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Psychological Responses after a Major, Fatal Earthquake: The Effect of Peritraumatic  
Dissociation and Posttraumatic Stress Symptoms on Anxiety and Depression

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### **Abstract**

Following trauma, most people with initial symptoms of stress recover, but it is important to identify those at risk of continuing difficulties so resources are allocated appropriately. There has been limited investigation of predictors of PTSD following natural disasters. This study assessed psychological difficulties experienced in 101 adult treatment seekers following exposure to a significant earthquake. Peritraumatic dissociation, posttraumatic stress symptoms, anxiety, depression, and emotional support were assessed. Path analysis was used to determine whether the experience of some psychological difficulties predicted experience of other difficulties. As hypothesized, peritraumatic dissociation was found to predict posttraumatic stress symptoms and anxiety. Posttraumatic stress symptoms then predicted anxiety and depression. Depression and anxiety were highly correlated. Contrary to expectations, emotional support was not significantly related to other psychological variables. These findings justify the provision of psychological support following a natural disaster and suggest the benefit of assessing peritraumatic dissociation and posttraumatic stress symptoms soon after the event to identify people in need of monitoring and intervention.

## Psychological Responses after a Major, Fatal Earthquake: The Effect of Peritraumatic Dissociation and Posttraumatic Stress Symptoms on Anxiety and Depression

While the experience of trauma is a relatively common occurrence, long-term negative psychological consequences do not occur in the majority of individuals (Bonanno, Brewin, Kaniasty, & La Greca, 2010). Consequently, knowledge of factors associated with posttraumatic psychopathology is important because it may help identify individuals most likely to experience long-term psychological difficulties following a traumatic event and facilitate their access to treatment. The relationship between peritraumatic dissociation and posttraumatic psychological difficulties has been studied largely in those exposed to combat and relational trauma. Only a small number of studies have examined large populations affected by disasters. Most of these have been limited to human-made (e.g., factory explosion; Lensvelt-Mulders et al., 2008; Van der Velden et al., 2006) rather than natural disasters, such as flood, fire, tornado and earthquakes (but see Cardena, & Spiegel, 1993). Therefore, evaluations of the relationship between peritraumatic dissociation and posttraumatic outcomes in samples from populations exposed to natural disaster are needed to establish the generality of prior research.

Brewin, Andrews and Valentine (2000) found that variables occurring during and after a traumatizing event (e.g., lack of social support, ongoing life stress, trauma severity) were more strongly related to adult PTSD development than pre-trauma variables. Ozer, Best, Lipsey, and Weiss (2003) supported several of Brewin et al.'s (2000) findings (e.g., lack of posttrauma support). They also found that peritraumatic dissociation, referring to dissociative experiences occurring at the time of a traumatic event and immediately after (Marmar et al., 1994), was the strongest predictor of PTSD development.

A relationship between peritraumatic dissociation and PTSD has been established in those exposed to war, accidents, violence, terrorism, human-made disasters, traumatic

childbirth, and cancer (e.g., Lensvelt-Mulders et al., 2008; Ozer et al., 2003; Van der Hart, Van Ochten, Van Son, Steele, & Lensvelt-Mulders, 2008). Research suggests small to moderate average associations (between 0.35 and 0.4; Breh & Seidler, 2007; Ozer et al., 2003), however, while peritraumatic dissociation increases the probability of subsequently developing PTSD, a direct causal relationship between the variables has not yet been established (Lensvelt-Mulders et al., 2008) and it remains contentious whether peritraumatic dissociation predicts PTSD independently of any other psychological variables. It has been argued that the association is likely to be confounded by other variables, such as other psychological difficulties present at the same time (Van der Velden & Wittmann, 2008), or cognitive processes operating during and after the event which mediate the relationship between peritraumatic dissociation and PTSD (Engelhard, Van Den Hout, Kindt, Arntz, & Schouten, 2003; Pacella et al., 2011). Severe and ongoing peritraumatic dissociative reactions are believed to play an important role in this relationship, and may represent one of a number of potential pathways to PTSD (Cardena & Carlson, 2011). Yet, taken together, the literature suggests a relationship of small to moderate magnitude (e.g., .35 - .4) between peritraumatic dissociation and PTSD.

