Predictors of psychological resilience amongst medical students following major earthquakes


ABSTRACT

AIM: To identify predictors of self-reported psychological resilience amongst medical students following major earthquakes in Canterbury in 2010 and 2011.

METHODS: Two hundred and fifty-three medical students from the Christchurch campus, University of Otago, were invited to participate in an electronic survey seven months following the most severe earthquake. Students completed the Connor-Davidson Resilience Scale, the Depression, Anxiety and Stress Scale, the Post-traumatic Disorder Checklist, the Work and Adjustment Scale, and the Eysenck Personality Questionnaire. Likert scales and other questions were also used to assess a range of variables including demographic and historical variables (eg, self-rated resilience prior to the earthquakes), plus the impacts of the earthquakes.

RESULTS: The response rate was 78%. Univariate analyses identified multiple variables that were significantly associated with higher resilience. Multiple linear regression analyses produced a fitted model that was able to explain 35% of the variance in resilience scores. The best predictors of higher resilience were: retrospectively-rated personality prior to the earthquakes (higher extroversion and lower neuroticism); higher self-rated resilience prior to the earthquakes; not being exposed to the most severe earthquake; and less psychological distress following the earthquakes.

CONCLUSION: Psychological resilience amongst medical students following major earthquakes was able to be predicted to a moderate extent.

Psychological resilience refers to positive adaptation, or the ability to maintain or re-gain mental health, despite adversity. In 2010 and 2011, the region of Canterbury, New Zealand, encountered adversity in the form of a series of powerful earthquakes and aftershocks. Seven months following the most severe earthquake (February 2011), medical students from the Christchurch campus, University of Otago, were surveyed. The present study aims to identify predictors of self-reported psychological resilience amongst these medical students.

Method

The study method, sample characteristics, and general psychological functioning of the sample are described in full elsewhere. The study was approved by the University of Otago Ethics Committee.

Participants

All 253 medical students (registered from November 2010) from the Christchurch campus, University of Otago, were emailed inviting them to participate in an electronic survey asking them about their experiences relating to the earthquakes. Students were in their 4th, 5th or 6th year of study. Surveys were sent out in September 2011, seven months after the most severe earthquake.

Measures

Primary outcome measure

Current, self-rated resilience as measured by the Connor-Davidson Resilience Scale was the primary outcome measure in the present study. This scale has been identified as having superior psychometric scales to many other resilience scales, and has been used to evaluate resilience following earthquakes in China and Turkey.
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Predictor measures

A range of pre-earthquake, peri-earthquake, and post-earthquake factors potentially associated with resilience or psychological distress were assessed:

- Demographic measures (gender; age; relationship status; ethnicity; years living in New Zealand; and year of medical training).
- Historical measures (self-reported mental health problems prior to the earthquakes, yes/no; self-reported physical health problems prior to the earthquakes, yes/no; retrospectively-rated resilience prior to the earthquakes, Likert scale 1–5; and retrospectively-rated personality prior to the earthquakes; Eysenck Personality Questionnaire, brief version).
- Exposure to earthquakes (total number of significant earthquakes exposed to, 0–3; and exposure to the most severe earthquake, February 2011, yes/no).
- Adverse impact of earthquakes on living arrangements, course provision and/or study resources, and finances (at worst and currently for each, Likert scales 0–3).
- Feeling burdened by obligations to others (Likert scale 1–5).
- Total perceived support (University + clinical placements + people in life in general; Likert scale 1–5).
- Feeling safe living, and feeling safe working, in Christchurch (Likert scales 1–5).
- Psychological distress, as measured by:
  - Depression, Anxiety and Stress Scale (DASS),\(^3\)
  - Post-traumatic stress checklist.\(^10\)
  - Alcohol misuse (Likert scale 0–3).
- Self-reported mental health problems since the earthquakes (yes/no).
- Self-reported physical health problems since the earthquakes (yes/no).
- Problems with functioning since the earthquakes (Work and Adjustment Scale).\(^11\)

A past history of abuse and/or trauma was not assessed.

Statistical analyses

Some measures were not normally distributed or contained very low numbers in some categories. For these reasons, the following variables were dichotomised: years living in New Zealand (less than 10 years, or 10 years or more); ethnicity (New Zealand European yes/no); in a relationship (yes/no); and alcohol misuse (yes/no). Where feasible, some measures were combined to yield a summary variable, in order to reduce the total number of univariate analyses that were performed. For example, ‘support’ (University + clinical placements + people in life in general) and ‘DASS total’ (depression + anxiety + stress subscales).

The above predictor measures were formulated as occurring either pre-earthquake, peri-earthquake, or post-earthquake. First, univariate analyses were conducted to identify candidate variables for inclusion in subsequent modelling. This was done by identifying predictor variables that were significantly (\(p =<0.05\)) associated with resilience in univariate analyses. Second, these statistically significant predictors were examined using a multiple linear regression analysis to identify which combination of variables was best able to predict resilience. Additional post-hoc analyses were undertaken comparing each of the predictors identified in the multiple linear regression, to identify which variables were the strongest predictors of resilience. Throughout the paper, significance was determined using \(p =<0.05\).

