

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

**Psychological Outcomes for Adolescents after the  
Canterbury Earthquakes: Posttraumatic Stress,  
Resilience and Related Factors**

A thesis presented in partial fulfilment of the  
requirements for the degree of

Master of Arts

In

Psychology

At Massey University  
New Zealand

Timothy Heetkamp  
2013

## Abstract

This study investigated the psychological response of adolescents to several significant earthquakes in Canterbury, New Zealand. The most destructive of these earthquakes resulted in 185 casualties. A survey was conducted with 570 adolescents at secondary schools in Christchurch 6 months after the most destructive earthquake. A quantitative methodology was utilized where questionnaires were completed online and in paper format. Participants were surveyed in relation to the constructs of posttraumatic stress disorder (PTSD), psychological resilience, trauma exposure, the level of fear experienced, and the psychosocial support accessed. The age of the participants ranged from 13 to 20 years ( $M = 15.2$  years;  $SD = 1.48$ ). Statistical analyses were completed to establish the base rates of PTSD, the relationship between psychological resilience and PTSD, the relationship between trauma exposure and PTSD, and the relationship between fear and PTSD. Additionally, the moderating effect of psychological resilience was analysed. Results established statistical significant relationships between psychological resilience and PTSD, trauma exposure and PTSD, and fear and PTSD. Furthermore, a base rate of 24% for PTSD was established within this sample. Psychological resilience was found to moderate the relationship between fear and PTSD, but did not moderate the relationship between trauma exposure and PTSD. These results are discussed in relation to earthquake-related traumatic exposure. This research project has important clinical and theoretical implications for people working with adolescents who have been exposed to the trauma of an earthquake.

## Acknowledgements

The two year journey of this thesis has been challenging to say the least.. Without the support of the people who I now acknowledge, this thesis would not have been possible and the journey would have been very different.

To my best friend Jackie - my focus on this work has asked a lot of you. Thank you for staying alongside me on this journey, even during its steepest and bumpiest sections. Your energy, positive outlook, and belief in me have been constant sources of inspiration.

To my children Stella, Isaac and Tembi, I dedicate this work to your future. May you continue to thrive in spite of life's challenges. This thesis has cost you not having me around as much. It wasn't really your choice, but I thank you all the same, and I hope that in some way it benefits you too. I look forward to many more adventures with you.

To Mom and Dad, for always wanting the best for me, encouraging me, believing in me and offering me practical support. You have been a firm source of resilience in my life. Thank you.

To my dear friends, including my two sisters, thank you for the practical help given with tasks such as proof reading as well as the emotional support and encouragement. And to my colleagues at work, thanks for cutting me You have each been a source of strength to me.

To Geraldine Meyers and Moana Bianchin, my life-coaches during this process. Thank you for your ongoing support, your honesty and for reminding me of my priorities.

To the teenagers who inspired me to do this work, this research would not have been possible without your participation. My wish is that you will find the resources you need to deal with the difficulties of life and that you will experience a joy of living.

Finally, to my research supervisor Dr. Ian de Terte, thank you for your crucial input into this work. You have constantly gone beyond the call of duty in the process of supporting me. I'm convinced that Sunday night Skype calls and 24 hour feedback timeframes are not the norm for most supervisors! In addition to your extensive knowledge, you always seemed to offer me the correct combination of challenge and support. This encouraged me to continue, and motivated me to extend myself. I count myself very fortunate to have been supervised by you. Again, thank you.

# Table of Contents

Abstract.....	i
Acknowledgements .....	iii
List of Tables and Figures .....	vi
Introduction .....	1
<b>1. Relevant Literature.....</b>	<b>7</b>
What are Disasters? .....	7
Earthquakes.....	10
History of Psychological Research after Disasters.....	11
Disasters and Youth .....	15
Models of Psychological Response to Disasters.....	17
Posttraumatic Stress Disorder.....	20
PTSD after Disasters.....	21
PTSD, Adolescents and Earthquakes.....	22
Resilience .....	23
Relationship between Resilience, PTSD and Disaster.....	29
<b>2. Method.....</b>	<b>33</b>
Research Design.....	33
Participants .....	33
Measurement.....	34
Procedure .....	44
<b>3. Results.....</b>	<b>49</b>
Data Screening and Correction.....	49
Descriptive Statistics .....	54
Hypothesis Testing.....	61
Summary of Results. ....	69
<b>4. Discussion.....</b>	<b>72</b>

Posttraumatic Stress Disorder.....	72
Resilience .....	76
Trauma Exposure .....	84
Fear during earthquakes.....	86
Access of Psychosocial Support.....	88
Study limitations.....	93
Directions for future research .....	98
Conclusion .....	100
<b>References</b> .....	<b>103</b>

<b>Appendices</b> .....	127
A. Tables of Results .....	127
B. Research Questionnaire.....	131
C. Information Sheets and Consent Forms .....	139
D. Email Message of Acknowledgement. ....	144

## LIST OF TABLES

Table 1 Summary of Descriptive Statistics, T-tests, and Effect sizes for Measurement Scales.....	55
Table 2 Differences in Mean Scores by School.....	58
Table 3 Pearson Product-Moment Correlation for Primary Measurement Scales.....	60
Table 4 Pearson Correlation Coefficients for Variables in Hierarchical Multiple Regression....	65
Table 5 Summary of Hierarchical Multiple Regression Analysis.....	66
Figure 1 Moderation of Fear and PTSD by Resilience.....	70



At 4.35am on September 4, 2010, more than 400,000 people were wrenched from their sleep by the violent force of a 7.1 magnitude earthquake. The shaking continued for approximately 40 seconds and in this time an estimated \$3 billion worth of damage was sustained by land, buildings and other property (Bennett, 2011). The epicentre was situated close to Darfield, a small town 40km west of Christchurch, New Zealand. The quake was felt widely across the South Island as well as parts of the North Island. However, the most severe damage was sustained within an 80 km radius of the epicentre. Most of this damage occurred in Christchurch, New Zealand's second largest city with a population of 368,000. Media reports described it as miraculous that there were no casualties as a direct result of the earthquake (Van Beynen, 2010). This was attributed to the timing of the earthquake, when most people were in bed when it struck. Ongoing, significant aftershocks occurred in the months following the initial earthquake, but their severity did not match that of the first quake and by the beginning of 2011, their magnitude was slowly abating. This changed suddenly on February 22, 2011.

At 12.51 pm on this day, a 6.3 magnitude earthquake struck the greater Christchurch area, with devastating force. The epicentre was located 6 km south-east of the city's central business district (CBD) at a depth of only 2 km. The earthquake's peak ground acceleration, a measure of the intensity of ground shaking, was one of the highest recorded during any earthquake worldwide (Kam & Pampanin, 2011). The Christchurch CBD was severely affected. Of the 185 people who died as a direct result of the earthquake, 173 were killed in the CBD. The collapse of one building alone was responsible for 115 of these deaths. More than 3000 injured people sought medical

attention and over 200 of these injuries were life threatening (Kay, 2011).

The earthquake had an immense impact on the infrastructure of Christchurch. Much of the city was without power and water directly after the impact, and a percentage of residents in the city's eastern suburbs were without these services for up to 4 weeks. More than 6,000 homes were condemned and had to be vacated. Schools were closed for 3 weeks and several schools were unable to reopen due to the extent of damage. Site sharing arrangements were carried out between several high schools where one school would use the buildings for the first part of the day and another would use them for the second part of the day.

Aftershocks continued to occur on a regular basis after February 22, 2011, and on the June 13, 2011, two significant aftershocks, the first with a magnitude of 5.9 and the second with a magnitude of 6.3, occurred 80 minutes apart, causing considerable further damage. Although no loss of life resulted from these aftershocks, they were said to have a considerable impact on the morale of many Christchurch inhabitants who were still dealing with the effects of the February 22 event (Hartevelt, 2011). Further destructive aftershocks occurred 6 months later, on the afternoon of December 23, 2011. Three quakes with a magnitude of 5.9, 5.3 and 6.0 respectively, occurred within two hours of each other. These resulted in further property damage, but no loss of life. At the time of writing, aftershocks continue to be felt in Christchurch on a regular basis; however, the magnitude of these continues to diminish.

It seems plausible that a series of events such as these, including one where substantial loss of life and injury incurred, would have a psychological impact on a percentage of people who experienced them. This assumption has been tested numerous by researchers after a wide array of disasters around the world. Norris

and her colleagues (2002a, 2002b) conducted a systematic review of 160 of these studies and concluded that disasters, including earthquakes, have a serious and often persistent psychological effect on a considerable percentage of survivors. Generally, between 10% and 50% of the affected population were found to have some form of psychological distress following significant disasters. This was true across all life stages, including adolescence.

### **Adolescence**

Adolescence is a critical stage of human development. It is in this stage that fundamental changes to biological, cognitive and social processes take place, as the transition is made from childhood to adulthood (Ehrlich, Dykas, & Cassidy, 2012). During this development, risk is also dramatically increased. Mortality rates from accidental death and suicide are three times more likely for 15-19 year olds than they are for 10-14 year olds (Kypri, Chalmers, & Langley, 2002). Depression and anxiety become more prevalent, and the abuse of alcohol and other drugs escalates (Costello, Mustillo, Erkanli, Keeler, & Angold, 2003). At a time when such crucial development is occurring and risk from various factors is already high, it follows that an event such as an earthquake, which impacts directly on an individual's cognitive and social processes, may threaten the healthy development of adolescents who are victims of it.

### **The Study**

This study aimed to discover knowledge that would be useful in the mitigation of risk and the promotion of healthy psychological development of adolescents after the earthquakes. In order to elicit knowledge that would inform resource planning, intervention, and future research, the following three questions were focused on:

- What is the extent of psychological distress experienced by adolescents in Christchurch as a result of the earthquakes?
- What resilience factors might protect adolescents against psychological distress?
- What factors might increase adolescents' psychological distress in response to the earthquakes?

Posttraumatic stress disorder (PTSD) symptoms were measured in order to ascertain the extent of psychological distress experienced. Impairment to daily functioning was also investigated as an indication of the impact of this distress. The relationship between established resilience factors and PTSD symptoms was investigated to ascertain whether these resilience factors might ameliorate the risk of psychological distress. The amount of trauma exposure and the level of fear experienced by adolescents during the earthquakes were seen as risk factors that may increase psychological distress. These two constructs were measured, and the relationship between them and PTSD symptoms explored. Five hypotheses were established in order to empirically test the prevalence of PTSD symptoms and their relationship with the resilience and risk factors described above. These hypothesised that:

1. Severe PTSD symptoms would be present in more than 10% of the sample.
2. A statistically significant inverse relationship would exist between measures of resilience and PTSD symptoms.
3. A statistically significant positive relationship would exist between the measures of trauma experienced during the earthquakes and PTSD symptoms.
4. A statistically significant positive relationship would exist between the measures of fear experienced during the earthquakes and PTSD symptoms.

5. Resilience scores would moderate the relationship between the level of trauma exposure and PTSD symptoms.

These hypotheses were tested using various statistical techniques. The techniques, their results and the interpretation of these results form the basis of this thesis.

This study makes a unique contribution to the field of adolescent psychology as well as the field of disaster psychology. No prior studies were found that measured the constructs of PTSD, resilience, trauma exposure and fear amongst adolescents exposed to earthquakes. Therefore, this study provides new knowledge. This knowledge relates to the psychological impact that a cluster of destructive earthquakes have had on adolescents in Christchurch. It further suggests resilience factors that could buffer the risk of psychological trauma, and indicates several factors that may be involved in the mechanism of PTSD development. The findings of this study have the potential to inform intervention and indicate areas for further research.



## 1. Relevant Literature

This chapter reviews literature relevant to the primary elements of this thesis: disaster, PTSD, resilience, trauma exposure, and fear during earthquakes. It begins by clarifying an appropriate definition of the term *disaster*, with a focus on earthquakes. It goes on to summarise important historical junctures which have shaped the field of disaster psychology, and discusses more recent psychological literature related to disasters. The primary constructs: PTSD, resilience, exposure to trauma and fear are explained, with reference to recent literature. A consideration of these aspects of the literature highlights the need for further investigation of these constructs in adolescents following disaster caused by earthquakes.