Research has also tentatively suggested that peritraumatic dissociation is associated with increased psychopathology in general, including symptoms of anxiety (Bremner & Brett, 1997) and depression. Bronner and colleagues (2009) found a strong association between peritraumatic dissociation, anxiety and depression in children and adolescents following admission to an intensive care unit. While the literature indicates that those who dissociate during a traumatizing event are at an increased risk of developing PTSD and other posttraumatic outcomes, it also suggests a complex relationship where other variables also influence psychological outcome following exposure to trauma. A further complex relationship exists between symptoms of depression and PTSD following trauma exposure

(Bonanno et al., 2010). Some have argued that PTSD and depression are independent disorders following trauma (Shalev et al. 1998), whereas others have found an increased risk of depression in those who develop PTSD (Breslau, Davis, Peterson & Schultz, 2000; O'Donnell, Creamer, & Pattison, 2004).

Lack of social support after a traumatic event has been associated with an increased risk of PTSD development in two meta-analyses (Brewin et al., 2000; Ozer et al., 2003). Social support is defined as resources provided by other people (Östberg & Lennartsson, 2007). Poor social support has been associated with the onset and maintenance of PTSD where it is thought to influence the re-experiencing and avoidance symptoms (Guay, Bilette, & Marchand, 2006). Social support may alter appraisals of the distressing event, and impact on emotional states and coping strategies (Joseph, Williams, & Yule, 1997). Reduced social support or isolation may minimize opportunities for therapeutic post-event processing (Guay et al., 2006). Research on victims of natural disasters suggests that perceived social support deteriorates following the traumatizing event (Bonanno et al., 2010; Kaniasty, Norris, & Murrell, 1990), possibly as a result of 1) expectations of support not being met, 2) that distress may affect one's perceptions of support, or 3) that the natural disaster limits the availability of support due to many people being affected by the event (Kaniasty et al., 1990). Social support is a complex construct with several different dimensions, including emotional (e.g., availability of concern, listening), instrumental (e.g., money, labor), and informational (e.g., advice, information) (Östberg & Lennartsson, 2007). The current focus was on one dimension of emotional support (i.e., availability of another to listen to quake experience).

The present study examined psychological difficulties experienced in the aftermath of a natural disaster – the February 22, 2011, Christchurch (New Zealand) earthquake. This 6.3 magnitude quake was in actuality an aftershock from a 7.1 magnitude earthquake occurring the previous September, which due in part to its timing and location claimed no lives, despite

generating psychological distress (Dorahy & Kannis-Dymand, 2012). The February quake killed 185 people ([www.police.govt.nz/list-deceased](http://www.police.govt.nz/list-deceased)), injured thousands and left houses, utilities and infrastructure severely damaged or destroyed. Aftershocks were persistent, with over 12000 recorded (<http://www.geonet.org.nz/earthquake>) to December 2012.

Whereas the majority of post-disaster research is limited to posttraumatic stress reactions (McFarlane, van Hoof, & Goodhew, 2009), the current study investigated a number of psychological reactions associated with trauma exposure. Exploration of the relationships among posttraumatic psychological experiences will increase understanding of how peritraumatic dissociation relates to other posttraumatic psychological sequelae in the context of a natural and ongoing disaster. Path analysis was used to compare two alternative models on the relationship between peritraumatic dissociation, trauma symptoms, posttraumatic anxiety and depression, and emotional support (in the form of having people to listen).

#### *Hypothesized Model 1*

In the first model (See Figure 1) peritraumatic dissociation was expected to predict trauma symptoms (e.g., Lensvelt-Mulders et al., 2008) and posttraumatic anxiety (e.g., Bremner & Brett, 1997; Bronner et al., 2009), which in turn would predict depression (Goenjian, Steinberg, Najarian, & Fairbanks, 2000; O'Donnell et al., 2004) and lack of emotional support (Bonanno et al., 2010; Kaniasty et al., 1990). The variables of depression and anxiety were allowed to correlate to reflect their directionally complex relationship (e.g., Garber & Weersing, 2010; Kaufman & Charney, 2000). Finally, trauma symptoms were expected to predict anxiety (Bonanno et al. 2010) and depression was hypothesized to lead to less emotional support (Coyne, 1999; Guay et al., 2006).