Results

Response rate and demographics

Of the 253 medical students who were invited to participate in the survey, 210 completed the survey and 198 endorsed the item giving consent for the study and reported which year of the medical course they were currently in. Analyses reported in this paper involve these 198 students (198/253 = 78%).

Mean age for the medical students was 23.5 years (SD 2.1, range 20–33 years), 61.9% were female, 74.6% had lived in New Zealand for 10 years or more, and 53.0% were single. Fifty-six percent indicated being New Zealand European, and the 43.9% who did not indicate being New
Zealand European were from a range of ethnic backgrounds (Chinese, other, Malay, Māori, Middle East, Indian and Samoan; ordered from most common category to least common category). The 198 participants were in their 4th (n=66), 5th (n=77) or 6th (n=55) year of training. In a previous paper, we reported that students in their 6th year of study were significantly more likely to be women.

Univariate analyses
Univariate analyses were conducted using independent t tests*, one-way analysis of variance ∆ or Pearson correlations ‡. Significance was determined using p =<0.05, however findings where p =<0.01 are listed first and shown in bold.

Pre-earthquake variables
The following predictor variables were significantly associated with higher resilience scores on the Connor-Davidson Resilience Scale (ie, being more resilient):

- **Personality** (Eysenck Personality Questionnaire) prior to the earthquakes ‡ (higher extraversion [Pearson correlation = 0.39, p<=0.001] and lower neuroticism [Pearson correlation = -0.38, p<=0.001]).
- **More resilient prior to the earthquakes ‡** (Pearson correlation = -0.40, p <=0.001).
- **Absence of mental health problems prior to the earthquakes ‡** (t =3.1, df = 164, p=0.002).
- **Female gender* (t = -2.3, df = 164, p=0.03).**
- **New Zealand European ethnicity* (t = -2.4, df = 165, p=0.02).**
- **Living in New Zealand for 10 years or more* (t = -2.1, df = 165, p=0.04).**
- **Year of medical training* (6th-year students significantly more resilient than 5th-year students; F=4.3, p=0.02).**

Age ∆ and physical problems prior to the earthquakes* were not significantly associated with resilience.

Peri-earthquake variables
The following predictor variable was significantly associated with higher resilience scores on the Connor-Davidson Resilience Scale (ie, being more resilient):

- **Not being exposed to the most severe earthquake, February 2011* (t =2.9, df = 164, p =0.005).**

Total earthquake exposure (0–3 significant earthquakes) ‡, and adverse impacts at worst (living arrangements, course provision and/or study resources, and finances) ‡ were not significantly associated with resilience.

Post-earthquake variables
The following predictor variables were significantly associated with higher resilience scores on the Connor-Davidson Resilience Scale (ie, being more resilient):

- **Feeling more supported** (University + clinical placements + people in life in general; ‡ Pearson correlation = 0.23, p=0.003).
- **Experiencing fewer current mental health problems** as assessed by:
  - **DASS total ‡** (Pearson correlation = -0.38, p=0.003).
  - **Post-traumatic checklist total ‡** (Pearson correlation = -0.23, p=0.003).
  - **Mental health problems since the earthquakes ‡** (t =3.1, df = 164, p=0.002).
  - **Feeling less burdened by obligations to others ‡** (Pearson correlation = -0.18, p=0.02).

Relationship status*, current adverse impacts (living arrangements, course provision and/or study resources, and finances) ‡, not feeling safe living in Christchurch ‡, not feeling safe working in Christchurch ‡, alcohol misuse*, physical problems since the earthquakes*, and problems with functioning (Work and Adjustment Scale) ‡ were not significantly associated with resilience.

Multiple linear regression analysis
The statistically significant (p<0.05) predictors identified through the univariate analyses were entered into a multiple linear regression analysis in blocks (predisposing variables, precipitating variables and perpetuating variables). At each block entry, methods of forward and backward variable elimination were used to arrive at a set of stable and parsimonious predictors. The final fitted model produced an R-square of 0.35. The following variables significantly
(p<0.05) contributed to the final fitted model (ordered from strongest to weakest):

- Extraversion (Eysenck Personality Questionnaire; β=0.28). Higher levels of retrospectively self-rated extraversion prior to the earthquakes predicted higher levels of resilience.
- DASS total (β=0.23). Less distress predicted higher levels of resilience.
- Resilience prior to the earthquakes (β=0.14); Higher levels of self-rated resilience prior to the earthquakes predicted higher levels of resilience.
- Earthquake exposure (β=-0.14); not being exposed to the most severe earthquake, February 2011, predicted higher levels of resilience.
- Neuroticism (Eysenck Personality Questionnaire; β=-0.14). Lower levels of retrospectively self-rated neuroticism prior to the earthquakes marginally predicted higher levels of resilience.

Additional post-hoc analyses (using an F-test) comparing each of the predictors identified through multiple linear regression analysis were undertaken. These confirm the hierarchy of effects described above.

