

Post-Earthquake Psychological Functioning in Adults with Attention-Deficit / Hyperactivity Disorder: Positive Effects of Micronutrients on Resilience

Julia J. Rucklidge, *University of Canterbury*

Neville M. Blampied, *University of Canterbury*

The September, 2010, 7.1 magnitude earthquake in Christchurch, New Zealand, provided an opportunity to study the after-effects of a major earthquake where death and injury were absent. It created a natural experiment into the protective effects on well-being of taking EMPowerplus (EMP+), a micronutrient supplement, in a group of 33 adults diagnosed with ADHD who had been assessed prior to the earthquake. Fortuitously, 16 were currently taking the supplement as part of on-going research at the time of the quake, while 17 were not (they had completed their trial of EMP+ or were waiting to begin consumption). The Depression Anxiety and Stress Scale (DASS-42) which had been administered at varying times before the earthquake on recruitment into the micronutrient study was re-administered by telephone 7-10 and again 14-18 days post-earthquake to volunteer, earthquake-exposed participants. A modified Brinley plot analysis of the individual DASS-42 scores showed that the 16 participants on the nutritional supplement were more resilient to the effects of the earthquake than the 17 individuals not taking the supplement. This effect was particularly marked for Depression scores.

On 4th September, 2010, at 4.35am local time, a 7.1 magnitude earthquake struck the Canterbury region of New Zealand (Quigley et al., 2010), with its epicentre about 40 kms from the South Island's major city, Christchurch (population ~380,000). Despite the large magnitude of the earthquake, there were no deaths and only two serious injuries. This is remarkable (Royal Society of New Zealand, 2010), especially compared with other recent urban earthquakes of similar or lesser magnitude, where considerable loss of life was experienced (e.g., L'Aquila, Italy, April, 2009: Magnitude 5.8, 308 deaths and 1500 serious injuries; Haiti, January 2010: Magnitude 7, 222,570 deaths and 300,000 injuries; www.usgs.gov/earthquakes/recenteqs [ww/Quakes/](http://www.Quakes/), but cf Bodvarsdottir & Elklit, 2004).

Christchurch and its region did, however, suffer extensive damage to

land, watercourses, buildings, roads, and other infrastructure, with damage estimated to exceed NZ\$4 billion (Quigley et al., 2010). Following the initial earthquake were numerous aftershocks: 935 in total in the first two weeks, with 10 of magnitude 5 or greater, and 105 greater than magnitude 4 (see www.geonet.co.nz).

Earthquakes and their aftershocks are unpredictable, uncontrollable, aversive events, and events of this nature are known to induce a variety of debilitating psychological consequences (Soames-Job, 2002).

Consistent with this, research has shown increased levels of psychological distress in survivors of major earthquakes, but the focus of much of this research has been on the severe end of the distress spectrum, especially post-traumatic stress disorder (PTSD; for reviews see Bonanno, Brewin, Kaniasty, & La

Greca, 2010; Neria, Nandi, & Galea, 2007). The Christchurch earthquake provided a rare opportunity to study the psychological effects of an earthquake but without the effects of death and injury affecting the responses of survivors. Recent research (see Bonanno et al., 2010) has suggested that distinctive individual trajectories of response are evident after a disaster such as an earthquake.

A minority of survivors (rarely more than ~30% of the affected population) show immediate or delayed severe symptoms of distress, including full PTSD, and a second minority group (typically ~ 20 to 25%) experience moderate to severe symptoms initially, but recover relatively rapidly thereafter. The majority of survivors (typically 50% or more) display *psychological resilience*, defined by Bonanno et al., as evidencing a stable pattern of few

or mild symptoms of distress throughout the post-disaster period, operationalised as reporting no more than one symptom of PTSD in the six months after a disaster (Bonanno, Galea, Bucciarelli, & Vlahov, 2006).

Interestingly, anecdotal reports from mental health professionals and services suggest that those with pre-existing mental health conditions were particularly vulnerable to post-quake exacerbation of their distress (e.g., *Rehab use up tenfold after quake*, The Press, 25th January, 2011). Logistically, this is a difficult issue to research but the Attention-Deficit/Hyperactivity Disorder (ADHD) Diagnostic Assessment and Research Unit at the University of Canterbury was able to study this for one particular diagnostic group, namely adults with ADHD. Prior research has suggested that individuals diagnosed with ADHD are generally vulnerable to experiencing high levels of stress (Lackschewitz, Huther, & Kroner-Herwig, 2008), suggesting that they are likely to be among those most vulnerable to enhanced distress in the wake of disasters, although we are unaware of any research confirming this.

There is, however, a growing body of research showing that nutritional supplements such as EMPowerplus (EMP+) have benefits, specifically for those with ADHD (Rucklidge, Johnstone, & Kaplan, 2009) and more generally (Carroll, Ring, Suter, & Willemsen, 2000; Schlebusch et al., 2000), in promoting resistance to stress. Furthermore, Yesilyaprak, Kisac, and Sanlier (2007), researching the aftermath of an earthquake in Turkey, reported a link between poor nutrition post-earthquake and levels of stress in survivors, suggesting that nutrition may have a part to play in vulnerability or resilience to a natural disaster.

Fortuitously, the ADHD research group had a number of participants who had been, or were scheduled to be, participants in studies of the effects of a micronutrient supplement on mood stability (Rucklidge, Taylor, & Whitehead, 2010). All the participants had completed their

assessments and had received the diagnosis prior to the earthquake. Some were no longer taking the micronutrient at the time of the earthquake either because they had completed a trial of the supplement or had yet to begin, while others were currently taking the supplement. All, therefore, had a pre-quake formal psychological diagnosis of ADHD and pre-quake assessment of levels of anxiety, depression, and stress, but formed two groups (on or off the supplement) exposed to the same natural experiment, the earthquake. Rucklidge, Johnstone, Harrison, and Boggis (2011) report a group-based statistical analysis of the data from this study.

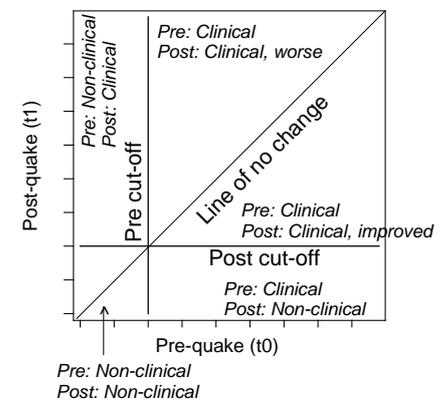
The purpose of this report is to examine the results reported by Rucklidge et al. (2011) at the level of individual responses, consistent with the emphasis by Bonanno et al. (2010) on considering individual differences in disaster responses. It also serves to introduce a relatively novel way of analysing such data, using modified Brinley plots (Blampied, 2007; Brinley, 1965).