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Insert figure 1 about here

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### *Hypothesized Model 2*

In model 2 (Figure 1) lack of emotional support was anticipated to exert influence on psychological experiences following trauma, rather than be influenced by these experiences (cf., Model 1). This is consistent with lack of emotional support potentially limiting opportunities for cognitive and emotional processing following a distressing event, which heightens the likelihood of PTSD symptom development (Joseph et al., 1997; Lepore, 2001). Finally, consistent with some animal studies on social isolation and anxiety, lack of emotional support was predicted to increase anxiety symptoms (Lukkes, Mokin, Scholl & Forster, 2009).

## **Method**

### ***Participants***

Participants were 101 treatment-seeking individuals attending a free, brief-intervention, counseling and health-care clinic in Christchurch following the February 22<sup>nd</sup> Earthquake. The clinic caters for all sections of the community, but has a particular focus on low-income individuals. Participants completed a brief screening interview two-to-eight weeks after the earthquake as part of their clinical assessment. Due to the haste and complexity of setting up the counseling service in the immediate aftermath of an earthquake, not all counselors were aware or utilized the measure. The 101 participants screened reflected 22% of individuals seeking counseling during the assessment period (N=470). Most participants (68%) were assessed within 4 weeks, and only 7% of participants were assessed at 6 to 8 weeks post-quake. Anonymized interviews were then passed to the researchers.

There were no inclusion or exclusion criteria applied beyond participants being aged over 17.

Information regarding age and gender was mistakenly removed for many participants by the clinician-interviewer in an attempt to protect identifying information, which meant it could not be later retrieved from files. Of those participants whose gender was recorded on



the questionnaire (n = 13), 77% were female and 23% were male. The mean age of the participants who had this information supplied (n = 43) was 42.86 years (SD = 15.2; range 17-84 years). Over 80% of participants were New Zealand Pakeha (white European). The remainder were made up of New Zealand Maori and other ethnicities. This is consistent with the population of Christchurch.

### ***Measures***

Following the February 22<sup>nd</sup> Christchurch Earthquake a questionnaire was rapidly designed, independent of this project, by clinical psychologists in Christchurch for use as a clinical screening tool in health and mental health services dealing with those experiencing mental health difficulties as a result of the quake (Brief Trauma Screening Interview, BTSI, contact second author for copies). It integrated items from a number of existing measures and consists of 21 items<sup>1</sup>, organized as follows. All items were anchored to the earthquake.

#### *Re-experiencing and Arousal*

Posttraumatic re-experiencing and arousal symptoms were assessed via the 10-item Trauma Screening Questionnaire (TSQ; Brewin et al., 2002). This tool was designed to identify those at risk of developing posttraumatic stress disorder following a traumatic event. The items have excellent internal consistency (Foa, Riggs, Dancu, & Rothbaum, 1993), and sensitivity (0.86) and specificity (0.93; Brewin et al., 2002) in identifying those with PTSD. For development of the BTSI a new rating scale was added to each item to assess symptom severity. Thus, for questions affirmed with a 'yes,' (i.e., experienced twice in the past week) participants were asked to rate the severity of their experience on a 5-point Likert scale from 0 (*A little bit*) to 4 (*Extremely*). Cronbach's alpha for severity scores are in Table 1.

#### *Anxiety and Depression*

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<sup>1</sup> The auditory hallucinations item was omitted in this study due to low affirmation rate.