**Peri-earthquake variable**

Not being exposed to the most severe earthquake (February 2011).

**Post-earthquake variables**

Feeling more supported, experiencing less self-reported mental health problems following the earthquakes, and feeling less burdened by obligations to others.

Consistent with previous studies, the present study found that resilience was associated with multiple factors when univariate analyses were performed. Many of the variables that were significantly associated with resilience are not easily amenable to change (eg, demographic factors and earthquake exposure). However, this does not necessarily mean that resilience is static. For example, fifth-year medical students were significantly less resilient than sixth-year students. Fifth-year students had more earthquake exposure, and were arguably under considerably more pressure as their final major set of examinations occur at the end of their fifth year. Feeling more supported following the earthquakes was associated with higher resilience. Taken together, these findings suggest that resilience may be dynamic, although the present study did not set out to evaluate this issue.

Previous studies have reported that ethnic minority status is associated with increased psychological risk following trauma, which is broadly consistent with the present finding that students who were not from the majority ethnic group, and had lived in New Zealand for less than 10 years, were less resilient. Consistent with previous studies, we found that resilience was positively associated with extroversion and negatively associated with neuroticism. Inconsistent with a previous similar study, the present study found that female gender was significantly associated with higher resilience. However, female students were also significantly more likely to be sixth-year students, which in itself was associated with higher resilience (ie, both female gender and being a sixth-year student were associated with greater resilience on univariate analyses). A disadvantage of univariate analyses is that they do not account for inter-correlations amongst variables, and potentially

**Discussion**

The present study aimed to identify predictors of resilience amongst medical students following a series of major earthquakes. The survey was sent out seven months following the most severe earthquake, and a response rate of 78% was achieved. Being more resilient, as measured by the Connor-Davidson Resilience Scale, was significantly (p<0.05) associated with the following variables, using univariate analyses.

**Pre-earthquake variables**

Retrospectively self-rated personality prior to the earthquakes (being more extroverted and less neurotic), more resilient (retrospectively self-rated) prior to the earthquakes, female gender, New Zealand European ethnicity, living in New Zealand for 10 years or more, year of medical training (being a 6th-year versus a 5th-year student), and the absence of self-reported mental health problems prior to the earthquakes.
lead to a type-1 error being made due to multiple comparisons (ie, incorrect rejection of the null hypothesis). In the present study, the purpose of the univariate analyses was to identify candidate variables for inclusion in statistical modelling. A multiple linear regression analysis was performed to identify the most parsimonious predictors of resilience, and post-hoc tests were performed to confirm which variables were the strongest predictors of resilience. The final fitted model was able to explain 35% of the variance in resilience scores. The following variables contributed to the final fitted model:

- Personality (higher extroversion and lower neuroticism). *Educational institution unlikely to know this.*
- Higher resilience prior to the earthquakes. *Educational institution unlikely to know this.*
- Not being exposed to the most severe earthquake. *Educational institution likely to know this.*
- Lower levels of psychological distress (DASS total). *Educational institution unlikely to know this for most students, unless they ask.*

While resilience was associated with less psychological distress, resilience was not simply the converse of psychological distress. Lack of psychological distress by itself, did not fully account for resilience. Personality and lack of exposure to the most severe earthquake, in combination with a lack of psychological distress, provided the best prediction of resilience.

In a previous report on the same sample,2 we identified predictors of psychological distress (DASS total). The only variable that predicted both psychological distress and resilience was neuroticism. High neuroticism predicted psychological distress, and low neuroticism predicted resilience. However, in the present study, neuroticism was of marginal predictive value in the final fitted model, and was the weakest of the final five variables in predicting resilience. No known other studies have examined predictors of resilience amongst medical students using modelling techniques.

The results from the statistical modelling in the present study may seem somewhat sobering from the perspective of an educational institution. The variables associated with resilience were either already ‘set’ (personality and resilience prior to the earthquakes), were not able to be prevented (exposure to most severe earthquake), or may not be known by an educational institution unless they went out of their way to find out (current level of psychological distress). The latter would be able to be assessed though. It seems likely that there are no easy answers for educational institutions regarding how they could better select students in terms of resilience. While it would be possible to select medical students on the basis of their personality profile (higher extroversion) and resilience scores (higher levels of baseline resilience), these self-report measures would be highly vulnerable to students simply learning ‘what they needed to say’ to get into medical school. Instead, the present study suggests that educational institutions should expect to have limited control over whether students are resilient or not, and should be prepared to provide support to those who are less resilient and need help.

Limitations with the present study include the retrospective nature of the assessment of some variables (personality, resilience prior to the earthquakes and health problems), and the reliance on self-report data. The response rate in the present study (78%) is adequate, but a higher rate would have been desirable. While it was necessary to dichotomise some variables due to low responses in some categories (eg, some ethnic groups), it is possible that some relevant predictor variables were not included in the analyses.

**Conclusion**

Psychological resilience amongst medical students following major earthquakes was able to be predicted to a moderate extent.
Competing interests:
Nil

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