Brinley plots were developed (Brinley, 1965) as a way of displaying data from cognitive psychology experiments, where different groups, such as men vs women, or young vs old, were exposed to the same conditions in one or more experiments. For each experimental condition, therefore, a coordinate pair comprising the average performance of each group in each condition could be plotted in a scatter-plot. If there were no systematic differences between the groups, the data points would lie on or randomly about the diagonal, but if there was a systematic effect of group identity on mean performance, this would be seen in systematic deviations of the points above or below the diagonal.

Despite their utility for visually displaying systematic effects of group membership, Brinley plots are not widely used in psychology (for a contemporary example, see Dye, Green, & Bavelier, 2009), but Blampied (2007) noted, in the context of single-case research, that they had considerable potential for detecting

systematic effects of interventions while preserving the identity of each individual participant in the visual display.

When time-series data are available for individuals, with a baseline measure and one or more post-intervention measures, then systematic effects will be observed in a scatter plot of baseline versus post-intervention scores as deviations from the diagonal, the line of no effect (if baseline score = intervention score, the data point lies on the diagonal). In essence, this is a form of visual cluster analysis that has the benefit over group mean data of displaying both systematic effects and the full range and variability of individual responses (see also Sobell, Sobell, & Gavin, 1995). If lines are placed on the graph to indicate clinical cut-off scores, then the graph space is partitioned into clinically meaningful domains, as illustrated in Figure 1, and the clinical significance of the outcomes for individuals is readily apparent.



▲Figure 1: The partitioning of the Brinley plot graph space so as to indicate the clinical meaning of observed changes, based on reduction in the dependent variable score indicating clinical improvement, and showing established cut-off scores on the DASS-42 for “normal to mild” versus more severe levels of distress (based on Lovibond & Lovibond, 1995 a,b).

Method

Participants

Thirty-three individuals (ages 16 years and over), all of whom were resident in Christchurch at the time of

the earthquake, were recruited from among a larger number of individuals who had been or were currently participating in research into a EMPOWERplus, a micronutrient supplement consisting of 36 ingredients: 14 vitamins, 16 minerals, 3 amino acids and 3 antioxidants.

Those ($n = 17$, 9 men, 8 women) who (a) had been assessed and confirmed as having ADHD and completed all baseline measures, and (b) were not taking EMP+ or any other psychotropic medication at least two weeks prior to and during the assessment period after the earthquake constituted the control individuals.

The remainder of the recruits ($n = 16$, 11 men, 5 women) (a) had begun taking EMP+ at least two weeks prior to the earthquake, (b) were taking at minimum at least 50% of the optimal dose, and (c) were not currently taking any psychotropic medication (with one exception; see Rucklidge et al., 2011); these were the micronutrient group.

The diagnosis of ADHD was based in all cases on the participants having met the Connors' Adult ADHD Diagnostic Interview for DSM-IV (Epstein et al., 2004). Participants also had to have shown elevations on at least one of the DSM-IV subscales of the Connors' Adult ADHD Rating Scales (Connors et al., 2003; see Rucklidge et al., 2011, for more details). Various analyses (see Rucklidge et al., 2011) indicated that there were no substantive differences in age, marital status, socio-economic status or intelligence between the two groups, nor were there differences in their experience of (generally mild to moderate) adversity from the earthquake. The majority reported Pākehā (New Zealand European) ethnicity.

Measure

Psychological distress was assessed using the full Depression, Anxiety and Stress Scale (DASS-42; Crawford & Henry, 2003; Lovibond & Lovibond, 1995a, b). This is a 42-item questionnaire, with items rated from 0 (did not apply to me at all) to 3

(applied to me very much or most of the time) relative to the past week.

The DASS-42 has good psychometric properties (Cronbach's alphas range from .84 to .97 across the scales and across studies), and with high correlations (typically $> .60$) between the separate DASS-42 scales and other validation measures (e.g., Beck Depression Inventory; Crawford & Henry, 2003; Lovibond & Lovibond, 1995a, b).

Scores less than 13, 10, and 18 for Depression, Anxiety, and Stress respectively are classified as indicating no more than 'mild' levels of distress (Crawford & Henry, 2003; Lovibond & Lovibond, 1995a, b).

Procedure

Participants in the micronutrient group were taking EMP+ according to the standard protocol for the research programme. They were given the capsules every two weeks, and adherence was monitored by daily diary records and weekly pill counts. Optimum dosage was defined as fifteen capsules/day, in three equally divided doses, taken with food and water. Any adverse effects were assessed at regular visits to the research clinic, and participants were monitored by the team psychiatrist.

Baseline (t0) - pre earthquake: At the time of initial recruitment into the micronutrient study, all participants had undergone extensive psychological assessment, including formal diagnosis of ADHD, and had completed the DASS-42 at various times [averaging 1.13 ($SD = .78$) years for the control participants and 0.83 ($SD = .64$) years for the micronutrient participants; the difference is not statistically different] before the earthquake (Time zero; t0). Recruitment and data-gathering for the present study were all done by telephone contact.

Time one (t1) - 7-10 days post-earthquake: Participants were contacted by telephone. In the ensuing interview they first gave informed consent, and then reported on any damage to their home, personal injuries, or any such events affecting

those close to them. Current medication use and EMP+ adherence (where relevant) were assessed. Then the DASS-42 items were completed.

Time two (t2) - 14-18 days post-earthquake: A second telephone call re-administered the DASS-42.

Results

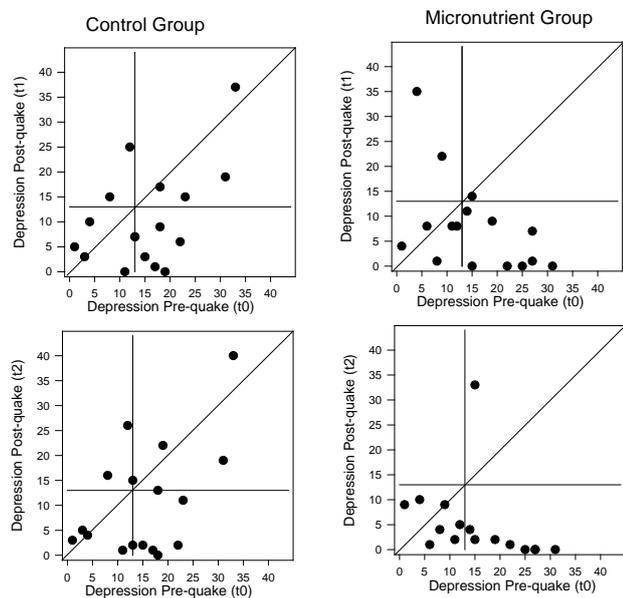
The focus of this report is on individual levels of anxiety, depression, and stress as measured before the earthquake, and then at approximately one and two weeks afterwards. For each person we had nine scores, representing their pre-quake (t0), week 1 (t1), and week 2 (t2) scores for each of anxiety, depression, and stress. Additionally, Table 1 (adapted from Rucklidge et al., 2011) shows the means and standard deviations for each group and across time, the results of paired-sample t-tests, and the Cohen's-d effect sizes for each condition and measure across time.