Three items measuring anxiety symptoms and two items measuring symptoms of depression were included in the BTSI. The three anxiety items were taken from the Generalized Anxiety Disorder-7 scale (GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006). It is a psychometrically sound measure of general anxiety symptoms, with excellent internal consistency (Spitzer et al., 2006). The 3 items were chosen as they assessed the core features of anxiety, worry activity that might drive anxiety and fear about future events (which was pertinent given aftershocks). They were: 'Feeling nervous, anxious or on edge'; 'Not being able to stop or control worrying', 'Feeling afraid as if something awful might happen'. The two depression items were taken from the depression module of the Patient Health Questionnaire (PHQ; Spitzer, Kroenke, Williams, & the Patient Health Questionnaire Primary Care Study Group, 1999). The PHQ-9 is a reliable and valid measure of depression severity, with excellent internal consistency (Kroenke, Spitzer, & Williams, 2001). The two items were chosen to reflect elements of the affect and cognitions associated with depression and were, 'Feeling down, depressed, or hopeless', 'Feeling bad about yourself — or that you are a failure or have let yourself or your family down'. Responses indicated how often the individual was bothered by these difficulties as a result of the earthquake and since the earthquake. Each item was rated on a 5-point Likert scale, ranging from 0 ('Not at all') to 4 ('Everyday'). Summed scores at or above 6 for the anxiety metric and 4 for the depression scale indicate considerable symptoms experience of more than half the days in the past week.

### *Peritraumatic Dissociation*

Experiences of dissociation during and immediately after the earthquake were measured by four items from the Peritraumatic Dissociative Experiences Questionnaire (PDEQ; Marmar et al., 1994). The PDEQ consists of 10 items and has good psychometric properties, including high internal consistency (Marmar et al., 1994; Weiss, Marmar, Metzler, & Ronfeldt, 1995). The 4 items chosen (items 3-6) were found to be the best predictors of

acute stress symptoms and best reflect derealization-depersonalization experiences at the time of trauma (Brooks et al., 2009). The response scale ranged from 0 (not at all) to 4 (extremely). Summed scores at or above 6 indicated experiencing considerable peritraumatic dissociation, that was beyond the 'slightly' and in the 'somewhat' range.

### *Emotional Support*

Emotional support was measured with the following item: 'Have you got people around that you can talk to about what you have experienced during and since the earthquake?' This item was rated on a 5-point Likert scale from 0 ('Not at all') to 4 ('Constantly').

### *Procedure*

Individuals seeking counseling for earthquake-related distress were assessed with the BTSI as part of routine clinical care. As the BTSI was designed as a screening interview, the client's counselor worked through the questions in-session with them.

### *Analysis*

To test the competing models, path analysis in Amos 18.0 software with maximum likelihood estimation was employed; the data approximated multivariate normality as assessed by Mardia's coefficient. The adequacy of each model was assessed by a range of fit indices as suggested by Hoyle and Panter (1995). These were the likelihood ratio Chi-square test, the Root Mean Square Error of Approximation (RMSEA; Steiger, 1990), the Comparative Fit Index (CFI; Bentler, 1990) and the Tucker-Lewis Index (TLI; Bollen, 1989). A non-significant chi-square test, a RMSEA less than .06 and CFI and TLI values greater than .95 were considered evidence of desirable model fit (Hu & Bentler, 1999).

## Results

### *Descriptive Statistics*

Descriptive for each variable measured by the BTSI are in Table 1. Eighty one percent of the sample reported experiencing at least 6 of the possible 10 trauma symptoms twice in the past week and, therefore, were at risk of developing PTSD (Brewin et al., 2002).

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Insert Table 1 about here

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### *Model testing*

In each of the models the residual terms of the endogenous anxiety and depression variables were allowed to correlate; this reflects the directionally complex relationship between the variables as hypothesized (see Figure 1). As expected a strong, positive and statistically significant relationship was found between the variables ( $r = .64$ ).

### *Model 1*

The initial model was specified and estimated based on model 1 (see Figure 1); all four of the fit indices indicated acceptable model fit (see Table 2). The standardized regression coefficients for each tested model are reported in Table 3. Three of the path coefficients in model 1 demonstrated weak, non-significant standardized regression weights (namely, depression to emotional support, anxiety to emotional support and trauma symptoms to emotional support). Therefore, eight separate models were specified and estimated with different combinations of the weak, non-significant paths trimmed (Duncan, 1975). The best fitting and most parsimonious model (as confirmed by the Bayes information criterion; Raftery, 1993) had all three of the weak non-significant paths trimmed and was labeled model 1a. Model 1a demonstrated acceptable model fit on all four indices (see Table 2) and provided a more parsimonious explanation of the data. Model fit did not differ significantly between the models (nested  $\chi^2$  difference test:  $\chi^2=3.54$ ;  $df=3$ ;  $p=.32$ ).