### What are Disasters?

The term disaster originates from the Greek words *dis* meaning bad and *aster* meaning star, alluding to the ancient belief that catastrophic events were caused by the fateful positioning of the planets (Harper, 2001). Although the present day meaning of disaster seems obvious, MacFarlane and Norris (2006) noted that the term is difficult to define precisely, and argued that this impacts on the clarity of research in the field. They have proposed a definition of disaster for research purposes that consists of five elements. By this definition, a disaster is: (a) a potentially traumatic event that is (b) collectively experienced, (c) has an acute onset, (d) is time-delimited, and (e) may be attributed to natural, technological, or human causes. This definition was adopted by the Task Force on Psychological Responses of Children to Natural and Manmade Disasters (Pynoos, Steinberg & Goenjian, 2007)

and will be used for the purpose of this thesis. Its elements are now explained.

A disaster is a *potentially traumatic event*, since a disaster is usually not traumatic for every person who experiences it. Research has consistently found that a large percentage of the people who experience disasters do not develop adverse psychological symptoms (Norris, Friedman, Watson, Byrne, Diaz, & Kaniasty 2002; (Furr, Comer, Edmunds, & Kendall, 2010). On the other hand, every disaster carries with it the potential for individual and collective traumatic consequences to occur (Harper, 2001; van der Kolk, McFarlane, & Weisaeth, 1996). Bonanno (2012) has supported this aspect of the definition by consistently using the term *potentially traumatic event* when referring to disasters or other events that might lead to post traumatic stress. Disasters are *collectively experienced events*, in that they always affect groups of people. The World Disaster Report (International Federation of the Red Cross and Red Crescent Societies, 2010) defined a disaster as an event where: 10 or more people are reported killed, 100 or more people are reported affected, an appeal for international assistance is issued, and/or a state of emergency is declared. This emphasises the requirement of a collective experience in order for an event to be defined as a disaster. Disasters have an *acute onset* in that they are sudden. Although there are large variations in how sudden the onset of a disaster is, with some disasters being preceded by several days or even weeks of warning, (e.g., floods and hurricanes), and some by no warning at all, (e.g., earthquakes), disasters can be differentiated from other events by the sudden and sharp escalation of threat at a certain point, followed by the relatively rapid de-escalation of threat once the primary cause has abated (Macfarlane & Norris, 2006). Being *time de-limited* refers to



the event having a specifiable beginning and end. This aspect of the definition differentiates events of disaster from other adversity such as ongoing political violence, health pandemics and wars. Norris et al., (2002 b) noted that these crises are not less serious than disasters, but should be considered separately to disasters, due to their unique trajectories.

Disasters have traditionally been classified by the initial cause of the event, with human-caused and natural disasters being the two primary categories.<sup>1</sup> Human-caused disasters can be divided into two subcategories: technological disasters and disasters of mass violence. Technological disasters refer to those caused by human or technological error such as nuclear meltdowns and major oil spills, whereas mass violence refers to disasters caused with intent, such as shooting sprees or peace-time terrorist attacks (Macfarlane & Norris, 2006).

Natural disasters occur as a result of natural phenomenon such as earthquakes, tsunamis, landslides, volcanic eruptions, floods and cyclones (Abbott, 2009). Philips (2005) argued that the term *natural disaster* is deceiving because a natural disaster is not caused by the natural phenomenon alone, but rather is ameliorated by human vulnerability factors, for example, insufficient building codes in the case of earthquakes. When a natural phenomenon places sufficient stress on factors of human vulnerability, and is accompanied by a lack of appropriate emergency management, a disaster will occur (Philips, 2005). Human vulnerability factors and a lack of appropriate emergency management are more common in developing countries, where resources are scarce (Norris & McFarlane, 2006). This is

---

<sup>1</sup> The terms human-caused and man-made are both used in the research literature to describe the same disaster type, however the term human-caused will be used in this thesis since it is free of gender bias.

why the impact of natural disasters is often significantly higher when the disaster occurs in a developing country than when it occurs in a developed one (Dayton-Johnson, 2004).

In summary, a disaster can be defined as a potentially traumatic event that is collectively experienced, has an acute onset, is time delimited and can be attributed to natural, technological or human causes. This review of literature includes studies of disasters with various typologies, however natural disasters, in particular earthquakes, are afforded special attention since they relate directly to the current study.

## **Earthquakes**

An earthquake is caused by the sudden release of accumulated strain along fault lines which are fractures in the earth's crust (Quinn, 2003). Although the seismic activity along many fault lines is scientifically measured, and earthquake probability forecasts are made, these have a low level of accuracy and many fault lines remain undetected (Sammis & Sornette, 2002). Earthquakes are primarily unpredictable events with severely sudden onset (McFarlane & Norris, 2006), and this distinguishes them from other disaster types. Earthquakes have resulted in over 500,000 deaths in the past decade, more than any other category of natural disaster (International Federation of the Red Cross and Red Crescent Societies, 2010) and are therefore worthy of ongoing research attention.

**Earthquakes in New Zealand.** New Zealand lies in the *Pacific Ring of Fire* which is an area of dynamic geological activity susceptible to earthquakes (Abbott, 2009). It lies between the Australian and Pacific Plates and has a large fault line

running through a significant portion of its two islands. For this reason, even prior to the Canterbury earthquakes, it was subject to approximately 15,000 earthquakes a year, where approximately 200 of these were strong enough to be felt (GNS Science, 2011). Despite this, in comparison to global earthquake fatalities, New Zealand has a low overall fatality rate. Two primary reasons for this are the relatively small population density of 15.5 per square kilometer and the fact that it is a developed country, which has meant more investment in earthquake preparedness compared with developing countries which have higher death tolls (Phillips, 2005). The earthquake with the highest fatalities was the Napier earthquake of 1931 in which 256 people were killed. Including the Canterbury earthquakes, a total of 479 people have died as a result of earthquakes in New Zealand since 1843, compared to 215 from all other natural disasters in the same time period. Research into psychological response after earthquakes is therefore an important endeavor in New Zealand, and it is required in order to provide an evidence base on which to design effective intervention (Masten & Narayan, 2012). Attention is now directed toward the history of psychological research pertaining to disasters in general. This provides a context for current research in the field.

### **History of Psychological Research after Disasters**

**Early research.** The psychological effects of disasters have probably always been of interest to humans who naturally seek to make meaning of their own experience and to understand the experience of others, often with the aim of relieving suffering (Staub & Vollhardt, 2008). Symptoms of psychological trauma following war were documented by the medical profession as early as 1861 and

described with terms such as *soldier's heart*, *shell shock* and *combat exhaustion* (Anders, 2012). The Swiss psychiatrist Stierlin carried out the first systematic examination of civilian disaster victims following the 1907 Messina earthquake that killed 70,000 people (as cited in van der Kolk, McFarlane & Weisaeth, 1996). A primary finding was that 25% of the survivors suffered from sleep disturbances with intense nightmares. Three decades later, neurologist Alexandra Adler (1943) studied survivors of the Boston Coconut Nightclub fire in which 492 people were killed. Findings from her study of 46 survivors were published in a paper entitled "Neuropsychiatric complications in Victims of Boston's Coconut Grove Disaster." Here Adler documented ongoing symptoms such as nightmares, avoidance of reminders and anxiety in one third of her subjects. Many of the symptoms documented by both Stierlin and Adler's studies are synonymous with present day PTSD. However, they were referred to with terms such as "anxiety neurosis" (Adler, 1943, p. 1099). Psychiatrist Erich Lindemann (1944) published a study shortly thereafter entitled the "Symptomology and Management of Acute Grief" where he documented his observation and treatment of 13 survivors of the same Coconut Nightclub disaster, alongside other subjects who had experienced acute grief following other bereavements. Lindemann suggested that most cases improved with the correct psycho-social intervention aimed at helping the bereaved find new patterns of rewarding interaction. Both Adler and Lindemann's studies gained widespread attention and were important in increasing the focus of the psychological effects of disasters at the time.

The earliest study of children after disaster was conducted in the United

States after a tornado hit Vicksburg, Mississippi in 1953 (Bloch, Sliber & Perry, 1956). Several children were killed and others were injured when the tornado destroyed a movie theatre filled with children. A survey conducted by Bloch et al. just days after the event, found increased dependency on parents, regressed behaviour including enuresis, nightmares, specific fears related to the tornado, and tornado related games. They reported that severe reactions were more likely for children who received the greatest tornado impact, children who were seriously injured, or children who experienced the death or injury of a family member. These early findings of symptom type, and their correlation of their severity with trauma exposure, have been consistently replicated (Furr, et al., 2010).

**Shifts in research focus.** Raphael and Macquire (2009) noted various shifts in the focus of psychological disaster literature over time. The majority of research conducted during the 1950's and 1960's focused on the sociological aspects of disaster, for example, Quarentelli (1954) challenged widely held views of the time by arguing that widespread panic was unlikely to result from disaster, Wolfenstein (1957) published an essay on the behavioural responses and patterns of disaster over time, and Baker and Chapman (1962) published a book entitled *Man and Society in Disaster*. A seminal work at this time was Lifton's (1967) study on Hiroshima survivors 17 years after the atomic bomb. His work was the result of 75 in-depth case studies with survivors of the bomb and provides poignant examples of the presence of resilience amidst trauma and suffering. Lifton used qualitative methods as did the majority of researchers of this period.

An event that had a major impact on the disaster research field and signalled

a shift from qualitative to quantitative research methods was the Buffalo Creek Disaster of 1972. This disaster occurred when a coal mine dam collapsed above a small mining settlement in West Virginia, killing 125 people from a community of 5000. Funding provided by the coal mine in the course of litigation enabled multiple researchers from various disciplines to investigate the impact of this event. These researchers focused on the loss of community (Erikson, 1976), family and personality change (Titchener & Kapp, 1976), emotional and behavioural problems (Church, 1974), the course of trauma (Rangel, 1976), and the psychological state of children (Newman, 1977). Gleser, Green and Winget (1978) quantified existing interview data of 381 survivors. These reports were analysed using a Psychiatric Evaluation Form, and significant psychopathology was found amongst the sample. Longitudinal studies conducted by the same investigators found lingering psychopathology, including PTSD, more than 10 years after the disaster (Green, Grace, Lindy, & Gleser, 1990). In the same era as the Buffalo Creek disaster various studies were being carried out after other disasters. For example, the assessment of tornado survivors (Penick, Powell, & Sieck, 1976), the investigation into the psychological impacts of Cyclone Tracey in Australia (Gordon, 1977) and the study of emotional trauma following floods in Brisbane (Abraham, Price, Whitlock and Williams, 1976). The development of a standardised measure of post-traumatic stress, the Impact of Events Scale (Horowitz, Wilner & Alvarez, 1979), signalled the arrival of a more quantitative research approach where specific and standardised symptomology was being studied across different disasters.

A pivotal development in the history of disaster research was the

introduction of the PTSD classification in the *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed., *DSM-III*; American Psychiatric Association [APA], 1980). Following its inception, the majority of psychological disaster studies focused on PTSD or aspects thereof following disaster (Raphael & Macquire, 2009). In the decade following the introduction of the PTSD criteria, meta analyses and reviews of literature (e.g., Green & Solomon 1995; Miller & Kraus 1994; Rubonis & Bickman, 1991) further integrated research and guided future collaborative research approaches. The concept of resilience in response to trauma (Rutter 1990, Yule, 1992; McFarlane & Yehuda, 1996) attracted a growing research interest at the time, resulting in an increase in studies and literature relating to it.

The rapid advancement of information technology in the latter part of last century led to an increase in the quantity and quality of disaster literature (Schlenger & Silver, 2006). The internet allowed information to be shared with greater speed and ease following disasters, resulting in faster research response after disaster, additional methods for data collection, and more collaboration between researchers. Furthermore, the increased availability and quality of technological equipment for neurobiological and genetic studies have resulted in rapid growth in the application of these methods for understanding the psycho-biological effects of disasters (Mahan & Ressler, 2012).

## **Disasters and Youth**

Norris and her colleagues (2002) synthesised findings from the substantial body of disaster literature published between 1981 and 2001. In this landmark review, 160 studies consisting of a total of 60,000 participants were analysed. They

found that youth were more impaired after disasters than adults. Psychological sequelae included depression and anxiety disorders, PTSD, and non-specific distress such as perceived stress, demoralisation and negative affect. Consistent with findings from research with adults, the prevalence of PTSD amongst youth samples varied considerably (7% -56%), with severity of trauma exposure, family factors, and the availability of psychosocial resources having a significant effect on impairment. The analysis did not differentiate disaster effects on pre-adolescent children from effects on adolescent youth. This was because many of the studies making up the analysis did not investigate these groups separately.