Figures 2, 3, and 4 show, respectively, the DASS-42 depression, anxiety, and stress levels for the participants as the scores changed over time. The left panels in each figure show the individual data for the control participants while the right panels show the individual data for the participants who were taking EMP+ at the time of the earthquake and for the two following weeks. The top row in each figure compares t1 against t0 and the second row compares t2 against t0 (the t1 versus t2 comparisons were done, but do not add anything much to the analysis). For the t0-t1 and t0-t2 comparisons, if the earthquake had no effect on the individual, then their data points will lie on or close to the diagonal, irrespective of where they lie in the distribution of scores on the measure. If, over that time period, their level of depression, anxiety or stress has increased, their data point will lie above the diagonal, and if their respective scores have decreased, they will lie below the diagonal. Fig 1 indicates how changes can be categorised relative to the cut-off scores reported by Crawford and Henry (2003) and Lovibond and Lovibond (1995a, b).

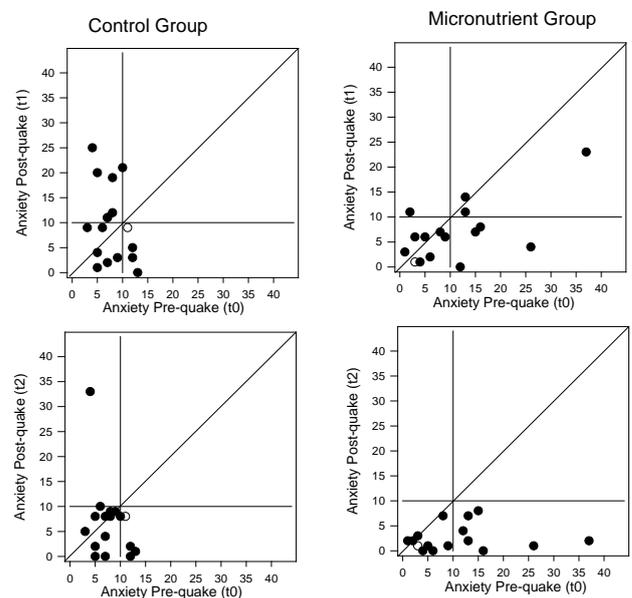
Group	N	Baseline		Time 1		Time 2		Baseline-Time 1			Baseline-Time 2		
		Mean	SD	Mean	SD	Mean	SD	Paired t- test	Effect size ¹	% from baseline	Paired t- test	Effect size ¹	% from baseline
Control	17												
Depression		15.35	8.92	10.53	9.90	10.71	11.20	2.13*	0.51	-31.40%	1.89	0.45	-30.20%
Anxiety		7.76	3.01	9.65	7.66	6.76	7.68	-0.85	-0.21	24.40%	0.45	0.11	-12.90%
Stress		19.12	7.71	18.18	9.53	17.47	10.96	0.42	0.1	-5.90%	0.66	0.16	-8.60%
DASS total		43.41	14.34	38.35	22.73	34.94	26.29	0.83	0.2	-11.70%	1.27	0.31	-19.50%
Micronutrient	16												
Depression		15.38	9.00	8.00	9.46	5.13	8.17	1.85	0.46	-48.00%	2.92*	0.73	-66.60%
Anxiety		10.81	9.60	6.88	5.84	2.56	2.61	2.1	0.52	-36.40%	3.39**	0.84	-76.30%
Stress		23.5	9.81	14.19	10.03	10.56	7.76	2.38*	0.59	-39.60%	4.01**	1	-55.10%
DASS total		49.81	24.53	29.06	19.54	18.25	16.12	2.50*	0.63	-41.70%	4.03**	1.01	-63.40%

Notes to Table 1: * $p < .05$, 2-tailed, ** $p < .01$, 2-tailed, Baseline: represents entry point into the study, a time before the earthquake and before consumption of micronutrients that varied across participants, Time 1: one week post-earthquake, Time 2: two weeks post earthquake, Control group = those participants who were not consuming micronutrients two weeks prior to and through the assessment period post-earthquake, Micronutrient group = those participants consuming micronutrients at least two weeks prior to and through the assessment period post-earthquake, DASS = Depression Anxiety and Stress Scale, ¹Effect size is based on Cohen's d , calculated as the difference in mean symptom severity at Baseline and at Time 1 (Time 2), divided by the standard deviation of the differences across participants.

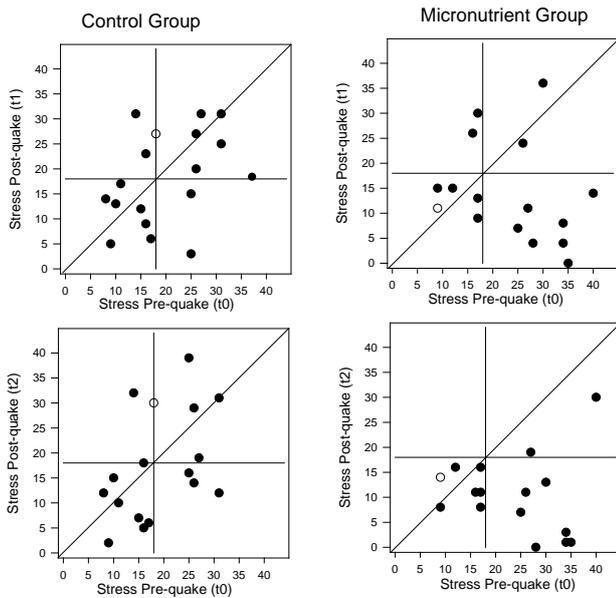
▲ Table 1: Group depression, anxiety and stress scores across time and between groups, showing means, standard deviations, t -values, effect size (Cohen's d), and percent change from baseline



▲ Figure 2: Depression scores compared pre-earthquake (t_0) and at time 1 and time 2 after the earthquake. Control individuals' data are shown in the left panels and treated individuals' data in the right panels. Cut-offs are those published for the DASS-42 by Lovibond and Lovibond (1995 a, b).



▲ Figure 3: Anxiety scores compared pre-earthquake (t_0) and at time 1 and time 2 after the earthquake. Other features are as for Fig 2.



▲ **Figure 4:** Stress scores compared pre-earthquake (t_0) and at time 1 and time 2 after the earthquake. Other features are as for Fig 2.

Depression

The distribution of depression scores prior to the earthquake was similar for the control and micronutrient groups, and equivalent numbers (~50%) fell above the clinical cut-off. In the control group, three individuals, ranging from one with a very low score to one with a high score did not change their score when assessed at t_1 , two individuals, both of whom had been non-depressed before the earthquake now reported clinical levels of depression, and the rest reported reduced levels, although two remained above the clinical cut-off. The pattern of change was somewhat similar for the micronutrient group. Two individuals who had been below the cut-off pre-quake reported moderate to high levels of depression post-quake but, notably, of those above the cut-off pre-quake all but one had reduced scores and were now in the non-clinical range, and the one exception was on the cut-off border.