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Insert Table 2 about here

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### *Model 2*

The second model was specified and estimated based on model 2 (see Figure 1); three of the fit indices indicated acceptable model fit though the RMSEA was slightly high (see Table 2). The standardized regression coefficients are reported in Table 3. Two of the path coefficients in model 2 demonstrated weak, non-significant standardized regression weights (namely, emotional support to anxiety and emotional support to depression). Therefore, four separate models were specified and estimated with different combinations of the weak, non-significant paths trimmed (Duncan, 1975). The best fitting and most parsimonious model (as confirmed by the Bayes information criterion; Raftery, 1993) had both of the weak non-significant paths trimmed and was labeled model 2a. Model 2a demonstrated acceptable model fit on all four indices (see Table 2) and provided a more parsimonious explanation of the data compared to model 2; model fit did not differ significantly between the models (nested  $\chi^2$  difference test:  $\chi^2=1.36$ ;  $df=2$ ;  $p=.507$ ).

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Insert Table 3 about here

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Model 1a and Model 2a both entailed removing the relationships between emotional support and the other variables resulting in both models converging to produce the same accepted final model (see Figure 2). Peritraumatic dissociation moderately predicted increased trauma symptoms and weakly predicted increases in anxiety. Trauma symptoms in turn predicted increased depression and anxiety symptoms.

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Insert Figure 2 about here

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For the sake of completeness a direct path from peritraumatic dissociation to depression was specified which resulted in a very weak and statistically non-significant standardized regression coefficient ( $r=-.03$ ;  $p=.767$ ). This relationship was not supported by the data and was not included in the final model (see Figure 2). However, the model did demonstrate that peritraumatic dissociation has an indirect effect on depression ( $r=.15$ ) and anxiety ( $r=.18$ ) moderated through trauma symptoms. Therefore the total effect of peritraumatic dissociation on anxiety was  $r=.34$  and  $r=.15$  on depression.

### **Discussion**

A high level of psychological impairment was present two to eight weeks following the February 22<sup>nd</sup> earthquake in treatment seekers. In particular, symptoms of hyperarousal and re-experiencing, and anxiety and depression were experienced at high levels. While it is unknown how participants would have scored prior to the earthquake, questions were anchored to symptoms resulting from the quake and high levels of such psychological difficulties in the aftermath of natural disasters are consistent with the literature (Norris et al., 2002). Two alternative models, based on different findings in the literature, were developed to test relationships between psychological variables experienced following the quake. The most parsimonious version of both models converged to produce the same model. This model revealed that, as hypothesized, peritraumatic dissociation moderately predicted trauma symptoms. Trauma symptoms then moderately to strongly predicted symptoms of depression and anxiety. Peritraumatic dissociation was a weak predictor of anxiety symptoms. A strong, significant correlation was found between symptoms of depression and symptoms of anxiety. Interestingly, emotional support neither predicted nor was predictive of any of the variables.

#### **Peritraumatic Dissociation and Posttraumatic Stress Symptoms**

The finding that peritraumatic dissociation was a significant predictor of posttraumatic stress symptoms adds support to previous research that overwhelmingly demonstrates a moderate relationship between these variables (e.g., Lensvelt-Mulders et al., 2008). This relationship has been less widely explored in people exposed to a significant earthquake compared with other trauma populations. These findings suggest peritraumatic dissociation is an important predictor for the development of posttraumatic stress symptoms in victims of an ongoing natural disaster. Consequently, as in other trauma populations (Lensvelt-Mulders et al., 2008), peritraumatic dissociation appears an important variable to assess shortly after natural disasters to assist identifying people at risk of developing PTSD.