A review entitled “The Psychological Consequences of Earthquakes and Other Disasters on Children and Youth” was conducted 17 years ago in New Zealand (Williams, 1995). It summarised international research relating to young people’s response to disaster, methods of assessing their psychological wellbeing following disaster, and effective interventions. The findings were applied to young people in New Zealand, and culminated in suggestions for ongoing research into the psychological effects of disasters on New Zealand youth, as well as the implementation of appropriate interventions. This review also failed to clearly differentiate between findings pertaining to younger children and those pertaining to adolescents.

**Adolescence.** It is appropriate at this point to clarify the meaning of the term *adolescence*. Although a single scientific definition of adolescence does not exist, there is agreement that the term denotes the developmental transition between childhood and adulthood (Ehrlich, Dykas, & Cassidy, 2012). Indeed, the term adolescence is



derived from the Latin word *adolescere* meaning to grow up. A wide age range, from 9 to 24 years, is suggested by some researchers to be the age of adolescence (Stanovich, West, & Toplak, 2012). However, 11 to 19 years is more commonly suggested, with three stages: early from 11 to 13 years; middle from 14 to 16 years and late from 17 to 19 years (Bronk, 2011). This research focuses on 13 to 18 year old adolescents, which is the age range of secondary school students in New Zealand, and is also the period of highest risk for mortality and the development of psychopathology (Price & Zwolinski, 2010).

Although the body of research investigating the psychological impact of disasters on youth has grown steadily over the last two decades (Norris 2006), the majority of existing studies have grouped pre-adolescents and adolescents together (Furr, et al., 2010). While this is understandable given the similarities between these two age groups, it is widely accepted that adolescents are at a developmental stage distinct from that of pre-adolescent children (Steinberg & Sheffield, 2001). An example of one of these distinctions is the process of individuation which takes place during adolescence, marked by a reduced reliance on parents and increased reliance on peer networks for support (Gnautati, 2001). Attachment and support mechanisms are important factors in response to trauma (Garmezy & Rutter, 1985), consequently, an adolescent would draw on different support mechanisms than children, and their response to trauma may be different as a result of this. This illustrates the necessity for adolescents to be considered a distinct population subset when investigating the psychological effects of disaster.

## **Models of Psychological Response to Disasters**

Various theories support psychological research in the disaster arena.

Benight, Cieslak and Waldrep (2009) reviewed prevailing theories and suggested that theoretical foundations were an important basis for sound research practice.

Adequate theory also provides a greater depth of understanding to clinicians, counsellors and other intervention professionals assisting those with disaster related distress. Four leading theories are briefly reviewed in order to provide a basis for the current study. These are: *social cognitive theory* (Bandura 1997), *conservation of resources theory* (Hobfoll, 1989), *learning theory* (Başoğlu & Şalcioğlu, 2011) and *psychobiological theory* (Mahan & Ressler, 2012).

Social cognitive theory (Bandura, 1997) postulates that humans regulate their behaviour through the self-evaluation of successful or unsuccessful goals. A key construct within social cognitive theory is self-efficacy, the perception of personal capability. This concept is closely related to certain constructs of resilience (Rutter, 1985; Connor & Davidson, 2003). Benight and Bandura (2004) demonstrated the importance of a particular type of self-efficacy termed *coping self-efficacy* in predicting psychological recovery in a variety of disaster settings.

Conservation of resources theory (Hobfoll, 1989) has been widely referred to in the disaster literature (Hobfoll, 1991, Norris et al. 2002 b; Freedy, Saladin, Kilpatrick, Resnick, & Saunders, 1994). It is based on the premise that people are “biologically primed and further learn to obtain, retain, and protect the resources that they value” (Benight, McFarlane & Norris, 2006, p. 68). According to conservation of resources theory, stress occurs when critical physical resources (e.g., food, shelter) and/or psychological resources (e.g., self-esteem, mastery) are lost or

threatened. Hobfoll (1991) argued that under this theory, traumatic stress occurs in response to the sudden and unexpected loss of resources. Smith and Freedy (2000) found evidence supporting conservation of resources theory in victims of a flood, where resource loss was shown to be predictive of poor psychological outcomes.

Başoğlu and Şalcioğlu (2011) presented a learning theory of traumatic stress specific to earthquakes. This model proposed that the perceived lack of control and perceived inability to escape an unpredictable traumatic stressor, leads to a progression from fear to *learned helplessness* (Seligman & Maier, 1976). Learned helplessness describes a condition where the organism is so fearful that it no longer acts on opportunities for escape or reward, but rather behaves helplessly in the midst of the stressor (Maier, 2001). Başoğlu and Şalcioğlu suggested that learned helplessness is the primary factor in the development of PTSD following earthquakes. They proposed that an individual's sense of control over their fear of earthquakes is crucial to trauma resilience. The use of graduated self exposure to increase a person's sense of control over their fear of earthquakes has been found to be an effective treatment approach (Başoğlu & Şalcioğlu, 2011).

Mahan and Ressler (2012) presented a psychobiological model for PTSD in response to disaster. They highlighted the central role of the fear neural circuit in PTSD. This circuit is driven primarily by the amygdala, but other parts of the brain such as the prefrontal cortex, hippocampus, sensorimotor cortex and thalamus also play a role. Their model explains the role of the serotonin transporter gene, 5-HTT as well as other genes in the susceptibility for PTSD among children. This provides biological rationale for the role of conditioned fear in the maintenance of PTSD.

Although the current study does not test a specific theory, a synthesis of the above theories provides a foundation for it. For the purpose of this thesis, PTSD following a disaster is viewed as being determined firstly by pre-existing biological, psychological and social (biopsychosocial) factors prior to the trauma, secondly by an individual's level of traumatic exposure during the event, and finally, by the availability of biopsychosocial resources following the event. These 3 elements interact, resulting in either successful coping or perceived lack of control which results in learned helplessness, the primary mechanism in psychopathology following disaster (Seligman & Maier, 1976; Başoğlu & Şalcioğlu, 2011). PTSD, resilience, trauma exposure and fear in adolescents are the primary constructs investigated in this study. Existing literature relating to these constructs is now reviewed.

### **Posttraumatic Stress Disorder**

PTSD is currently the most studied mental disorder in the wake of disasters (McFarlane, Van Hoof & Goodhew, 2009). The primary reason for this is that the classification of PTSD clearly links trauma experienced during a disaster, to specified symptoms (Neria, Nandi & Galea, 2008). PTSD was first defined in the third edition of the *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed.; *DSM-III*; American Psychiatric Association [APA], 1980). In the two previous editions of the *Diagnostic and Statistical Manual of Mental Disorders* (1st ed.; *DSM-I*; & 2nd ed.; *DSM-II*; American Psychiatric Association [APA], 1952; 1968), psychological disturbance after

trauma was viewed as an acute psychological reaction that in most cases abated over time (Brett, 2007). This reaction was named *transient situational personality disturbance* in the first edition of the *DSM* (APA, 1952) and *transient situational disturbance* in the second edition of the *DSM* (APA, 1968). The third edition of the *DSM* (APA, 1980) differentiated between PTSD and *acute stress disorder* (ASD), where ASD was classified by post-traumatic symptoms present for 4 weeks or less. The distinction between PTSD and ASD also exists in the current *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association [APA], 2000), and is proposed to remain in place in the next edition (American Psychiatric Association [APA], 2012).

According to the *DSM-IV-TR* (APA, 2000), a diagnosis of PTSD is warranted when exposure to a traumatic stressor has occurred, and the person exposed has been confronted with death or serious injury and responded with intense fear, helplessness or horror. At least one month after the disaster, they have begun to, or continue to experience at least one symptom of intrusive recollection such as flashback memories or recurring nightmares; at least three symptoms of avoidance/numbing such as avoiding places that remind them of the trauma or difficulty remembering important aspects of the trauma; and at least two symptoms of hyper-arousal such as difficulty falling asleep or being easily startled. Furthermore, significant distress or impairment in normal functioning must have occurred in order for a diagnosis of PTSD to be made.

### **PTSD after Disasters**

Norris et al. (2002) found that the prevalence of PTSD varied greatly across

different disasters. They attributed this variation to: (a) differences in disaster severity, (b) differences in severity of trauma experienced by the sample, and (c) variability in methodological aspects, such as type of measurement used and period of time since the disaster. They noted that higher levels of PTSD were found amongst youth samples, which included both children and adolescents, compared to adult samples.

Furr, Comer, Edmunds and Kendall (2010) conducted a recent, meta-analysis specific to youth PTSD following disasters. Ninety-seven studies from journal articles were included in their analysis. Disasters were found to have an overall significant effect on youth PTSD ( $r_{\text{pooled}} = .19$ ,  $SE_r = .03$ ;  $d = 0.4$ ). Female gender, higher death toll, closer proximity to disaster, personal loss, perceived threat and distress at the time of event all had a significant effect on youth PTSD. Studies of adolescents and younger children were included in this analysis and variability in age effects was found; however, the analysis did not find a significant overall effect of age on PTSD. In contrast, Yelland et al. (2010), found a significant effect of age on PTSD where younger children reported greater symptom severity than adolescents. The effect of age on PTSD has not been consistently replicated (Norris et al. 2002a; Pynoos, Steinberg & Goenjian, 2007).

A finding that has been replicated in multiple studies is that females experience higher levels of PTSD than males. Tolin and Foa's (2006) meta-analysis of studies across all age groups, found that females were twice as likely as males to experience PTSD in their lifetimes. Another robust finding is referred to as the *dose-response effect*, where more severe trauma exposure (dose) leads to higher levels of

PTSD (effect) (Goenjian et al., 2005). An associated finding is that subjective fear at time of trauma predicts higher levels of PTSD (Başoğlu & Şalcioğlu 2011; Comer & Kendall, 2007). Başoğlu and Şalcioğlu have stressed the importance of measuring traumatic exposure and fear in relation to PTSD and disaster, in order to investigate the influence of these factors on outcome, and to provide data for comparison.

### **PTSD, Adolescents and Earthquakes**

Although many studies have grouped younger children and adolescents together in their samples, some have focused exclusively on adolescents. These provide findings relevant to the current study. Goenjian et al. (2011) conducted a 32 month follow-up study of 511 adolescents who had originally been evaluated 3 months after the 1999 Parnitha Earthquake in Greece which had a magnitude of 6.0 and a death toll of 143. They found a significant decrease in PTSD symptoms over time, however 8.8% of the sample were still experiencing moderate to severe levels of symptoms after 32 months. Dell’Osso et al. (2009) investigated 475 senior high school students 21 months after the 2009 L’Aquila earthquake in Italy which had a magnitude of 6.3 and a death toll 309. Full and partial PTSD was reported by 31.4% and 30.7% of the sample respectively. Fifteen percent of the same sample reported the loss of a close friend or relative and significantly higher PTSD symptoms were reported by bereaved subjects. Zheng, Fan, Liu, and Mo, 2012 examined the relationship between negative life events, coping styles and PTSD amongst 2250 adolescent survivors of the 2008 Wenchuan earthquake in China, which had a magnitude of 8.0 and a death toll of 68,000. Negative life events post-disaster were significantly associated with adolescents’ reported PTSD symptoms, with academic

pressure being the strongest predictor of PTSD. Negative and positive coping styles were also significantly associated with levels of PTSD. Positive coping style is related to the concept of resilience, and Zheng et al. called for psychosocial interventions aimed at increasing positive coping style. Researching the effects of the same disaster on a separate sample of 330 adolescents who lived in an area further away from the epicentre with less damage than other parts of Wenchuan, Liu et al. (2011) found 11.2% and 13.4% prevalence of PTSD amongst adolescents at 6 and 12 months respectively. This difference was not statistically significant which suggests that the prevalence of PTSD symptoms remained relatively stable over time. Two commonalities exist in the diverse findings of adolescents' response to earthquakes: First, the level of PTSD symptoms vary amongst disaster type and sample, but can be severe and affect a significant proportion of the population. Second, there are various risk factors that increase the likelihood of PTSD symptoms, and various protective factors that decrease the likelihood of PTSD symptoms. Resilience, a construct related to protective factors, is now considered.