When assessed at t_2 the control group had split into two groups. One group was characterised by low post-quake depression scores while the others had scores close to or above the cut-off, and for these the general pattern was for their scores to have increased at t_2 . The pattern was conspicuously different for those taking micronutrients. In this group only one individual remained depressed. All the rest were now substantially in the non-depressed range, and with large degrees of change shown by those reporting high levels of pre-quake depression, representing the continuation of the downward trend evident at t_1 .

Anxiety

Prior to the earthquake, the majority of individuals in both groups reported low levels of anxiety, but while similar

numbers in each group reported anxiety levels above the clinical cut-off, the range of anxiety was considerably higher in the micronutrient group. In the week after the quake (t_1) anxiety levels rose for approximately half of the individuals in the control group, most into the clinical range, with four reporting moderate to severe anxiety. This was a transient response for all but one individual, and at t_2 low levels of anxiety again characterised the control group. The group taking EMP+ showed a different pattern of response. Only one individual reported an increase in anxiety immediately post-quake (t_1) and that only to the border of clinical levels. The rest showed either little change in anxiety, or reductions, with the reductions especially evident in those who had reported high anxiety pre-quake. This pattern of continuing reductions to low levels of anxiety continued at t_2 , at which time nobody in this group scored above the clinical cut-off.

Stress

Before the earthquake, the range of stress levels reported by individuals in the two groups was similar, although the highest levels were reported in the micronutrient group. In the control group, immediately after the earthquake approximately equal numbers reported increases and decreases in stress and eight individuals reported clinical levels of stress. In the micronutrient group, only four reported increases in stress immediately after the quake, and notably, seven individuals who had reported clinical levels of stress pre-quake now reported lower levels of stress sufficient to move them into the non-clinical range. The pattern did not change much for the control group at t_2 , but the pattern of general reduction in stress continued to be evident at t_2 , and four previously highly stressed individuals now reported very low stress levels.

Discussion

These results are the outcome of a natural experiment in which the impact of a common event, the earthquake, was assessed in two groups who shared a common diagnosis of ADHD, but were different in that one group was taking micronutrients at the time of the earthquake and the other group was not (although some had taken the supplement at an earlier time). Because the experiment is natural rather than contrived, there are some threats to inference that need to be acknowledged.

First, participants were not randomly assigned to treatment conditions. Rather, the micronutrient and the control participants were recruited at varying times before the earthquake, with the control participants having been recruited earlier (approximately 3.5 months earlier on average). Changes over time since recruitment and initial assessment may have generated individuals who, although not substantively different in demographic and other measured factors, may have been differentially resilient for unknown reasons with these different individuals ending up in the two groups in such proportions between the earlier and later assessed as to produce a seeming, but pseudo, treatment effect. While not impossible, this seems unlikely.

Second, and again because of the differences in recruitment time, individuals in the micronutrient condition had less exposure to various challenges and vicissitudes of life prior to the second assessment (at t1), and therefore had, presumably, less opportunity to change their initial scores, for better or for worse. Control group scores, therefore, could have been more variable in consequence, though not necessarily with any systematic trend; however, the SDs shown in Table 1 suggest otherwise. In addition, factors such as regression to the mean (McDonald, Mazzuca, & McCabe, 1983) may have had greater opportunity to influence t1 scores for the control individuals relative to the micronutrient participants. These effects, if they occurred, cannot be documented, and so any systematic effects they may have had on the data remain undetermined. It seems unlikely, however, that they have unduly and systematically biased the data so as to suggest an effect of micronutrients where there was none.

A further substantive issue is that there is no direct control for placebo effects, in that the control participants were not receiving any treatment at the time of the earthquake (although some had taken the micronutrient treatment for a time prior to the earthquake and others were waiting to have their first experience with the supplement – it depended on their particular history of recruitment into the research programme), while the micronutrient group were taking daily pills. Differences between the two sets of participants might be due to a placebo effect (Hrobjartsson & Gotzsche, 2001) engendering resilience to the earthquake arising from the fact of consuming the supplement, independent of any specific nutritional effect. While a general placebo effect involving expectations of resilience to stress or challenge cannot be ruled out, it is unlikely that any participant had any expectation, covert or overt, that taking a nutritional supplement would specifically render them resilient to the effects of an earthquake, since as at September, 2010, few if any residents of Christchurch had any expectancies related to direct earthquake experience.

These limitations notwithstanding, the data clearly showed different patterns of change in DASS-42 scores from before the earthquake compared with a period of approximately two weeks after the earthquake for those individuals taking the supplement at the time of the earthquake as opposed to those not taking it. We hope that the utility of the modified Brinley plots for displaying such data is clear. We make a general inference here that low scores on a measure of depression, anxiety, and stress are indicative of positive well-being and resilience, although no direct measure of well-being was made, and conclude that the overall pattern of changes within and between the two groups of participants indicates that those taking the nutritional supplement benefited from it, in that with few exceptions, their depression, anxiety and stress decreased over time. Their well-being and resilience were enhanced during an extremely stressful time. While our data are consistent with Bonanno et al.'s (2006; 2010) general conceptualisation of resilience, we did not use a measure nor assess over a sufficient time period to permit the exact application of their operational definition of resilience to our study.

It is important to note that the measures taken were sensitive enough to detect dynamic changes over time, so that the data are not just a static representation of pre-quake differences between the two groups of participants, however those differences may have arisen. This is especially evident in the DASS-42 anxiety scores for the control participants, where a transient upward pulse of anxiety is evident in the data at t1, but not at t2. This pulse is absent in the data from those taking the nutritional supplement at either time. Differences between the two groups of participants are also particularly evident over time for depression scores, with the graphic analysis showing very clear differences at t2. The modified Brinley plots permit these dynamic changes over time to be clearly displayed.

Overall, therefore, the data reported here (and complimented by Rucklidge et al., 2011) are consistent with the growing body of evidence

that nutritional supplementation with nutrients of the kind found in EMP+ are beneficial to those with ADHD during a stressful period such as a natural disaster. Only by additional research, particularly using placebo controls, will enlighten us about the specificity of these beneficial effects. The second, and much more catastrophic earthquake of 22 February, 2011 has permitted us to partially replicate this study, but with individuals representative of the general population of Christchurch (rather than with those having a psychiatric diagnosis), and with comparison to an over-the-counter supplement (Berocca™) that has been shown to be better than a placebo in three RCTs to date for the reduction of stress and anxiety in the general population (Carroll et al., 2000; Kennedy et al., 2010; Schlebusch et al., 2000). When these data are analysed, some of the issues surrounding the data presented in this study will be clearer. Meantime, the evidence (from this and previous studies) is that encouraging adults with pre-existing vulnerabilities (such as ADHD) facing stressful life events to improve their nutrition by means such as EMP+ at least fulfils the ancient principle of the helping professions – *primum non nocere*; first, do no harm – and it may well be beneficial in enhancing personal resilience in stressful times, to the benefit of the individual and their community.