Future work needs to determine mediating and moderating variables that lead to PTSD from peritraumatic dissociation. Some support exists for the role of avoidant coping, distress and persistent dissociation in this relationship (Briere, Scott, & Weathers, 2005; Fikretoglu et al., 2006; Pacella et al., 2011). Dissociation may impede the process of memory integration (Van der Kolk & Van der Hart, 1989), producing perceptual rather than conceptual representations of the traumatic event, which underpin traumatic stress symptoms (Holmes, Brewin, & Hennessy, 2004; Lyttle, Dorahy, Hanna, & Huntjens, 2010; Huntjens, Dorahy & Van Wees, in press). Consistent with this is the finding that fragmented memory mediated between peritraumatic dissociation and acute PTSD (Engelhard et al., 2003; see Huntjens et al., in press).

The finding that peritraumatic dissociation predicts general anxiety symptoms is consistent with limited research in this area, such as Bremner and Brett's (1997) finding that peritraumatic dissociation increased the risk of general psychopathology, including anxiety. It is also consistent with findings from a pilot study where peritraumatic dissociation was strongly associated with anxiety (Bronner et al., 2009), and findings that trait dissociation is correlated with anxiety (Wolfradt & Meyer, 1998). Peritraumatic dissociation may predict

symptoms of anxiety because failure to adequately process a trauma memory may heighten perceived danger about the world and how to cope with it (Ehlers & Clark, 2000). In addition, people who dissociated extensively at the time of the earthquake may represent individuals with less effective emotion regulation strategies (Wolfradt & Meyer, 1998), and this may increase the likelihood of suffering from anxiety symptoms.

Trauma symptoms significantly predicted anxiety and depression, consistent with previous work (e.g., Breslau et al., 2000), including O'Donnell et al. (2004) who found that PTSD was a risk factor for later depression. Participants in the current study were exposed to prolonged natural disaster stress from continuing aftershocks and disruptions, which may have left them feeling anxious and helpless. Prolonged exposure to triggers (e.g., aftershocks) may maintain anxiety and trauma symptoms and result in feelings and thoughts associated with depression, such as helplessness (Brewin, Gregory, Lipton, & Burgess, 2010).

Posttraumatic stress symptoms may increase the risk of depression and anxiety symptoms due to the shared risk factors for both anxiety disorders and depression (Kaufman & Charney, 2000). Consistently, Breslau et al. (2000) and O'Donnell et al. (2004) found that risk factors for developing PTSD and depression following trauma were similar.

Psychopathology following trauma may be considered a general traumatic stress factor, where the different psychological experiences are not independent of each other (O'Donnell et al., 2004). The strong correlation between symptoms of depression and anxiety fits with the two disorders being highly comorbid in general and trauma-exposed populations (Ginzburg, Ein-Ror, & Solomon, 2010; Kaufman & Charney, 2000). Experiencing one disorder has also been found to predict experience with the other (Garber & Weersing, 2010), which may reflect shared common etiological factors, such as biological pathways and cognitive biases (Levine, Cole, Chengappa, & Gershon, 2001; Seligman & Ollendick, 1998).



The lack of a significant path between emotional support and trauma symptoms, depression and anxiety is inconsistent with existing research that suggests social support plays an important role in PTSD development (e.g., Brewin et al., 2000; Guay et al., 2006; Ozer et al., 2003). It is also inconsistent with indications that increasing perceived social support following natural disasters predicts reductions in psychological distress (Norris & Kaniasty, 1996). Social support is a complex, multidimensional construct (Östberg & Lennartsson, 2007). The single item, which assessed having people around to share experiences of the event limited the assessment of social support to the emotional domain. It may be that in this sample of earthquake victims, this particular form of emotional support was not an important variable in immediate recovery. Given assessment was undertaken shortly after the quake, it may be that instrumental (e.g., money, physical assistance) and informational (e.g., information on sourcing resources, shelter, food, water) forms of social support, like having a place to live and having utilities such as water, electricity and sewage operational, are more important in the initial phase of recovery. The benefits of emotional support may be evident further along the recovery period. Well over half the participants were assessed within 4 weeks, and less than 10% were assessed 6 to 8 weeks following the quake. Ozer et al. (2003) found the relationship between social support and PTSD was stronger when the period of time between the trauma and the assessment point was longer. They concluded that social support may serve as a secondary protective factor in PTSD development. This study measured reactions shortly after the trauma and emotional support may indeed play a role in post trauma psychopathology in this population as more time passes. Other forms of social support may have a more immediate impact.