## **Resilience**

The term *resilience* has been used in science for over a century (Bonanno, 2012), but it was not until the 1970's that it was first used in social science literature. Norman Garmezy (1971) initially used the psychological concept when he investigated a subset of people with schizophrenia who consistently showed a better trajectory of improvement than the majority of patients with schizophrenia. Rather than focusing on pathology, Garmezy focused on factors that were not shared by the majority of patients with schizophrenia and found pre-morbid protective factors



such as competence at work, functional social relations, marriage, and capacity to fulfil responsibility within the subset that improved. Following this, Garmezy & Streitman, (1974) studied the children of women with schizophrenia and found that many functioned normally despite their high-risk exposure. They identified factors that acted as protective buffers against psychopathology in these children, and although they did not use the term resilience in their published findings, the concept of psychological resilience was established. Rutter (1976) was also influential at the time, presenting detailed findings on risk and protective factors in a book entitled *Helping Troubled Children*. Werner and Smith (1982) were the first authors to use the term resilience in the context of human development. They used it to describe approximately one third of children from a birth cohort in Hawaii who developed normally, despite being subject to multiple developmental risk factors. These initial studies were the start of what was to become a prolific body of research into psychological resilience.

Resilience has recently been described as a “conceptual umbrella”, used for a large array of factors found to modify the impact of adversities (Hjemdal, Friborg, Stiles, Marinussen & Ronvingel, 2006 p.85). In accordance with this description, the concept is subject to a wide range of definitions. Concerns over ambiguities in definitions of resilience have been expressed by several researchers (Kaplan, 1999, Tarter & Vanyukov, 1999, Tolan 1996), and some have called for the concept of resilience to be abandoned altogether. (Kaplan, 1999; Tarter & Vanyukov, 1999). Luthar, Cicchetti and Becker (2000) have provided a thorough and convincing response to these criticisms, and call for a continued increase in the rigour of

empirical resilience research, due to its ability to expand developmental theory and provide direction for successful intervention.

Luthar et al. (2000) explain that although variations in definitions of resilience do exist, the majority of definitions acknowledge the requirement of two central factors: (1) exposure to significant threat or severe adversity; and (2) the achievement of positive adaptation despite major assaults on the developmental process. These factors are captured in Masten, Best and Garmezy's (1990) broad and often cited description of resilience as "the process of, capacity for, or outcome of successful adaptation despite challenging or threatening circumstances" (p.426). Bonanno (2004) offers a related yet more stringent definition of resilience positing that resilience is present only when an individual maintains a stable equilibrium in the midst of a stressor. By this definition, resilience does not include significant recovery or "bouncing back" Wagnild and Young (1993, p. 37). Disagreement exists over this aspect of recovery and whether a response of recovery after significant impairment can be labelled resilience (Masten, Monn & Supkoff, 2011). For the purpose of this thesis, recovery from impairment in a short space of time, for example the six month period between the most serious earthquake and data collection in the case of this study, is nevertheless defined as a resilient response (Bonanno, 2012).

**Models of Resilience.** Theoretical models of resilience are important to enhance research precision and improve communication across methodologies (Kumpfer, 1999; Chichetti & Garmezy, 1993; Luthar, Cichetti, & Becker, 2000).

Various models of resilience have been presented in the literature, and four models relevant to this study are discussed. Kumpfer (1999) proposed a resilience

framework influenced by social ecology theory (Bronfenbrenner & Crouter, 1983), as well as the concept of resilience as a process rather than a collection of static factors (Rutter 1990; Werner 1989). Her framework consists of the following six interacting domains: (1) Stressors or Challenges. These are the antecedents, for example earthquakes, that may activate disequilibrium; (2) The External Environment which includes both risk and protective factors in the individual's critical domains of influence such as family, community, culture, school, and peers; (3) Person-Environment Interactional Processes which refer to the way an individual interacts with their environment and includes perception, reframing, active coping, and environment modification; (4) Internal Self Characteristics which are cognitive, social, physical, emotional and spiritual competencies that facilitate successful adaptation amidst adversity; (5) Resilience Processes which refer to the unique coping processes learned by the individual in response to previous exposure to stressors; and (6) Positive Outcomes which are successful adaptations to challenges and stressors that increase the likelihood of successful coping with future stressors. Kumpfer (1999) reviewed research outcomes within each of the 6 domains and found empirical support of the framework in various populations. This framework is useful to the field of resilience, in that it highlights the multi-systemic nature of resilience and allows for clarification of the specific area or domain that the research is being conducted in.

The *Five Part Model* of resilience proposed by deTerte, Becker and Stephens (2009) shares some similarities with Kumpfer's framework. It is an adaptation of the *Five Areas Model* used in cognitive-behavioural assessment and therapy (Williams &

Garland, 2002). In this model as it is applied to resilience, four internal factors (cognitions, emotions, behaviours and physical activities) and one external factor (the environment), interact with each other when a person is under stress, to determine a resilient or non-resilient outcome. Under this model, the environment factor includes sub-domains of family, community and societal support. The Five Part Model shares similarities with Kumpfer's framework due to its multisystemic, ecological orientation; however, it differs in that it does not include the stressor or outcome domains and does not explicitly refer to the two transactional domains of person-environment processes and resilience processes (domains 3 & 5) included in Kumpfer's model. The Five Part Model is parsimonious (Epstein, 1984) and is useful in reference to the current study, which seeks to measure external as well as internal aspects of resilience.

Connor and Davidson (2003), who have developed a widely used measure of resilience, have defined resilience as "stress coping ability" within the individual (p.76). Their model of resilience consists of empirically derived cognitive and trait factors found to be associated with resilient outcome in the face of stress. The model and associated measure, draws on Kobasa's (1979) concept of hardiness as well as Rutter (1985) and Lyons' (1991) work on protective cognitive perceptions and personality traits. Criticism of Connor & Davidson's model has been laid on the basis that it consists of trait resilience, or personality factors inherent in the individual, and excludes external protective factors (Bonanno, 2012). Additionally, if resilience consists of trait factors alone, which an individual either has or does not have, there would be little opportunity to modify resilience. The seminal paper by

Mischel (1973), argued that less than 10% of behaviour is dictated by personality traits. However, Bensimon (2012) provided convincing evidence of the role of trait resilience in mediating between trauma and PTSD in college students. Furthermore, Fincham, Altes, Stein and Sedat (2009) found trait resilience to moderate between exposure to violence and PTSD in a sample of South African adolescents. The finding that trait resilience increased in subjects given antidepressant medication (Connor & Davidson, 2003) as well as those who received cognitive-behavioural therapy, demonstrates that these resilience traits can be altered. Although it is likely that trait-resilience is only one part of the entire construct, there is convincing evidence that the individual trait factors are protective against psychopathology, including PTSD, and it is for this reason that they are measured in the current study. Ungar (2010), conceptualizes resilience from a social-ecological perspective and defines it as:

both the capacity of individuals to *navigate* their way to the psychological, social, cultural and physical resources that sustain their well-being, and their capacity individually and collectively to *negotiate* for these resources to be provided in culturally meaningful ways" (2008, p.225).

This definition highlights the concept of resilience being ecological, involving the individual, their external resources and their social/cultural connections, and aligns with Kumpfer's (1999) framework, including the transactional domains. Ungar and Liebenberg (2011) have identified 32 separate resilience domains within seven distinct categories. They recommend a mixed-methods approach for investigating resilience, which includes both quantitative and qualitative methods, in order to

increase the depth and validity of findings. Although a mixed methods approach is often preferable, this approach requires more planning and resources per participant. Norris (2006) notes various logistical and resource constraints following disaster, and these make the implementation of mixed methods approaches more challenging.

In her review of the resilience literature pertaining to youth, Masten (2011) identified seven specific protective factors that are consistently evidenced in the resilience literature. These are: good caregiving, close relationships with prosocial others, intelligence, self regulation, self efficacy, faith/religious affiliation, and effective schools. These common protective factors emphasize the multisystemic nature of resilience (Kumpfer, 1999; deTerte et al., 2009) where environmental, as well as individual aspects contribute to it. It has been recommended that resilience research takes the multisystemic composition of this construct into account and that researchers clearly specify the aspects of resilience under investigation (Luthar, 2000).

### **Relationship between Resilience, PTSD and Disaster**

Research on the prevalence of psychopathology after disaster (e.g. Norris et al., 2002), suggests that the majority of people are resilient to psychological dysfunction after disaster, since in most cases only a minority of the affected population develop disorders such as PTSD, anxiety or depression after disaster (Bensimon, 2012). Furthermore, longitudinal studies on PTSD after disasters have found consistent evidence of a steady reduction in symptoms over time in adults (Norris et al., 2002a; Tedeschi, Calhoun, & Cann, 2007), children (Furr et al., 2010; Norris et al., 2002a), and adolescents (Goenjian et al., 2011). This demonstrates an

innate tendency toward resilience under the 'ability to bounce back' definition (Rutter, 1990; Masten, 2011). There are few studies, however, that specifically measure resilience factors in relation to PTSD after disaster. Furthermore, a literature search found no studies that investigate the relationship between resilience and PTSD in the adolescent population after earthquakes.

Wang et al. (2009) conducted a study of resilience in relation to PTSD amongst 341 adult earthquake victims following the devastating 2008 Sichuan Earthquake in China. They found a significant negative correlation between PTSD and resilience scores. Likewise, Ahmad et al. (2010) found a significant inverse correlation between resilience scores and lower PTSD symptoms amongst survivors of an earthquake in Pakistan which had a death toll of 75,000.

McDermott, Cobham, Berry and Stallman (2010) conducted a study using a construct of family resilience with 568 children and their caregivers after a cyclone in Australia. Contrary to the hypothesis that family resilience would be protective against PTSD, this study did not find a relationship between the family resilience construct, and PTSD. The researchers emphasized the need for more research using clearly defined resilience constructs in order to firmly establish the protective factors and their mechanisms that will ameliorate the risk of PTSD following disaster.

This chapter presented existing literature relevant to the primary elements of this thesis. It conveyed a current definition of disasters and described the development of research into the psychological effects of these events. Theoretical models of PTSD and resilience were summarised, and studies relevant to these constructs were discussed. Literature relating to the role of trauma exposure and fear in the development of PTSD were referred to and commonalities in the PTSD and

resilience constructs were highlighted. A reflection on these aspects of the literature manifests a gap in the current literature which calls for further investigation of PTSD, resilience and associated factors amongst adolescents following earthquakes. The methodology used to investigate these constructs amongst adolescents after the Canterbury earthquakes is now presented



## **2. Method**

### **Research Design**

This study used a quantitative, cross-sectional design to investigate PTSD, resilience, trauma exposure, fear experienced during earthquakes, and psychosocial support amongst adolescents following the 2010/2011 earthquakes in Canterbury. Five hundred and seventy adolescents completed an 86 item self-report questionnaire, consisting of six separate psychometric scales measuring the constructs. Various statistical procedures were used to test the previously stated hypotheses.

### **Participants**

Questionnaires from 525 participants were included in the final sample. Forty eight percent of the sample was male. The age of participants ranged from 13 to 20 years ( $M = 15.2$  years;  $SD = 1.48$ ). Seventy eight percent identified their ethnicity as New Zealand European, 5.7% identified as Maori, 4.5% as Pacific Island, 6.5% as Asian, and 5.1% as other. The distribution of participants across schools was as follows: 67.7.0% were from Hillmorton High School, 12.0% from Christchurch Girls' High School, 8.6% from Christchurch Boys' High School; 4.8% from Unlimited Paenga Tawhiti; 3.8% from Aranui High School; and 3.1% from Linwood College. Over 90% of the adolescents in the sample were within 25 km of the earthquake epicentre during the September 4, 2010, February 22, 2011, and June 13, 2011 earthquakes. Fifteen percent of adolescents in the sample were in the Christchurch city centre on February 22, 2011. A summary of demographic information is

presented in Table A1 of the appendices.

## Measurement

A self-report survey questionnaire consisting of 86 questions was used. This questionnaire consisted of six individual psychometric scales. They were the Child PTSD Symptom Scale (CPSS; Foa, Johnson, Feeny & Treadwell, 2001), the 10-item Connor-Davidson Resilience Scale (CD-RISC-10; Connor & Davidson, 2003; Campbell-Sills & Stein, 2007), and the Resilience Scale for Adolescents (READ; Hjemdal, Friborg, Stiles, Martinussen & Rosenvinge, 2009). Two scales had been adapted from the Survivor Information Form (SIF; Salcioglu, Basoglu, & Livanou, 2007). These were named the Trauma Exposure Scale and Fear Scale. A final scale developed for the purpose of this study was named the Psychosocial Support Scale. In addition to these six scales, nine questions at the beginning of the survey elicited demographic information, and two items were included at different points of the questionnaire to detect invalid responding. Each measurement scale is described below. Paragraph headings signal the construct that was measured by the scale being described.