References

- Blampied, N. M. (2007, August). *Single-case research designs: Adaptations for the analysis of group data*. Paper presented at the Association for Behavior Analysis International Conference, Sydney, NSW, Australia.
- Bodvarsdottir, I., & Elklit, A. (2004). Psychological reactions in Icelandic earthquake survivors. *Scandinavian Journal of Psychology, 45*, 3 – 13.
- Bonanno, G.A., Brewin, C.R., Kaniasty, K., & La Greca, A. M. (2010). Weighing the costs of disasters: Consequences, risks, and resilience in individuals, families, and communities. *Psychological Science in the Public Interest, 11*, 1 – 49.

- Bonanno, G. A., Galea, S., Bucchiarelli, A., & Vlahov, D. (2006). Psychological resilience after disaster: New York city in the aftermath of the September 11th terrorist attack. *Psychological Science*, *17*, 181 – 186.
- Brinley, J. F. (1965). Cognitive sets, speed and accuracy of performance in the elderly. In A. T. Welford & J. E. Birren (Eds.), *Behavior, ageing, and the nervous system: Biological determinants of speed of behavior and its changes with age* (pp. 114-149). Springfield, IL: Charles C Thomas.
- Caroll, D., Ring, C., Suter, M., & Willemsen, G. (2000). The effects of an oral multivitamin combination with calcium, magnesium, and zinc on psychological well-being in healthy young male volunteers: A double-blind, placebo-controlled trial. *Psychopharmacologia* (Berlin), *150*, 220 – 225.
- Conners, C. K., Erhardt, D., & Sparrow, M. A. (2003). Conners' Adult ADHD rating scales (CAARS). *Archives of Clinical Neuropsychology*, *18*, 431 – 437.
- Crawford, J. R., & Henry, J. D. (2003). The Depression Anxiety Stress Scales (DASS): Normative data and latent structure in a large non-clinical sample. *British Journal of Clinical Psychology*, *42*, 111–131.
- Dye, M. W. G., Green, C. S., & Bavelier, D. (2009). Increasing speed of processing with action video games. *Current Directions in Psychological Science*, *18*, 321 – 331.
- Epstein, J., Johnson, D., & Conners, C. (2002). Conner's adult diagnostic interview for DSM-IV™ (CAADID): Technical Manual. New York, NY: MHS.
- Hrobjartsson, A., & Gotzsche, P.C. (2001). Is the placebo powerless? *New England Journal of Medicine*, *344*, 1594 – 1602.
- Kennedy, D. O., Veasey, R., Watson, A., Dodd, F., Jones, E., Maggini, S., et al. (2010). Effects of high-dose B vitamin complex with vitamin C and minerals on subjective mood and performance in healthy males. *Psychopharmacology*, *211*, 55-68.
- Lackschewitz, H., Huther, G., & Kroner-Herwig, B. (2008). Physiological and psychological stress responses in adults with attention-deficit/hyperactivity disorder. *Psychoneuroendocrinology*, *33*, 612 – 624.
- Lovibond, S.H., & Lovibond, P.F. (1995a). *Manual for the Depression Anxiety Stress Scales* (2nd ed.). Sydney, Australia: Psychological Foundation.
- Lovibond, P. F., & Lovibond, S. H. (1995b). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research & Therapy*, *33*, 335 – 343.
- McDonald, C. J., Mazzuca, S. A., & McCabe, G.P. (1983). How much of the placebo 'effect' is statistical regression. *Statistics in Medicine*, *2*, 417 – 424.
- Neira, Y., Nandi, A., & Galea, A. (2007). Post-traumatic stress disorder following disasters: A systematic review. *Psychological Medicine*, *38*, 467 -480.
- Quigley, M., Villamor, P., Furlong, K., Beavan, J., van Dissen, R., Litchfield, N., Stahl, T., Duffy, B., Bilderback, E., Noble, D., Barrell, D., Jongens, R., & Cox, S. (2010). Previously unknown fault shakes New Zealand's South Island. *Eos*, *91*(49), 469 – 488.
- Royal Society of New Zealand. (2010). *The Canterbury Earthquakes: Answers to critical questions about buildings*. Downloaded from <http://www.royalsociety.org.nz/media/information-paper-earthquake-engineering-christchurch.pdf>
- Rucklidge, J. J., Johnstone, J.M., & Kaplan, B. J. (2009). Nutrient supplementation approaches in the treatment of ADHD. *Expert Review of Neurotherapy*, *9*, 461 – 476.
- Rucklidge, J. J., Johnstone, J. M., Harrison, R., & Boggis, A. (2011). Micronutrients reduce stress and anxiety following a 7.1 earthquake in adults with Attention-Deficit/Hyperactivity Disorder. *Psychiatry Research*, *189*, 281-287. DOI:10.1016/j.psychres.2011.06.016
- Rucklidge, J. J., Taylor, M., & Whitehead, K. (2010). Effect of micronutrients on behaviour and mood in adults with ADHD: Evidence from an 8-week open label trial with natural extension. *Journal of Attention Disorders*. Published on-line on 13 January, 2010. DOI 10.1177/1087054709356173.
- Schlebusch, L., Bosch, B. A., Polglase, G., Kleinschmidt, I., Pillay, B.J., & Cassimjee, M. H. (2000). A double-blind, placebo-controlled, double-centre study of the effects of an oral multivitamin-mineral combination on stress. *South African Medical Journal*, *90*, 1216 – 1223.
- Soames-Job, R. F. (2002). The effects of uncontrollable, unpredictable aversive and appetitive events: Similar effects warrant similar, but not identical, explanations. *Integrative Physiological & Behavioral Science*, *37*, 59 – 81.
- Sobell, M. B., Sobell, L. B., & Gavin, D. R. (1995). Portraying alcohol treatment outcomes: Different yardsticks of success. *Behavior Therapy*, *26*, 643 – 669.
- Soldatos, C. R., Paparrigopoulos, T. J., Pappa, D. A., & Christodoulou, G. N. (2006). Early post-traumatic stress disorder in relation to acute stress reaction: An ICD-10 study among help seekers following and earthquake. *Psychiatry Research*, *143*, 245 – 253.
- Yesilyaprak, B., Kisac, I., & Sanlier, N. (2007). Stress symptoms and nutritional status among survivors of the Maramara regions earthquakes in Turkey. *Journal of Loss & Trauma*, *12*, 503-597.

Authors' note

The authors are very grateful for financial support from the Vic Davis Memorial Trust, Ms M. Lockie, and the University of Canterbury. We also acknowledge the support of Truehope Nutritional Support Ltd in supplying the nutritional supplement. Rachel Harrison and Jeni Johnstone assisted with data collection. Above all we are truly grateful to the participants for agreeing to participate in the study at a most difficult time.

Julia Rucklidge and Neville Blampied are at the Department of Psychology, University of Canterbury, PB 4800, Christchurch, 8140, New Zealand. Contact by email is welcome to Julia.rucklidge@canterbury.ac.nz or Neville.blampied@canterbury.ac.nz.