### *Implications*

Predictive relationships between many of the psychological experiences measured in the weeks following a major earthquake demonstrate the importance of assessing a variety of

psychological phenomena, rather than simply posttraumatic stress symptoms. Peritraumatic dissociation and posttraumatic stress symptoms may act as predictive markers for developing other psychological difficulties, heightening the need for early assessment. Given the link between peritraumatic dissociation and the development of PTSD (e.g., Ozer et al., 2003), grounding and emotion regulation strategies may enable reductions in dissociation, and thereby reduce subsequent trauma symptoms associated with avoidance. The two should be utilized together, so arousal is kept to an optimal level. Grounding techniques, such as feeling one's feet on the floor, are utilized to modulate dissociation (Kreidler, Zupancic, Bell, & Longo, 2000). Emotional regulation techniques are intended to regulate arousal to a level where feelings can be safely processed without dissociation. Future research into the utilization of grounding and emotion regulation strategies shortly after trauma could identify whether minimizing dissociation reduces posttraumatic symptom development.

One strength of this study was measuring experiences from as little as two weeks after the earthquake, which is likely to heighten accuracy of reporting peritraumatic dissociation compared to longer trauma-assessments lags (Van der Velden & Wittmann, 2008). A further strength was assessing the predictive value of peritraumatic dissociation for symptoms of general anxiety. This path has received very little attention in previous research.

Study limitations include a cross-sectional and observational design, without control over independent variables, which limits the ability to establish causal relationships between variables. Future longitudinal designs in natural disaster samples should explore the accuracy of the predictive model found here. The actual severity of difficulties in the current sample could not be accurately determined compared to others in the earthquake-affected area. This threatens the external validity of the findings, as it is not clear whether the results generalize to other groups of earthquake-exposed individuals. Moreover, despite anchoring symptoms to those occurring from the earthquake, no baseline measures were taken, limiting accurate

determination of whether some of the reactions, such as depression and anxiety, were the actual result of earthquake exposure or exacerbations of previous difficulties. A contemporary study indicated that even where there were prior psychological difficulties, the earthquake experience led to additional distress (Rucklidge & Blampied, 2011). Anxiety, depression, and emotional support were assessed by a limited number of items, so do not capture the full domain of each construct. Items measuring peritraumatic dissociation reflect derealization-depersonalization, so peritraumatic dissociation was not fully assessed. Finally, due to the desire to have a measure available as soon as possible, the psychometric properties of the BTSI were not fully explored, and may be limited by the brevity of the measure.

### **Conclusion**

This study assessed the relationship between peritraumatic dissociation and short-term posttraumatic outcomes to a fatal earthquake. Findings suggest a similar relationship between the variables to those found in relational and combat-related trauma. The sample reported high levels of distress and two alternative models converged in showing that peritraumatic dissociation predicted posttraumatic stress symptoms and symptoms of general anxiety. Posttraumatic stress symptoms moderated between peritraumatic dissociation and anxiety symptoms and also predicted symptoms of depression. Depression and anxiety symptoms were highly correlated. Emotional support in the form of having someone to disclose experiences to was not significantly related to any of the other psychological variables, suggesting it did not play an important role in initial post trauma psychopathology. The finding of substantial psychological difficulties justifies the utility of screening individuals early on, particularly for peritraumatic dissociation and posttraumatic stress symptoms, to establish whether they are at high risk of other difficulties and to identify individuals in need of appropriate monitoring and intervention. Given peritraumatic dissociation was evident in this natural disaster sample, it should be included in screening tools used after such events.