**Posttraumatic stress disorder.** The Child PTSD Symptom Scale (CPSS, Foa et al., 2001) was designed to assess PTSD symptom severity in youth aged 8 to 18 years who had experienced a traumatic event. It was developed based on the Posttraumatic Diagnostic Scale (PTDS; Foa, Cashman, Jaycox, & Perry, 1997), that measured PTSD symptoms in adults. The language of the PTDS was modified by Foa et al. to allow comprehension from an age 8 reading level. The CPSS contains one question for each of the 17 *DSM-IV-TR* (APA, 2000) PTSD symptoms to ascertain

their frequency in the past two weeks. The instructions for answering the questions are as follows: "Circle the number that describes how often that problem has bothered you in the past 2 weeks." Answers are on a 4-point Likert scale, ranging from 0 (*not at all*), to 3 (*almost always*). The CPSS measures the three PTSD symptom clusters, namely, re-experiencing, avoidance and hyperarousal. Seven additional items appear after the 17 PTSD symptoms and elicit whether any of the PTSD symptoms have affected daily functioning such as relationships with friends, schoolwork, and general happiness with life. Foa et al. selected these 7 items on the basis of face validity to represent major areas of functioning in a young person's life. These seven items are scored dichotomously where the participant indicates Yes or No to each statement. The severity-of-impairment score ranges from 0 to 7, with higher scores indicating more functional impairment. The CPSS allows for specificity of a particular event in that it asks the participant to state what their most traumatic event has been, and complete the questionnaire according to this event. For the purpose of this study, however, the recent Earthquakes were specified as the event, and participants were required to indicate their symptoms in relation to this event.

A validation study of the CPSS (Foa et al., 2001) demonstrated sound psychometric properties. Good internal consistency was found with coefficient alphas of .89 for the total score, .80 for the re-experiencing cluster, .73 for the avoidance cluster, and .70 for the arousal cluster. Higher internal consistency was found in the current study, with Cronbach alpha's of .92 for the total score, .81 for the re-experiencing cluster, .84 for the avoidance cluster and .84 for the re-experiencing cluster, additionally. Test-retest reliability coefficients in the original validation

study ranged from moderate to excellent with .84 for the total score, .85 for re-experiencing, .76 for arousal and .63 for avoidance.

The developers of the CPSS established convergent validity by comparing it with the Child Post-Traumatic Stress Disorder Reaction Index (CPTSD-RI; Pynoos, Frederick & Nader, 1987). The Pearson product-moment correlation coefficient was .80 ( $p < .001$ ), demonstrating good convergent validity. Divergent validity was established by correlating CPSS scores with depression and anxiety scores on separate measures. The Pearson product-moment correlation coefficient was .58 ( $p < .001$ ) and .48 ( $p < .001$ ) for the depression and anxiety scores respectively, demonstrating that the CPSS was measuring a construct related, yet distinct from depression and anxiety. Similar robust psychometric properties have been reported by investigators using the CPSS amongst youth of diverse cultures and circumstances, for example Nepalese child soldiers (Kohrt et al., 2011) and Israeli adolescents seeking psychiatric care (Rachamim, Helpman, Foa, Aderka & Gilboa-Schechtman, 2011).

In the original validation study (Foa et al., 2001), a cut off score of 11 or higher differentiated participants with a PTSD diagnosis from those without a diagnosis. However, in the study with Israeli adolescents seeking psychiatric treatment, Rachamim et al., (2011) established a mean score of 15.14 ( $SD = 11.02$ ) amongst adolescents without PTSD (established by clinical interview), and a mean score of 26.08 ( $SD = 8.97$ ) amongst participants with PTSD. Furthermore, a study with Nepalese child soldiers (Kohrt et al., 2011), found that a cutoff score of 20 provided optimum sensitivity and specificity for PTSD. In the current study, a score above 15

was used as an indication of clinically significant PTSD symptoms. This is in accordance with a guideline from the International Society for Traumatic Stress Studies (ISTSS, 2012). The CPSS was selected for this study because it has good psychometric properties, a low reading age level, includes a functional impairment scale and could be targeted specifically to earthquake related PTSD.

**Resilience.** The 10-item Connor-Davidson Resilience Scale (CD-RISC-10, Connor & Davidson, 2003; Campbell-Sills & Stein, 2009) is a shortened version of the original 25-item CD-RISC (Connor & Davidson, 2003). The CD-RISC-10 is a self report measure designed to assess internal resilience – the dispositional factors found to increase an individual’s ability to cope with adversity (Kordich Hall, 2010). The 25-item CD-RISC was developed with the specific purpose of investigating resilience as a moderating variable between trauma and PTSD (Connor & Davidson, 2003). Campbell-Sills and Stein (2009) developed the 10-item version of the CD-RISC after conducting exploratory and confirmatory factor analysis of the 25-item version with a sample of 1,743 undergraduate students in the United States. The 10-item version was found to have superior psychometric properties, such as a more stable single factor structure and higher internal consistency when compared to the 25-item version. Both versions have been translated into multiple languages.

The CD-RISC-10 asks respondents to rate the extent to which the statement in each item applies to them, taking the past month into account. Each item is rated on a 5-point Likert scale from *not true at all* (0) to *true nearly all time* (4). The total score for the CD-RISC-10 ranges from 0 - 40. An example of an item is: “I tend to bounce back after illness, injury or other hardship”.

Numerous studies have used either the 25-item CD-RISC or the 10-item CD-RISC to measure resilience amongst diverse samples, such as U.S. combat veterans (Morey, Petty, Cooper, LaBar, & McCarthy, 2008), outpatients with generalized anxiety disorder (Connor, Vaishnavi, Davidson, Sheehan, & Sheehan, 2007), Turkish earthquake survivors (Karairmak, 2010), Alzheimer's caregivers (Gough, Wilks, & Prattini, 2010) and adolescents with diverse traumatic experiences (Jorgensen & Seedat, 2006; (Bruwer, Emsley, Kidd, Lochner, & Seedat, 2008; Yu, Lau, Mak, Zhang, & Lui, 2011). These studies and many others (cf. Davidson 2011), have supported the psychometric properties of both the CD-RISC and the CD-RISC-10. Cronbach alphas for the CD-RISC-10 have ranged from .80 - .96 in numerous studies (e.g. Karairamak, 2010; Yu et al., 2011; & Khoshouei, 2009), providing evidence of good internal consistency across various cultures. Evidence of acceptable test-retest reliability of .87 and .88 was found by Connor and Davidson (2003) and Khoshoei (2009) respectively. Construct validity has been supported by studies that have found the CD-RISC scores to uniquely moderate between trauma and PTSD (Connor & Davidson, 2003; Fincham et al., 2009; Roberts, 2007), depression (Burns, Anstey, & Windsor, 2010; Ahmed et al., 2010), anxiety (Smith et al., 2008) and suicidal ideation (Pietrzak et al., 2010).

A Cronbach's alpha of .88, was found for the CD-RISC-10 in the current study which indicates good internal consistency. Evidence of convergent and divergent validity of the CD-RISC 10 was observed through its correlation with other measures in this study as reported in the results section of this thesis. The CD-RISC-10 was selected for the current study due to its relevance to the current study, sound

psychometric properties, and suitable reading-age level.

The Resilience Scale for Adolescents (READ, Hjemdal et al. 2006) is a 23-item self report scale adapted from the Resilience Scale for Adults (RSA, Friborg et al., 2003; Hjemdal et al., 2001). The RSA is a 33-item self-report scale which assesses resilience across five domains: Personal Competence; Social Competence; Structured Style; Family Cohesion and Social Resources. Several studies have found the Norwegian, French and Romanian versions of the RSA to be both reliable and valid (Friborg, Hjemdal, Rosenvinge, & Martinussen, 2003; Friborg et al., 2006; Hjemdal et al., 2011). No published studies have reported the psychometric properties of the English version.

In developing the READ, the semantic-differential response format of the RSA was simplified to a 5-point Likert scale in response to feedback from adolescent pilot samples (Hjemdal et al., 2006). In addition, the wording of items was simplified in order to allow comprehension at a lower reading-age level. Exploratory and confirmatory factor analysis for the READ (Hjemdal et al., 2006; Soest, et al., 2011 ) found a five-factor solution congruent with that of the RSA, resulting in the retention of the same five subscales. Several items from the RSA which hindered the factor structure and internal consistency of the READ were excluded, resulting in a 28 item measure. In the original validation study with 421 adolescents, Hjemdal et al. (2006) reported Cronbach's alpha ranging from .69 to .85 for the Structured Style, Social Competence, Social Resources, Family Cohesion, and Personal Competence subscales. A subsequent study with 6,723 adolescents (von Soest et al., 2011), found a similar alpha range from .69 to .89 across the 5 subscales. Structured Style was the

only subscale with an alpha slightly lower than the acceptable level of .70 (Streiner & Norman, 2006). Von Soest et al suggested that this subscale's lower internal consistency may be related to the fact that it contains only 3 items. Reliability analysis conducted in the current study found alphas ranging from .63 for the Structured Style Subscale to .77 for the Social Resources Subscale. The Structured Style Subscale was the only subscale with an alpha value below .70.

Convergent validity were evidenced in previous studies where READ scores were negatively correlated with measures of depression and anxiety (Hjemdal et al., 2006; von Soest et al., 2011). Exploratory and confirmatory factor analysis (von Soest et al., 2011) found evidence of superior reliability and factor structure when five items were excluded resulting in a 23-item scale. This 23-item version was used in the current study. Although no published studies were found where the English version of the READ had been used with adolescents, a robust process of translation by the original authors ensured the integrity of the English version. While the findings relating to the reliability of the READ in the current study provide mixed evidence, they do not discount its reliability, since with the exception of Structured Style subscale all other subscales demonstrated sufficient reliability coefficients. Finding a different factor structure for a scale is common with exploratory factor analysis across different studies and does not on its own suggest that the measure is unreliable (Tabachnick & Fidell, 2012). The READ was selected for this study because it is designed specifically for adolescents, contains personal as well as environmental resilience factors, is based on sound resilience theory and has prior evidence of sound psychometric properties.



**Trauma Exposure.** Exposure to earthquake related trauma was measured using a 9-item scale, named the Trauma Exposure Scale. The items were adapted from the 28-item Survivor Information Form (SIF; Başoğlu, Kiliç, Şalcioğlu, & Livanou, 2004), which was designed to assess trauma exposure during earthquakes. Eighteen items of the SIF were excluded since they were designed to measure demographic information already elicited at the beginning of the current study's questionnaire. Seven of the traumatic-exposure items used in the current study are dichotomous and required a *Yes/No* response. Item examples are: "Did you get injured during the earthquakes?" and "Did anyone in your family die during the earthquakes?" The remaining two items of the Trauma Exposure Scale elicited data regarding the participant's house. The first of these asked what the extent of damage to their house was, 0 (*no damage*) to 3 (*severe damage*). The second question asked whether they had to move out of their house because of the earthquakes and required a dichotomous *Yes/No* response. The nine items of the trauma exposure scale have face validity for the assessment of this construct. In addition,(Metin. Başoğlu, Kiliç, Şalcioğlu, & Livanou, 2004) conducted multiple regression analysis with these items, and found that they made a statistically significant contribution to the prediction of PTSD symptoms. This demonstrated the predictive validity of these items, and was replicated in the current study. The Trauma Exposure Scale was used in this study as it is a valid measure with which to establish the extent that the sample was exposed to trauma, and to investigate the relationship that trauma exposure has with PTSD symptoms.

**Fear during earthquakes.** The highest level of fear experienced during any of the earthquakes and the highest level of fear during the most recent aftershock were measured using two items. These two items comprised the Fear Scale. The first item was adapted from the SIF (Başoğlu, Kiliç, Şalcioğlu, & Livanou, 2004), and the second item was developed specifically for this study due to the volume and frequency of significant aftershocks. The items were scored using a 5-point Likert scale ranging from 1 (*no fear at all*) to 5 (*extreme fear/terror*). The construct validity of this scale is supported by findings that fear during earthquakes accounted for a significant variation in symptoms of PTSD and other psychopathology after earthquakes (Metin. Başoğlu et al., 2004; Basoglu & Salcioglu, 2011). Reliability analysis revealed a Cronbach's alpha of .78, demonstrating sufficient inter-item correlation. The fear scale was used to measure the level of fear experienced during the earthquakes and aftershocks and to explore the impact that fear had on PTSD symptoms.