After the Earthquakes: Immediate Post-Disaster Work with Children and Families

Richard Sawrey, *Narrative Consultations*

Charles Waldegrave, *The Family Centre*

Taimalieutu Kiwi Tamasese, *The Family Centre*

Allister Bush, *Capital Coast District Health Board*

Following the recent major Christchurch earthquakes, a huge amount of work has been carried out by a range of volunteers and professionals throughout the Canterbury area. We were able to make a small contribution these initiatives. Our team had the privilege of being involved in a special project offering a series of workshops to frontline workers in Christchurch, based on work we delivered to affected communities in Samoa after the 2009 tsunami. In March and April 2011 we delivered 14 workshops in Christchurch for a range of helping professionals and volunteers. Those attending were private practitioners as well as volunteers and staff personnel from a broad range of NGO's, including social service agencies, schools, health centres, local churches, refugee and migrant services, and Salvation Army volunteers. A total of 790 participants attended the 14 workshops. In this paper we first present some general principles and cautions regarding psychological support following the trauma of disaster. Next, our work in Samoa will be presented, noting the importance of avoiding re-traumatising and focusing on building the resilience of those affected. Some of the innovative approach with families and children in Samoa will be summarised, focusing on some principles for guiding post disaster intervention and a particularly helpful therapeutic technique called double listening. Finally we explain how this experience was translated into training in Christchurch: the workshop objectives will be identified, then some of the content of the workshop will be presented, bearing in mind that a 3-hour workshop is being outlined within the context of a brief paper. Finally a brief summary of the outcomes of the workshops will be outlined.

Unintentional Re-traumatisation

It is now well understood in the literature, but not well understood by some helping professionals and volunteers who have not lived through a disaster with multiple deaths, that some aspects of normal counselling, psychotherapy and psychological debriefing can unintentionally re-traumatise people and leave them considerably worse off than before the engagement.

Counselling and therapy in normal situations usually encourages people to address the pain in their lives, and work through it. However, in a post disaster situation, if people do not want to talk about the events of the

disaster, it is better not to intrude. It is perfectly healthy for people to protect themselves. Helpful questions will encourage stories of survival, resilience and strength since the disaster rather than focus on their trauma or their symptoms. Masten (2001) summarises the point well:

Resilience does not come from the rare and special qualities but from the everyday magic of ordinary, normative human resources in the minds, brains and bodies of children, in their families, relationships and their communities. It follows that efforts to promote confidence and resilience of children at risk should focus on strategies that protect or

restore the efficacy of these basic systems. (p. 227)

Shalev and Errera (2008) express a similar notion based on the work of Rutter: "Minor gains can, sometimes, launch a process of reconstitution. Often-heard expressions, such as 'I lost a son, but realized how many friends I have' can make the point: having friends cannot be measured against losing a son. However, the presence of a small 'but' is of essence, because it completely denies the totality of the loss. In evaluating people's inner resources following trauma one might wish to be tuned to the 'but'" (Shalev & Errera, 2008, p.157).

The World Health Organisation (WHO) strongly warns against the use of single session psychological debriefing. Much of the critical evidence on debriefing is quite recent, which explains why many well-meaning agencies and professionals who are not aware of this recent evidence, are still involved and without a doubt will continue to be involved in psychological debriefing. In summary WHO states that (a) emergencies are associated with wide distress and elevated rates of common mental disorders and trauma-related problems, (b) single-session psychological debriefing to the general population is not recommended as an early intervention and (c) a range of social and mental health interventions exist to address social and mental problems during and after emergencies.

The WHO report recommends that most presenting mental health problems during the acute emergency phase are best managed without medication following the principles of psychological first aid: listen, convey compassion, assess needs, ensure basic physical needs are met, do not force talking, provide and mobilise company from preferably family or significant others, encourage but do not force social support and protect from further harm. (WHO, undated).

Five Principles of Trauma Intervention

A very comprehensive and seminal review of the literature by a worldwide panel of experts (Hobfoll et al., 2007) summarises and analyses various studies and proposes a set of principles that guide the overall effectiveness of post disaster interventions. The interventions that were found to be helpful were grouped under the following principles, of those that promote:

- a sense of safety
- calming
- a sense of self collective efficacy
- connectedness *and*
- hope.

For the people of Saleapaga relocating the main village inland after the tsunami provides a good example of promoting safety. In a short space of time many households had moved and relocated. There were very few roads and no water reticulation inland so these needed to be built. In this situation there are the challenges of no fresh water or toilets so there is a range of physical requirements that need to be addressed before any psychological work can be of much benefit.

The Pacific Context

In the Pacific we are connected to multiple sites of disasters, but we are also connected to multiple sites of resilience. If we look throughout the Pacific, we see great stories of survival and resilience in many communities: locally here in Christchurch; in Queensland after the devastating floods; in Japan after the recent earthquake; in Samoa after the 2009 tsunami.

In the spirit of “alofa” through love and connection Tui Atua Tupua Tamasese Efi, the Head of State of the independent state of Samoa said in November 2009 after the tsunami at the New Zealand Families Commission Pasifika Families’ Fono in Auckland:

“O le e lave i tiga, ole ivi, le toto ma le aano’ (You who rally in my hour of need, you are my kin). Today I want to acknowledge our kinship with New Zealand. Samoa and New Zealand share so much. We share history, culture and rugby players. We share genealogy, faith, common environment and a future. New Zealand and Samoan family values and ties have changed so markedly over the years that the response of New Zealanders to the September 29th tragedy can only be described in terms of what would be the response of loving kin. The same must be said of Australia.”

The Family Centre Psychosocial Unit in Samoa

It was with this sense of alofa and wanting to support the people of Christchurch that we and many others

rallied to offer assistance to those affected. There are some similarities with the level of devastation between that experienced in Christchurch and Samoa. In a population approximately half the size of Christchurch there were 143 fatalities in Samoa alone. The most vulnerable sectors affected were female, young and the elderly. After the tsunami within a short space of time the Family Centre Psychosocial unit was mobilised. Our team leader, Taimalieutu Kiwi Tamasese travelled to Samoa within 24 hours of the event and Charles Waldegrave our other team leader invited and coordinated various health professionals associated with the Family Centre in various parts of the world. Both Allister Bush and Richard Sawrey, both previous staff members at the Family Centre, also travelled to Samoa to assist with the Family Centre Psychosocial Unit’s response. The partners involved with the response in Samoa were the Catholic Archdiocese of Samoa, a local Samoan NGO: Afeafe o Vaetoefaga, and The Family Centre.

Catholic Archbishop of Samoa Alapati Lui Mataeliga gave strong support for the project offering 25 catechists, priests and lay workers from the Catholic Church to assist with the work. We also had a local partnership with Samoan NGO Afeafe o Vaetoefaga. The Family Centre, of course, was centrally involved. The Family Centre was established in 1979 and has been involved in various developments in family therapy, psychology, community work, and social policy research for many years. Three important features of the work of the Family Centre informed our approach to the Samoan disaster:

- Cultural Knowledge: The Asiasiga Approach: The Three Elements of the Self: The Spiritual, Mental and Physical. The Importance of Connections and Relationships. Theological Knowledge. Rhythms of Nature. Personal, Collective Agency (Bush, Collings, Tamasese, & Waldegrave, 2005; Tamasese, Peteru, & Waldegrave, 1997).