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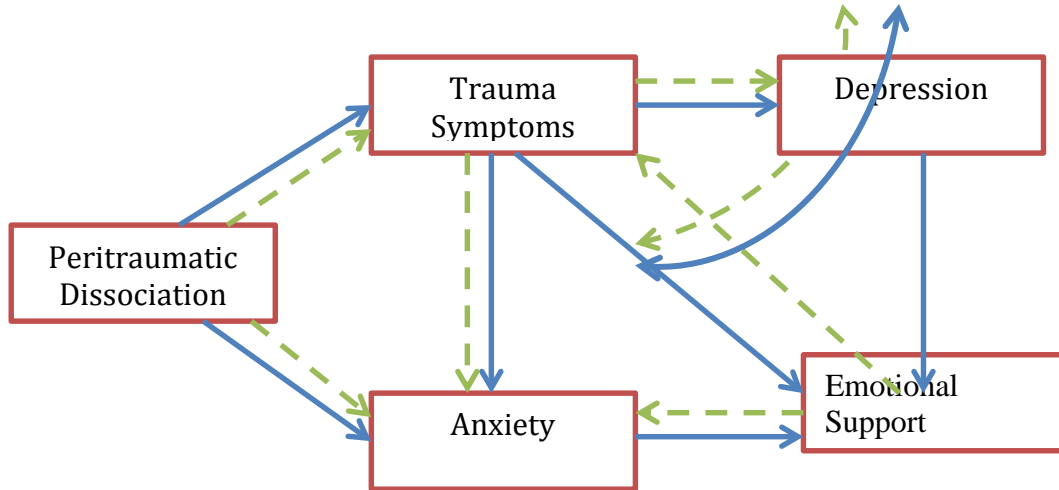
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Figure 1.

*Hypothesized Models*

*1 and 2*



Model 1 - Solid lines.

Model 2 - Dashed lines.

Table 1. *Descriptive Statistics for Brief Trauma Screening Interview*

<b>Variable</b>	<b>N</b>	<b>Mean/Sum</b>	<b>Standard Deviation</b>	<b>Range</b>	<b>Potential range</b>	<b>Cronbach's alpha</b>
Trauma	101	7.85	1.97	3-10	0-10	.67
Symptoms score						
Anxiety score	100	7.25	3.16	0-12	0-12	.84
Depression score						
Depression score	100	3.62	2.40	0-8	0-8	.67
Peritraumatic						
Peritraumatic	99	5.96	4.27	0-16	0-16	.74
Dissociation						
score						
Emotional	99	2.31	1.29	0-4	0-4	-
support score						

Table 2. *Fit indices for each of the competing path models specified*

Model	Chi-square	RMSEA	CFI	TLI
(with 90% confidence intervals)				
1	$\chi^2 = 2.26; df=2; p=.324$	.04 (0 - .08)	1	.98
1a	$\chi^2 = 5.80; df=5; p=.326$	.04 (0 - .14)	1	.98
2	$\chi^2 = 4.44; df=3; p=.218$	.07 (0 - .20)	1	.94
2a	$\chi^2 = 5.80; df=5; p=.326$	.04 (0 - .14)	1	.98

Table 3. *Standardized regression coefficients for each of the competing path models*

Path	Model 1	Model 1a	Model 2	Model 2a
Peritraumatic Dissociation → Trauma Symptoms	.37**	.37**	.36**	.37**
Peritraumatic Dissociation → Anxiety	.15*	.15*	.16*	.15*
Trauma Symptoms → Anxiety	.50**	.50**	.50**	.50**
Trauma Symptoms → Depression	.41**	.41**	.40**	.41**
Trauma Symptoms → Emotional Support	-.14	-	-	-
Anxiety → Emotional Support	.03	-	-	-
Depression → Emotional Support	-.11	-	-	-
Emotional Support → Trauma Symptoms	-	-	-.10	-
Emotional Support → Anxiety	-	-	.03	-

\*indicates significance at the <0.05 level

\*\*indicates significance at the <0.01 level

Figure 2. *The association between peritraumatic dissociation, trauma symptoms, anxiety and depression: Final accepted model*