**Psychosocial Support.** The Psychosocial Support Scale was developed for this study because no validated measures could be found which addressed the required aspects of this construct. Nine items developed for this study by the primary investigator, were included in the questionnaire, to determine the type of psychosocial support accessed by participants, and the extent to which such support had been accessed. The scale was called the Psychosocial Support Scale. Items elicited whether the participant had spoken to a school counsellor; a telephone counsellor; another counsellor; a parent/caregiver; or friends/other family members, in order to get support with earthquake related stress. An additional item allowed participants to indicate whether they had in fact experienced any earthquake related

stress. Items were scored using a dichotomous *Yes/No* response scale. The initial item in the scale sought a participant's consent for a school counsellor to contact them if the questionnaire indicated that this would be useful. This provided a feedback loop so that consenting adolescents with high PTSD scores could receive counselling support. Two additional items included in the scale related to mindfulness/relaxation skills. The first question asked whether the participant knew any relaxation skills or exercises that they could use when they experienced stress, whereas the second item asked whether they were interested in learning relaxation techniques such as breathing and body awareness. These items were included to investigate the prevalence of stress-coping skills amongst the sample as well as the feasibility of delivering a mindfulness-based cognitive-behavioural programme in schools. Since the Psychosocial support scale was dichotomous and measured diverse aspects of a construct, items were not expected to have high intercorrelations (Sapp, 2005). The items had face validity and although they were included for the purpose of descriptive analysis, significant correlations of the Psychosocial Support Scale with related measures in this study provided evidence of convergent validity.

**Validation items.** Two items were included in the questionnaire in order to detect random or erroneous responding. Following recommendations by Knowles and Nathan (1997), these items were included because no reverse-scored items existed in the questionnaire. The items "I have not smiled once since I was born" and "I am completely mute" were included at strategic points in the questionnaire. Questionnaires were excluded if either of these items were responded to in the affirmative. These items were tested in a pilot administration of the questionnaire.

All 10 participants understood the questions and none of them endorsed either of the items .

## Procedure

An application was made to Massey University's Human Ethics Committee in June 2011, describing the study and requesting the Committee's approval of the proposed study. Final approval was granted on 2 August 2011. A pre-test was conducted with a pilot group of 10 adolescents, consisting of six males and four females, from 13 to 15 years of age. This gave an indication that the average length of time to complete the questionnaire was 20 minutes, and confirmed that all items could be comprehended by adolescents in the lower age range of the sample.

**Participant Selection.** Non-probability, purposive sampling (Spring et al., 2003) was used to select 10 high schools from the total of 32 high schools in the Christchurch area. This was done in order for the study to be manageable within the resources available. Schools were selected with the intention of representing the total population of Christchurch Schools. To achieve this, schools in diverse socio-economic areas, measured by decile, were selected.<sup>2</sup> Additionally, schools with varying distances from the epicentre of the February 22 earthquake were chosen. Letters were sent to the Principal's of each of these schools explaining the project and requesting their consent. Letters were followed up with a phone call and in some cases a meeting was arranged to answer any questions that management staff had.

---

<sup>2</sup> The term *decile* refers to a 10% grouping. The New Zealand Ministry of Education uses a decile system to categorise the socio-economic status of schools. There are ten deciles and approximately 10% of schools in each decile. A school's decile rating indicates the extent to which it draws its students from low socio-economic communities. Decile 1 schools are the 10% of schools with the highest proportion of students from low socio-economic communities, whereas decile 10 schools are the 10% of schools with the lowest proportion of these students (New Zealand Ministry of Education, 2012).

Six out of the 10 schools approached gave their consent to participate in the study. These were: Christchurch Boys' High School; Christchurch Girls' High School; Hillmorton High School; Linwood High School; Aranui High School; and Unlimited Paenga Tawhiti. It was decided that this sample of high schools were sufficient in quantity and diversity to provide an approximate representation of the high schools in the Christchurch area.

Management at five schools decided not to designate a specific time during school for the administration of the questionnaire, but rather to allow the students to complete the online questionnaire in their own time either during school or at home. On the other hand, management and counselling staff at Hillmorton High School decided to allow all students the opportunity of completing a paper version of the questionnaire during form time - the 20 minutes before the start of subject lessons when students are in their form classes. This significantly affected the amount of students that participated at Hillmorton High School compared to the other five high schools.

An assembly time was arranged at each of the six high schools, in order for the researcher to explain the study to the students, invite their participation, and explain the process of consent including the requirement of parental consent. Approximately 4550 students were approached in total. Information sheets and consent forms were made available to each of these students to take home. The information sheets explained the objectives of the study and what was required of participants. It also alerted potential participants to the fact that the questionnaire contained questions relating to specific aspects of their earthquake experience (these

were contained in the Trauma Exposure Scale). It advised that respondents would be alerted to these before they occurred at which stage they could choose to omit them altogether. This was done to minimise the potential of further distress for participants who may already have been experiencing PTSD symptoms as a consequence of the earthquake. Contact details for local counsellors and Youthline were also provided in the information sheet. Deposit boxes for the consent forms were placed in central locations at all schools. All returned consent forms, irrespective of whether they gave or withheld consent, were placed in a prize draw for an iPod, movie tickets or other entertainment vouchers. Adolescents who consented to participating, had their parents consent, and were from schools that opted for the online questionnaire; then participants filled out their email address in a space provided on the consent forms. An email was then sent to each of these participants with a link to the online questionnaire. Two hundred and fifty six students and their parents gave their consent to participate in the study, and were emailed a link to the questionnaire. One hundred and eighty eight participants, 73% of those who gave consent, finally completed a questionnaire. Online questionnaires composed 32% of the total number of questionnaires completed.

Parental consent at Hillmorton High School was obtained using a reverse consent process where a letter was sent to all parents with an information sheet about the study, advising them to return an included form if they did not want their adolescent to participate in the study. Students were also given the choice not to participate, in which case they could continue quietly with their own work during the form time that the questionnaire was administered in. Of the 550 students who

attend the school, 382 students, 72% of the total school, participated in the study.

**Statistical procedures.** The online survey programme Survey Gizmo ([www.surveygizmo.com](http://www.surveygizmo.com), 2011) was used for online administration of the questionnaire. This allowed collected data to be exported into the Statistical Package for the Social Sciences (SPSS) version 18, which was used for statistical analysis in this study. The paper version of the questionnaire was collected by teachers at Hillmorton High School for safe-keeping before they were collected by the researcher. Responses on each paper questionnaire were then inputted into SPSS. Descriptive statistics were used initially to explore the data set. Independent samples t-tests were used to ascertain the difference between data from various subsets of the sample, for example, the difference in PTSD scores for males and females. An analysis of variance (ANOVA) conducted to investigate the difference in total scale scores across schools. Pearson's product-moment correlation was used to investigate correlations between measures and test the hypothesis that significant relationships would exist between constructs such as PTSD and resilience. The reliability of measures was tested using Cronbach's alpha to ascertain the inter-item correlation and therefore internal consistency of the scales (Pallant, 2011). Hierarchical multiple regression analysis was used to investigate the unique contribution that the trauma exposure, fear and resilience variables made individually, to explaining change in PTSD symptoms. A moderation analysis was used to test the hypothesis that resilience would moderate the relationship between trauma exposure and PTSD symptoms. A subsequent moderation analysis was conducted to investigate whether resilience would moderate the relationship between fear and PTSD symptoms. Results of these analyses are presented in the following chapter.





### 3. Results

This chapter describes the results of the study in relation to each of the five hypotheses. Data screening and correction methods are first discussed, followed by a summary of key descriptive statistics. Each hypothesis is then considered separately, with test procedures and findings being reported. Finally, a summary of results is presented.

#### Data Screening and Correction

Data screening and the correction of errors or anomalies is imperative for accurate analysis (Pallant, 2011). The first method of data screening was the detection of invalid responding. Two validity questions described in the previous chapter, identified 45 questionnaires with invalid responses, and these were excluded from the analysis. The *descriptive statistics* function of SPSS was then used to screen for data entry errors (Pallant, 2011). This function identified values that exceeded the minimum or maximum range for each variable. Six data input errors were identified using this method, and these errors were rectified by referring back to the original data and correcting the entries. Missing data was then analysed and corrected, and finally, the normality of data was assessed which led to the transformation of non-normal distributions. These procedures are described in further detail below.

**Missing data.** Missing data was analysed prior to the implementation of further statistical procedures to reduce the probability of inaccurate analysis (Tabachnick & Fidell, 2012). Values in this study were missing either because

participants omitted responses in error, or elected not to answer. For ethical reasons, a statement in the questionnaire prior to the trauma exposure questions warned participants that these might remind them of their earthquake experience and encouraged participants not to answer them if they thought they might experience distress. Sixteen participants (3%) chose to omit these nine questions. Further analysis found that 1.3% of the remaining data were missing. Little's missing completely at random test (MCAR; Little, 1987) was carried out and revealed that the data were missing completely at random;  $\chi^2 = (748, n = 4669) = 0.4, p = 1.0$ .

Tabachnick and Fidell (2012) suggest that if less than 5% of the data are missing completely at random from a data set with greater than 100 responses, the effect is negligible and most of the accepted procedures for handling missing values would suffice. *Estimation maximisation* was used to replace the data that was missing, since this method is described as reliable (Howell, 2008; Tabachnick & Fidell, 2012) and is simple to execute in SPSS. Data missing from the 16 participants who chose to omit the trauma exposure questions were not replaced, since they were not missing at random and it could not be assumed that these missing values would be approximated by the remainder of the dataset. Missing value placeholders were used for these values and the *exclude cases listwise* option was selected in SPSS for all analyses. With this option, cases with any missing values are excluded completely from analyses. This option was selected based on the size of the existing sample as well as the probability that including these cases in analyses may have resulted in unpredictable bias (Howell, 2004).

**Normality of data.** The majority of parametric tests require sample scores to

approximate a normal distribution in order for optimal accuracy to be achieved (Pallant, 2007). Unfortunately, in applied social science research, normally distributed variables are seldom observed (Miles & Banyard, 2007); however, various approaches can be taken to increase the reliability of statistical tests where non-normal data is present (Tabachnick & Fidell, 2012; Pallant, 2007). The normality of each scale used in this study was assessed, first by observing the histograms and normal probability plots for each of these variables, and then by considering the magnitude of their skewness and kurtosis values (Stevens, 2007). The Kolmogorov-Smirnov and Shapiro-Wilk statistics, designed to test for violations of normality are known to be overly sensitive to violations, particularly in larger samples (Tabachnick & Fidell, 2012). This was the case in the current study where these tests indicated non-normality for each scale, including those with approximately normal distributions. For this reason the Kolmogorov-Smirnov and Shapiro-Wilk statistics were not used as an indication of normality (Tabachnick & Fidell, 2012).

The CPSS distribution was positively skewed. This was evident from the histogram and the normal probability plot as well as the Skewness statistic of 1.21.<sup>3</sup> The Kurtosis statistic of .87 was also high; however, Tabachnick and Fidell (2012) note that the effect of kurtosis on the estimation of variance becomes negligible with a sample size greater than 200. The avoidance, re-experiencing and arousal subscales of the CPSS had similar skewness values of 1.4, 1.2 and 1.0 respectively. Positive skewness of the CPSS data is to be expected, since 52% of the sample had very low to non-existent PTSD symptoms. Miles and Banyard (2007) have noted that positive

---

<sup>3</sup> Dover (1979) proposed a rule of thumb where a skewness statistic greater than 1.0 indicates severe skewness, one between 0.5 and 1 indicates moderate skewness and one between 0 and 0.5 denotes approximate symmetry.

skewness is often observed in the measurement of psychological disorders within normal populations, since most respondents will show no symptoms, in which case the majority of scores will be clustered around zero. For these reasons the Functional Impairment and Trauma Exposure scales were also positively skewed. The RISC, READ, Fear and Psychosocial Support variables approximated normal distributions as manifest by the histograms, normal probability plots as well as skewness and kurtosis values of less than 0.5 for each of these variables.

The use of non-parametric tests was considered for this study, since these do not assume that data are normally distributed. The disadvantage of these tests; however, is that they are less sensitive to significant differences as they use less information for computation than their parametric counterparts. Consequently, they have less power to accurately detect significant outcomes (Palant, 2011). An additional disadvantage is that there are no non-parametric alternatives for multivariate procedures such as multiple regression and moderation analysis.