After the Earthquakes: Immediate Post-Disaster Work with Children and Families

- Just Therapy: Sacredness, Belonging, Liberation (Waldegrave, Tamasese, Tuhaka, & Campbell, 2003)
- Narrative Ideas and Practices: Externalising Problems. Highlighting Stories of Resistance and Hope. Focus on Community Resilience (Denborough, 2006; Denborough, Freedman, & White, 2008)

What was the approach that we found helpful in the context to Samoa? Cultural knowledge was paramount, to work within the cultural framework of the people of Samoa. *Asiasiga* is a common principle within the Samoan context where people who are grieving or hurting would often be visited in their home for pastoral support, counselling and encouragement. In a Western context we might think it strange to have a psychologist knock on our door and say “would you like some help?”, however in the Pacific context it was seen as an act of love, alofa. So for every village that we visited we made contact with the local mayor or *pulinuu* for permission to visit the families affected. In such meetings there were formal rituals of greeting to the *pulinuu*. In every village that we visited we were warmly welcomed and invited to visit each household affected. We were working with a strong emphasis on the Samoan concept of well-being, where the spiritual, mental and physical aspects of people and families are interconnected. Dominance is given to people’s connections, places of belonging and relationships (Bush, Collings, Tamasese, & Waldegrave,



2005; Tamasese, Peteru, Waldegrave, 1997).

In Samoa we delivered a group programme to affected children. It was very well received, with large numbers of children attending. In these programmes, some interventions were offered to affected children that promoted calming, such as repetitive physical exercises, introduced by a visiting counsellor and mentor William Spears, and adapted by trained youth leaders to fit the local context (Berger & Gelkopf, 2009). Anxiety is held in our bodies through muscular tension so after these physical, repetitive and fun exercises the children according to reports from some of their teachers were “much happier and more relaxed.”

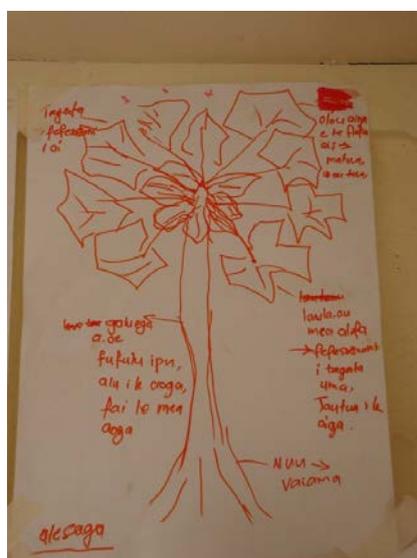
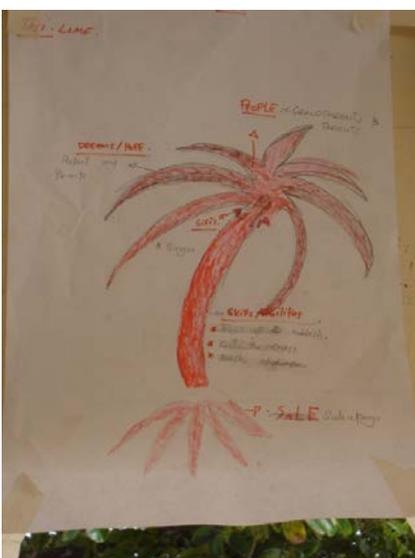
▲ **Figure 1:** William Spear with the children in Samoa

In the children’s programme an activity that promoted self and collective efficacy was the tree of life activity. This is a very effective and helpful narrative group activity that has been developed by Ncazelo Ncube and the Dulwich Centre team in Adelaide (Denborough, 2008). It has been delivered to a wide range of communities experiencing trauma including Rwanda, Palestine, and Zimbabwe.

The approach uses the metaphor of a tree to build resilience and healing. Children were facilitated in small groups to each draw their own tree and write on the various parts of the tree their responses to the following questions:

- Roots: Who are your people and places of belonging?
- Trunk: What are your strengths? What things can you do?
- Branches: What are your hopes and dreams?
- Leaves: Who are the people close to your heart?
- Fruits: What are the gifts you’ve been given by others?

◀ **Figure 2 & 3:** Tree of Life examples from the children



The drawings are then presented to the group together and displayed to represent a forest which offers the metaphor of gathering and supporting each other in times of distress or 'storms of life'.

Another activity that was offered in Samoa was messages to groups or families from previously visited groups. This strongly promoted a sense of connectedness between people. Affected families and groups of children from the children's programme were invited to offer messages of hope or support to other families and communities. The messages emphasised people's actions in response to trauma and the contribution they can give to others facilitating their ongoing connection with each other. In doing this, we give people who have been traumatized the opportunity to assist and offer comfort to others, encouraging their movement from victim and pathologising identities towards the positive contribution they can give to others.

Psycho-education is also very helpful, particularly normalising people's reactive anxiety symptoms to traumatic events – such as saying things like: "These are normal reactions to an abnormal event". Also people's experience of psychological numbing can be seen as functional rather than dysfunctional. Such a response could be viewed as assisting

with self protection and calming.

An example of collective efficacy is shown through the White Sunday commemorations. White Sunday occurred just two weeks after the tsunami – White Sunday is an annual church service that celebrates children's leadership in Samoa. So in a short space of time the children of Samoa were showing leadership, returning to normal rituals. Of course there were tears but these events were also rituals of resilience and healing. We attended the White Sunday services in Poutasi and were privileged to be witnesses of people's resilience and healing and our presence was acknowledged by the church elders, that we were joining them in their suffering, resilience and healing.

The Christchurch Workshops

Workshop Objectives were that participants will:

- become aware that some aspects of normal counselling, psychotherapy and psychological de-briefing can unintentionally re-traumatise people and leave them considerably worse off than before the engagement.
- develop therapeutic responses and helpful question lines that avoid re-traumatisation by identifying strengths in people's stories of

survival, their important points of social and family connections, and their critical people, symbols and places of meaning.

- learn ways of working with children experiencing grief or trauma individually and in schools that encourage resiliency and centres on strengthening personal resources, learning to control their bodies in stressful situations, understanding feelings and emotions and enhancing relationships.
- become informed about the evidence base and relevance of this approach.

Content Issues

Exposure to the media can have positive and negative effects so it is important to censor and limit disturbing and recurring images and stories of the disaster, particularly to children.

A positive image from the Christchurch Press after the most damaging earthquake was Somali women preparing meals for the emergency workers.



▲Figure 4: Somali women preparing meals for emergency workers (Christchurch Press 2011)

◀Figure 5: White Sunday in Poutasi 2009

Other images from the Christchurch Press show the Student Volunteer Army with great spirit and energy helping with the clean up. The flip side to this, of course, is being careful of what your children are exposed to and what you are exposed to. After some time of exposure to the media surrounding the disaster, people not living in Christchurch have reported needing to turn the radio and TV off. So we need to be careful what



images we are exposed to and what children are exposed to.

