when living with multiple stressors people prioritise their work according to their perceived immediate importance. That is, they prioritise clinical roles, whereas those roles seen as less immediately crucial, such as academic output, fall away. It may also be that academic and teaching roles require time and preparation and this may also be more difficult to protect from other demands. These findings may be informative for organisations in order to provide appropriate support to staff. For example, it may be helpful to recognise that academic or research writing, for example, is likely to fall off and employers may need to lower expectations for this. Positive initiatives by organisations are likely to be best targeted at areas providing increased academic support or, for example, taking over blocks of teaching. Unhelpful inputs are often unintentional, but relate to, for example, demanding increased reporting of activities that staff see as both less important and onerous. These findings support those recently summarised in a Red Cross report. Interestingly, two thirds of staff reported that positive experiences had also occurred as a result of the earthquakes. These included themes of greater appreciation of the things that really matter in life, positive effects on relationships with colleagues, family and community and being less materialistic. Similar post-traumatic growth descriptions of outcomes have been described previously by individuals and communities that have experienced adversity.

Strengths of the current study are that it provided a unique opportunity to assess the impact of a natural disaster on a working population. The study included the use of standardised tests and Likert-type scales developed to assess aspects of impact/functioning of specific relevance to this population and a measure of earthquake exposure. Limitations of the study include the low response rate, although this is common in post-disaster survey work, the reliance on self-report data (ie, no ratings from others, such as a clinician), the cross-sectional nature of the survey (that there are no comparisons pre-earthquake), and the retrospective nature of some of the assessments (personality, health problems and resilience prior to the earthquakes). Participants were not asked whether they had potentially high-risk roles, for example, as first responders or providing mental health treatment. These people may potentially be at increased risk of mental health effects, although the number of...
participants likely to have held that position would have been small, as only 18% of the survey identified as having a clinical role.

Conclusion
Findings from the current study have potential implications for workplaces, and in particular educational institutions, in the event of a disaster. The current study's findings are consistent with existing research in showing that psychological symptoms following a disaster are common, but for most people these improve with time. They also show that a minority (up to 13%), continue to report moderate to severe difficulties which persist even 18 months post disaster. This highlights the need for organisations to recognise and plan for this in order to provide appropriate interventions for their workforce. In predicting who is most likely to have problems, clearly the extent of exposure to both the immediate disaster events and the adverse sequelae that often follow (for example, damage to home and work environments, difficulties with insurance) were found to play an important role. Other important factors were as previously reported, ie, neuroticism and prior mental health disorders. Organisations may be able to identify some (but not all) of these factors affecting their staff which may be helpful for offering interventions where they are required. The study also gives insights into how different work roles were impacted and how organisations may best support staff over difficult times.

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