Various statisticians (e.g., Edgell & Noon, 1984; Glass, Peckham & Sanders, 1975; Rasch & Guiard, 2004; Zimmerman & Zumbo, 1992) have suggested that certain parametric procedures such as t-tests, analysis of variance (ANOVA) and Pearson product-moment correlations remain robust despite violations to the assumption of normality, particularly when the sample size is large. Rasch and Guiard (2004) suggested that a sample size greater than 200 mitigates the risk of type 1 or type 2 errors when violations of normality exist.

It was decided to proceed with parametric tests for data analysis, due to the advantages these have over non-parametric tests, as well as the confidence that could

be placed in the reliability of findings due to the type of parametric tests used, and the large sample size. For multiple regression and moderation analyses, skewed variables were transformed as suggested by various authors (e.g. Tabachnick & Fidell, 2012; Stevens, 2007) so that an approximation of multivariate normality could be achieved. The transformation procedures are described in further detail in this chapter when the results of these analyses are described.

**Outliers.** The outlier labelling rule (Tukey, 1977) was used to identify outliers within the primary variables of the study. A multiplier of 2.2 was used as suggested by Hoaglin and Iglewicz (1987). The outlier labelling procedure identified a value of 45.6 as the upper limit of the CPSS. One outlier was found for this variable at a value of 46.8. A decision was made to retain this outlier since it was one single case, was close to the cut-off value, and it is probable that it reflected an unusually high, but accurate CPSS score. The READ variable contained one outlier with a value of 37. A lower limit of 37.8 was detected for the READ. This case was also retained for similar rationale to that above. No outliers were detected for the Functional Impairment, RISC, Psychosocial Support, Fear, or the Trauma Exposure scales.

**Generalisability of Sample.** Chi-square goodness-of-fit tests were carried out for the variables of gender, age, ethnicity and school decile, to ascertain whether the selected sample was a reasonable representation of the population of adolescents attending high schools in Christchurch. The chi-square tests indicated that there was no significant difference between the current sample and the Christchurch adolescent population for proportions of gender  $\chi^2(1, n = 525) = .04, p = 1.0$ ; age,  $\chi^2(5, n = 525) = 1.3, p = 0.9$ , ethnicity  $\chi^2(4, n = 515) = 1.2, p = 0.9$  or school decile  $\chi^2(2, n = 525), p = 0.4$ .

## Descriptive Statistics

**Mean scores of variables and comparison by gender.** Table 1 displays the sample size, minimum and maximum values, mean and standard deviation for each scale by gender and for the total sample. Independent sample *t*-tests were conducted to compare male and female scores on each variable. The *t*-values of these as well as associated effect sizes, using Cohen's *d*, (Cohen, 1988), are displayed in the two right hand columns of Table 1. An effect size statistic indicates the magnitude of the difference between two groups. For Cohen's *d* statistic a value from 0 to 0.3 indicates a small effect size, between 0.3 and 0.6 a medium effect size, and above 0.6 a large effect size. (Cohen, 1988).

The difference in male and female mean scores was statistically significant for six of the seven scales. The largest difference in scores across gender was found for the Fear Scale where male scores were significantly lower than female scores,  $p < .001$ . The effect size (*d*) was .70, indicating a large effect for this difference. The next largest difference between male and female mean scores was found for the CPSS. Male scores were again significantly lower than female scores,  $p < .001$ , with a medium effect size of .57. Male scores were also significantly lower than female scores for the Functional Impairment, Trauma Exposure and Psychosocial Support scales. There was a small effect size for the difference in scores across gender for these three scales,  $d = .26$ ; .27, and .28 respectively. Conversely, the mean score for Males was significantly higher than for females on the CD-RISC with a small effect

Table 1.

## Summary of Descriptive Statistics, T-tests, and Effect sizes for Measurement Scales

Measure	<i>N</i>	Min-Max Score	<i>M</i> ( <i>SD</i> )	<i>t</i>	<i>d</i>
CPSS					
Male Adolescents	245	0 - 44	7.6 (8.6)		
Female Adolescents	264	0 - 47	12.8 (10.2)		
Total Sample	509	0 - 47	10.3 (9.8)	6.6**	.57
Functional Impairment					
Male Adolescents	245	0 - 7	1.5 (2.0)		
Female Adolescents	264	0 - 7	2.0 (2.1)		
Total Sample	509	0 - 7	1.8 (2.0)	2.9*	.26
CD-RISC 10					
Male Adolescents	245	2 - 40	25.6 (7.6)		
Female Adolescents	264	1 - 40	24.1 (6.6)		
Total Sample	509	1 - 40	24.8 (7.2)	2.5*	.22
READ					
Male Adolescents	245	36 -115	82.9 (14.5)		
Female Adolescents	264	38 -119	83.7 (13.7)		
Total Sample	509	36 -119	83.3 (14.1)	0.5	.05
Trauma Exposure Scale					
Male Adolescents	245	0 - 5	1.2 (1.2)		
Female Adolescents	264	0 - 6	1.5 (1.3)		
Total Sample	509	0 - 6	1.4 (1.3)	3.0*	.27
Fear Scale					
Male Adolescents	245		2.6 (1.9)		
Female Adolescents	264	0 - 8	3.9 (2.0)		
Total Sample	509	0 - 8	3.3 (2.1)	7.9**	.70
Psychosocial Support Scale					
Male Adolescents	245	0 - 5	1.3 (1.2)		
Female Adolescents	264	0 - 5	1.6 (1.3)		
Total Sample	509	0 - 5	1.5 (1.3)	3.2*	.28

Note. CPSS = Child Post-traumatic Symptom Scale; CD-RISC 10 = Connor-Davidson 10-item Resilience Scale; READ = Resilience Scale for Adolescents. Min-Max Score = minimum and maximum scores obtained in this study. *t* = t-test statistic for difference between male and female means; \**p* < .05. \*\**p* < .001. *d* = Cohen's *d*.

size,  $d=.22$ . The difference between male and female mean scores was not statistically significant for the READ.

**Individual Item analysis.** Individual items of the Trauma Exposure Scale, Psychosocial Support Scale, and Fear Scale were analysed to ascertain the extent to which each item was endorsed by the sample, and to investigate the difference in the proportions of male and female endorsement of each item. The chi-square goodness of fit statistic was used to explore the difference between the actual and expected percentages of male and female endorsements for each item. Endorsement percentages and chi-square statistics for each scale are presented in Table A1, A2 and A3 of the appendix. A significantly higher proportion of females than males reported having a family member that was injured in the earthquakes  $\chi^2(1, n = 509) = 6.1, p = .02$ , and knowing someone who had died in the earthquakes  $\chi^2(1, n = 509) = 4.1, p = .04$ , when the proportion of males and females in the total sample (48% and 52%) was used as a comparison criterion (Aron, 2011). A significantly smaller proportion of females reported knowing relaxation techniques compared to males, when the proportion of male and female PTSD symptom scores was used as a comparison criterion  $\chi^2(1, n = 509) = 8.4, p < .001$  (Aron, 2011). More females than males reported feeling extreme fear/terror during at least one of the earthquakes  $\chi^2(1, n = 509) = 19.4, p < .001$ . Additionally, each response category for level of fear during a recent aftershock, was endorsed by a significantly higher proportion of females than males  $\chi^2(1, n = 509) = 5.8, p = .001$ ;  $\chi^2(1, n = 509) = 16.0, p < .001$ ;  $\chi^2(1, n = 509) = 59.4, p < .001$  (medium, strong, and extreme fear/terror respectively), when



the proportion of males and females in the total sample was used as a comparison criterion.

**Differences in mean scores by school.** A one-way between-groups analysis of variance (ANOVA) was conducted for each of the primary variables, to explore whether different schools had significantly different mean scores for these variables. Aranui High School and Linwood College were combined to form one group for the purpose of this analysis. This was done to increase the group size so that small sample bias would be reduced, thereby increasing the reliability of ANOVA findings (Miles & Banyard, 2007). Combining these schools was justified since they are in close proximity to each other, being only three kilometres apart. Both are situated in the east of Christchurch, an area severely affected by the earthquakes, and both are decile two schools. Twenty participants from Aranui High School and 16 from Linwood College comprised the combined sub-sample of 36, which was re-labelled *Eastern Schools*.

Table 2 displays the mean scores for each school according to the relevant scales. Only those scales with a statistically significant difference are displayed. These were the CPSS, Functional Impairment, Fear, and Trauma Exposure scales. The eta squared effect size statistic (Cohen, 1988) was used to ascertain the magnitude of the difference in scores obtained across schools. An effect size between 0.1 and 0.6 is classified as small, between 0.6 and 0.14 as medium, and above .14 as a large effect size (Pallant, 2011). The eta squared values obtained showed that the difference in school scores had a small effect on the variances of the CPSS,  $\eta^2 = .04$ , Functional Impairment scale,  $\eta^2 = .05$  and Fear Scale,  $\eta^2 = .05$ , and a medium effect

Table 2.

## Differences in Mean Scores by School

Scale	CPSS	Func Imp	Fear	Trauma
	M (SD)	M (SD)	M (SD)	M (SD)
<b>School</b>				
Chch Boys	10.0 (8.7)	2.2 (2.1)	3.4 (1.8)	1.4 (1.3)
Chch Girls	13.9 (10.3) *	2.2 (1.8)	4.2 (1.9) *	1.9 (1.2)
Eastern Schools	15.9 (11.8) *	3.1 (2.4) *	4.1 (2.2) *	2.1 (1.3) *
Hillmorton	9.2 (9.2)	1.5 (1.9)	3.0 (2.1)	1.2 (1.2)
Unlimited	10.4 (10.0)	1.8 (2.0)	4.0 (2.0)	1.8 (0.8)
<b>ANOVA Statistics</b>				
<i>F</i>	6.6	6.9	6.4	7.9
<i>df</i>	5; 509	4; 509	4; 509	4; 509
<i>p</i>	< 0.001	< 0.001	<0.001	< 0.001

Note. CPSS = Child Post Traumatic Stress Scale, Func Imp = Functional Impairment scale; Fear = Fear Scale; Trauma = Trauma Exposure Scale. Chch Boys = Christchurch Boys' High School; Chch Girls = Christchurch Girls' High School; Eastern Schools = Aranui High School and Linwood College; Hillmorton = Hillmorton High School; Unlimited = Unlimited Paenga Tawhiti. Schools in table appear in alphabetical order. Scales with no statistical difference between mean scores of schools are not displayed. *df* = degrees of freedom between and within groups \*  $p < .05$  Tukey HSD test.

on the Trauma Exposure scale  $\eta^2 = .06$  (Cohen, 1988). No statistically significant difference was found between the mean scores for the CD-RISC, READ, or Psychosocial Support scales.

Post-hoc comparisons using the Tukey HSD test indicated that the Eastern Schools (Aranui High School and Linwood College) had significantly higher scores than Christchurch Boys' High School, Hillmorton High School and Unlimited Paenga Tawhiti for each of the four scales. Christchurch Girls High School had significantly higher scores than Christchurch Boys' High School, Hillmorton High School and Unlimited Paenga Tawhiti, for the CPSS and Fear scales.

**Correlation of measures.** The relationships between the primary measures in this study were investigated using Pearson product-moment correlation coefficients. Cohen (1988) provided a now widely used guideline for the magnitude of the relationship, where a correlation coefficient ( $r$ ) between .10 and .29 indicates a small correlation, between .30 and .49 a medium correlation, and above .50, a large correlation. This is a useful guideline in analysing the correlations between variables in this study, since several correlations are statistically significant, despite being small in magnitude, an occurrence often observed with larger sample sizes (Pallant, 2007). Using Cohen's guidelines, large correlations existed between the CD-RISC and READ scale, the CPSS and Functional Impairment scale, and the CPSS and Fear scale,  $r = .66$ ;  $.61$ ; and  $.58$  respectively. Conversely, negligible correlations existed between the Trauma Exposure scale and the READ, and between the Psychosocial Support Scale and the CD-RISC,  $r = -.07$  and  $-.04$  respectively. The remainder of the correlations were statistically significant; however, approximately half of these were

Table 3.