Double listening is one technique from Narrative Therapy that we had found to be very helpful in our work in Samoa. There are multiple ways to listen to a story. In our profession we are really attuned to psychological symptoms that might be problematic. We are good at that. However, alternatively we can instead focus on people's responses to a traumatic event – what is called the counter narrative. Just to give you a brief example: "The room shook, I was fearful, I stood up, I ran for the door, I looked for the kids, I was shaking with fear, I ran out onto the grass, I was scared, I called out to my neighbours". Now amongst that you can tune into the fear (being scared, the person shaking) and the trauma line of the story. Or you can listen to the person's responses and actions: "I stood up", "I looked for the kids", "I called out to my neighbours", with a focus on their implications: "I ran for the door" – the moving away from the danger. In amongst that story, therefore, in a very short space of time, you have already got some of Hobfoll et al's (2007) principles represented: promoting safety, self efficacy, and connection with others. So searching for the positive responses, the counterpoint to the story is the focus. In the context of the workshops in Christchurch we invited participants to interview each other using these ideas:

Scenario for role play

In groups of three participants

- *Distressed Person:* Think of a person who has been significantly distressed / traumatised by the quakes and the impacts on their family and livelihood. Take that role
- *Interviewer:* Listen, and then practice double listening and ask some questions that encourage resilience, for example: How have you managed since the quakes? Have you been able to help or support anyone else? What has sustained you during this time? How have you held on to hope since the quakes?

- *Observer:* Take notes that record helpful and unhelpful questions.

We then gathered together in larger groups for feedback and discussion regarding the helpful and unhelpful responses during the role play.

Workshop Outcomes

In terms of outcomes, the team was really humbled because we are not from Canterbury. It was very encouraging to see the large number of people who made the effort to attend the workshops. There was a very real warm sentiment experienced at all the workshops. We hoped there would be the understanding that we were coming with the spirit of being "loving kin", rather than outsiders thinking that we had something "expert" to share. The feedback was therefore very encouraging from the evaluation forms. A total of 790 participants attended the 14 workshops; 80% of participants rated the workshops as extremely or very helpful; 80% rated the workshops as extremely or very informative; 92% of participants identified examples (over 20 topics) of things they learned from the workshops, most of which referred to avoiding re-traumatisation, listening closely to clients and emphasising resilience; 97% of participants identified examples (23 topics) of things they had learned and were most likely to try out. The majority of these referred to encouraging resilience and positive questioning/double listening. Overall 80% rated the workshops as either extremely or very useful.

References

Berger, R., & Gelkopf, M. (2009) School-based intervention for the treatment of tsunami-related distress in children: A quasi-randomized controlled trial. *Psychotherapy and Psychosomatics*, 78, 364-371.

Berkowitz, S., et al. (2010). *Skills for psychological recovery: Field operations guide*. Washington, DC: The National Center for PTSD and the National Child Traumatic Stress Network.

Bush, A., Collings, S., Tamasese, K. & Waldegrave, C. (2005). Samoan and

psychiatrists' perspectives on the self: Qualitative comparison. *Australian and New Zealand Journal of Psychiatry*, 39, 621-626.

Denborough, D. (2006). *Trauma: Narrative responses to traumatic experiences*. Adelaide, Australia: Dulwich Centre.

Denborough, D. (2008). *Collective narrative practice: Responding to individuals, groups, and communities who have experienced trauma*. Adelaide, Australia: Dulwich Centre.

Denborough, D., Freedman, J., & White, C. (2008) *Strengthening resistance: The use of narrative practices in working with genocide survivors*. Adelaide, Australia: Dulwich Centre.

Forbes, D., Fletcher, S., Wolfgang, B., Varker, T, Creamer, M., et al.(2010). Practitioner perceptions of Skills for Psychological Recovery: A training program for health practitioners in the aftermath of the Victorian bushfires. *Australian and New Zealand Journal of Psychiatry*, 44, 1105-1111.

Hawker, D. M., Durkin, J., & Hawker, D. S. J. (2010). To debrief or not to debrief our heroes: That is the question. *Clinical Psychology and Psychotherapy*, 18, 453-463.

Hobfoll, S.E., Watson, P., Bell, C.C., Bryant, R.A., Brymer, M.J., Friedman, M.J., Friedman, M., Gersons, B.P.R., de Jong, J.T.V.M., Layne, C.M., et al. (2007). Five essential elements of immediate and mid-term mass trauma intervention: Empirical evidence. *Psychiatry* 70(4), 283-315. doi:10.1521/psyc.2007.70.4.283

Masten, A. (2001). Ordinary magic: Resilience processes in development. *American Psychologist*, 56, 227-238.

McDermott, B., & Cobham, V. (2011) Personal email communication.

Rajkumar, A., Premkumar, T., & Thayan, P. (2008) Coping with the Asian tsunami: Perspectives from Tamil Nadu, India, on the determinants of resilience in the face of adversity. *Social Science and Medicine*, 67, 844-853

Rutter, M. (1993). Resilience: some conceptual considerations. *Journal of Adolescent Health*, 14, 626-631.

Shalev, A., & Errera, Y. (2008). Resilience is the default: How not to miss it. In M. Blumenfield & R. Ursano (Eds.), *Intervention and resilience after mass trauma* (pp. 149-171). Cambridge, UK: Cambridge University Press.

Tamasese, K., Peteru, C., & Waldegrave, C. (1997). *Ole taeao afua, the new morning: A qualitative investigation into Samoan perspectives on mental health and culturally appropriate services*. Wellington, NZ: The Family Centre.

Waldegrave, C., Tamasese, K., Tuhaka, F., & Campbell, W. (2003). *Just Therapy – a journey: A collection of papers from the Just Therapy team, New Zealand*. Adelaide, Australia: Dulwich Centre.

Williams, R., & Dury, J. (2009). Psychosocial resilience and its influence on managing mass

emergencies and disasters. *Psychiatry*, 8, 293-296.

World Health Organisation (2003). *Mental health in emergencies: Mental and social aspects of health of populations exposed to extreme stressors*. Geneva, Switzerland: Department of Mental Health and Substance Dependence

World Health Organisation (undated) *Single-session Psychological Debriefing: Not Recommended* <http://www.who.int/hac/techguidance/pht/13643.pdf>

Authors' Note

Richard Sawrey at Narrative Consultations, PO Box 44, Paekakariki, New Zealand, richard.sawrey@hotmail.com or Charles Waldegrave at The Family

Centre, PO Box 31050, Lower Hutt, Wellington, New Zealand, waldegrave.c@fc.org.nz.

Our team wishes to state that our hearts go out to all the people of Christchurch. You have endured much but you have also sustained much and our hearts are with you in all that you have sustained in the last few months, and continue to do so.

We wish to offer much warm encouragement to those who continue to be involved in supporting the healing of the people and communities of Christchurch and Canterbury.

Mihi aroha ki a koutou. Alofa atu. Manuia. Soifua.



▲ A once serviceable bridge over the River Cam, Kaiapoi, before demolition, September 2011 — ©2011 Ross Becker