## Pearson Product-Moment Correlation for Primary Measurement Scales

Measure	1	2	3	4	5	6	7
1. CPSS	-						
2. Functional Impairment	.61**	-					
3. CD-RISC 10	-.31**	-.28**	-				
4. READ	-.11*	-.21**	.66**	-			
5. Trauma Exp.	.34**	.27**	-.18**	-.07	-		
6. Fear Scale	.57**	.28**	-.17**	.11*	.32**	-	
7. Psychosocial support Scale	.30**	.19**	-.04	.14*	.12**	.31**	-

Note.  $n = 509$ . CPSS = Child Post-traumatic Symptom Scale; CD-RISC 10 = Connor-Davidson 10-item Resilience Scale; READ = Resilience Scale for Adolescents. \*  $p < .05$  \*\* $p < .01$  (2-tailed).

small correlations. Correlations of medium magnitude as well as those approaching medium magnitude warrant closer examination (Miles & Banyard, 2007). Some of these are examined more closely during hypothesis testing procedures and others are given further attention when the interpretation of results are discussed in the following chapter.

Fisher  $r$ -to- $z$  transformations were used to ascertain whether there were any significant differences between the correlations of male scores and the correlations of female scores. No statistically significant differences were found at the  $p < .01$  level. Correlations between the primary measures of this study are presented in Table 3. An expanded presentation of correlations, which includes correlations between subscales, is depicted in Table A1 of the appendix.

## Hypothesis Testing

**Hypothesis one: Clinically significant PTSD symptoms would be present amongst 10% of the sample.** A participant's PTSD symptoms were deemed to be clinically significant if they scored above 15 on the CPSS. A score above 15 has been found to indicate symptoms at a level severe enough to warrant clinical intervention (International Society for Traumatic Stress Studies, 2011).

To test hypothesis one, a frequency analysis was conducted to ascertain what percentage of the sample had a CPSS score above 15. It was found that 24% of the sample had a CPSS score exceeding the cutoff. The 95% confidence interval for this proportion is 20.3% to 27.7%. The first hypothesis was therefore confirmed.

The following additional results relating to the CPSS bear relevance to hypothesis one: Only 13% percent of males scored above the cutoff in contrast to 34% of females. A chi-square goodness-of-fit test confirmed the statistical significance of this difference,  $\chi^2(1, n = 513) = 9.1, p = .003$ . Five percent of the sample (26 participants) had a PTSD score above 29, a value indicating extremely severe symptoms (Rachamim et al, 2011). Seventeen of these participants were female and nine were male. Over 40% of the sample had a score of less than 6, a value associated with low to negligible PTSD symptoms. Twenty four percent of these were male and 16 percent were female. Independent-samples t-tests were conducted to compare the mean CPSS scores found by Foa et al. (2001) in their validation study sample with the mean scores found in the current study. The total mean score in the current study ( $M = 10.3, SD = 9.8$ ) was significantly higher than that found by Foa et al. ( $M = 7.6, SD = 8.1$ ),  $t(109) = 2.52, p = 0.01$  (two-tailed). Likewise, the mean score for males in the

current study ( $M = 7.6$ ,  $SD = 8.6$ ) was significantly higher than the mean score for males found by Foa et al. ( $M = 3.7$ ,  $SD = 4.1$ ),  $t(78) = 4.33$ ,  $p < 0.001$ . The mean score for females, however, was not significantly higher in the current study ( $M = 12.8$ ,  $SD = 10.2$ ) than that found by Foa et al. ( $M = 10.3$ ,  $SD = 9.2$ ),  $t(62) = 1.64$ ,  $p = .11$ .

Forty two percent of the current sample reported some impairment to functioning because of PTSD symptoms, by endorsing at least one item of the functional impairment scale. Twenty percent of the sample endorsed three or more of these items. Chi-square analysis found no statistical difference between the percentage of male and females who endorsed more than three of the functional impairment items  $\chi^2(1, n = 513) = 1.9$ ,  $p = .161$ .

**Hypothesis two: A significant inverse relationship would exist between measures of resilience and PTSD symptoms.** To test this hypothesis, Pearson product-moment coefficients were computed and analysed. These are displayed in Table 3. Both measures of resilience, the CD-RISC and the READ, had a statistically significant inverse relationship with PTSD symptoms measured by the CPSS. The CD-RISC had a moderate negative correlation,  $r = -.31$ ,  $n = 513$ ,  $p < .001$ , and the READ had a small negative correlation,  $r = -.11$ ,  $n = 513$ ,  $p < .05$ , with the CPSS, thereby confirming hypothesis two. The inverse relationship between resilience and PTSD symptoms indicates that higher resilience scores were associated with lower PTSD symptom scores amongst the sample, and conversely, higher PTSD symptom scores were associated with lower resilience scores. Table A1 in the appendix displays correlations between the CPSS and its subscales, the READ and its subscales as well as the CD-RISC.

Multiple regression analysis was used to further explore the magnitude of the relationship between resilience and PTSD when other variables are also taken into account. Since results of the multiple regression analysis are relevant to hypothesis two three and four, they are presented along with the results of hypothesis four.

**Hypothesis three: A significant positive relationship would exist between measures of trauma experienced during the earthquakes and PTSD symptoms.**

Using the same method that was used to test hypothesis two, the Pearson product-moment correlation coefficient was calculated and analysed. A statistically significant positive relationship of medium strength was found between PTSD symptoms and the Trauma Exposure scale,  $r = .34$ ,  $n = 496$ ,  $p < .01$ , thereby confirming hypothesis 3.

**Hypothesis four: A significant positive relationship would exist between measures of fear experienced during the earthquakes and PTSD symptoms.** This hypothesis was also tested by computing Pearson's product-moment correlation coefficient. A statistically significant positive correlation with a large magnitude was found between PTSD symptoms and the Fear scale,  $r = .58$ ,  $n = 496$ ,  $p < .01$ , therefore confirming hypothesis four.

**Multiple regression analysis.** Hierarchical multiple regression analysis was used to determine the ability of trauma exposure, fear and resilience to predict PTSD symptoms after controlling for the influence of gender and school variables.

Preliminary analyses were conducted using SPSS Regression and SPSS Explore for the evaluation of assumptions (Tabachnick & Fidell, 2012)

These results led to transformation of the CPSS and Trauma Exposure

variables to reduce skewness and improve the normality, linearity, and homoscedasticity of residuals (Tabachnick & Fidell, 2012; Stevens, 2007). Square root transformations were found to be the most effective for both variables, reducing the skewness value from 1.12 to .04 for the Trauma Exposure scale and from 1.20 to .08 for the CPSS. With a criterion of  $p < .001$  for Mahalanobis distance, no multivariate outliers among the cases were identified. Tolerance and VIF statistics indicated no violation of the multicollinearity assumption. Residual and scatter plots indicated the assumptions of normality, linearity and homoscedasticity were satisfied (Pallant, 2011).

A four step hierarchical multiple regression analysis was conducted with PTSD symptoms (square root of CPSS) as the dependant variable. Gender and school were entered at Step 1 to control for these variables. The square root of the Trauma Exposure scale was entered at Step 2, the Fear scale at Step 3 and resilience scales, CD-RISC and READ at Step 4. Variables were entered in this order since chronologically, trauma exposure precedes fear during an earthquake and resilience factors come into effect after an earthquake has occurred, possibly ameliorating the effects of the trauma (Masten, 2011; Bonnano & Gupta, 2009). Intercorrelations between variables are displayed in Table 4. Whereas Table 5 displays the standardised regression coefficients ( $\beta$ ), squared semipartial correlations ( $sr^2$ ), multiple correlation coefficients ( $R$ ), coefficients of determination ( $R^2$ ), and  $R^2$  change ( $\Delta R^2$ ) for the multiple regression analysis.

The analysis revealed that at Step 1, gender and school contributed significantly to the regression model,  $F(2, 490) = 31.21, p < .001$ , and accounted for



Table 4  
 Pearson Correlation Coefficients for Variables in Hierarchical  
 Multiple Regression

Measure	1	2	3	4	5	6	7
1. CPSS (sq. root)	-						
2. Gender	.29	-					
3. School	.22	.19	-				
4. Trauma Exp. Scale (sq. root).	.31	.15	.26	-	-		
5. Fear Scale	.59	.33	.21	.34	-		
6. CD-RISC 10	-.30	.12	.01	-.16	-.19	-	
7. READ	-.09	.01	.07	-.05	.10	.65	-

Note.  $n = 509$ . CPSS=Child Post-traumatic Symptom Scale; CD-RISC 10 = Connor-Davidson 10-item Resilience Scale; READ = Resilience Scale for Adolescents.

Table 5.  
Summary of Hierarchical Multiple Regression Analysis

Variable	$\beta$	$s^2$	$R$	$R^2$	$\Delta R^2$
Step 1			.34	.11	.11
Gender	.26***	.069			
School	.17**	.029			
Step 2			.41	.17	.06
Gender	.24***	.060			
School	.11*	.012			
Trauma Exposure Scale (square root)	.24***	.055			
Step 3			.61	.37	.20
Gender	.10***	.009			
School	.07	.004			
Trauma Exposure Scale (square root)	.11*	.009			
Fear Scale	.50***	.201			
Step 4			.64	.41	.03
Gender	.09*	.006			
School	.09*	.006			
Trauma Exposure Scale (square root)	.08*	.005			
Fear Scale	.48***	.171			
CD-RISC 10	-.17***	.015			
READ	-.02	.000			

Note.  $n = 513$ , \* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$

11.3% of the variation in PTSD symptoms. Introducing the trauma exposure variable explained an additional 6.1% of the variation in PTSD symptoms and this change in  $R^2$  was also significant,  $F(1, 489) = 32.4, p < .001$ . Adding fear to the regression model explained an

additional 20.4% of the variation in PTSD symptoms and this change in  $R^2$  was significant,  $F(1, 488) = 158.4, p < .001$ . Finally, the addition of resilience to the regression model explained a further 3.4% of the variation in PTSD symptoms and this change in  $R^2$  was also significant,  $F(2, 486) = 14.1, p < .001$ . When all six independent variables were included in Step 4 of the model, the READ scale was not a significant predictor of PTSD symptoms,  $p > .05$ ; however, all other variables did significantly predict PTSD levels,  $p < .05$ . The strongest predictor was fear experienced during earthquakes, which uniquely explained 17.1% of the variance in PTSD symptoms, once all variables had been entered. Together, the six independent variables accounted for 40.6% of the variance in PTSD symptoms. This multiple regression analysis revealed that trauma exposure and fear were significant predictors of PTSD symptoms after differences in gender and school had been accounted for. It further found that Resilience as measured by the CD-RISC, but not the READ, had a modest, but significant effect on PTSD symptoms after gender, school, trauma and fear had been accounted for. These results provide further additional information on the practical relevance of correlations found for hypotheses two, three and four.

**Hypothesis five: Resilience would moderate the relationship between trauma exposure and PTSD.** A moderating variable is one that changes the relationship between two other variables. In this case it was hypothesised that higher levels of resilience would reduce the strength of the relationship between trauma exposure (the independent variable) and PTSD symptoms (the dependant variable), where the same level of trauma exposure would be associated with decreasing PTSD symptoms as the level of resilience increased (Tabachnick & Fidell, 2012). To test this hypothesis, moderation analysis was used. The CD-RISC was used as the moderating variable, since it had a stronger relationship with the

CPSS and Trauma Exposure scores than the READ, as evidenced by correlations and the multiple regression analysis described previously. The transformed variables, the square root of the CPSS and the square root of the Trauma Exposure scale were used. The required assumptions of normality, linearity and homoscedasticity were met (Tabachnick & Fidell, 2012). Moderation analysis was performed following the process outlined by Aitken and West (1991). The independent variable and moderation variable was first centred by subtracting the variable's mean from each observed score. This was done to eliminate the risk of multicollinearity effects between the variables. An interaction term was then created by multiplying the centred variables together. Finally, hierarchical multiple regression was used to test the interaction effect between the predictor and potential moderating variable. The centred variable for the main effect of trauma exposure was entered at Step 1, the centred variable for the main effect of resilience was entered at Step 2, and the interaction term was entered at Step 3. Results of this analysis revealed that the interaction term between trauma exposure and resilience did not explain a significant increase in the variance of PTSD symptoms,  $R^2$  change = .001,  $F(1, 494) = .339$ ,  $p = .56$ . Resilience, as measured by the CD-RISC did not moderate the relationship between trauma exposure and PTSD symptoms. Hypothesis 5 was therefore not supported.

Because of the large effect that fear during earthquakes had on the variance of PTSD symptoms, and the variance shared between this fear variable and the CD-RISC, a further moderation analysis was conducted to ascertain whether resilience, as measured by the CD-RISC, would moderate between fear and PTSD symptoms. For this analysis, the centred fear variable was entered at Step 1, the centred resilience variable at Step 2 and the interaction term of fear and resilience at Step 3. Results of the analysis showed that

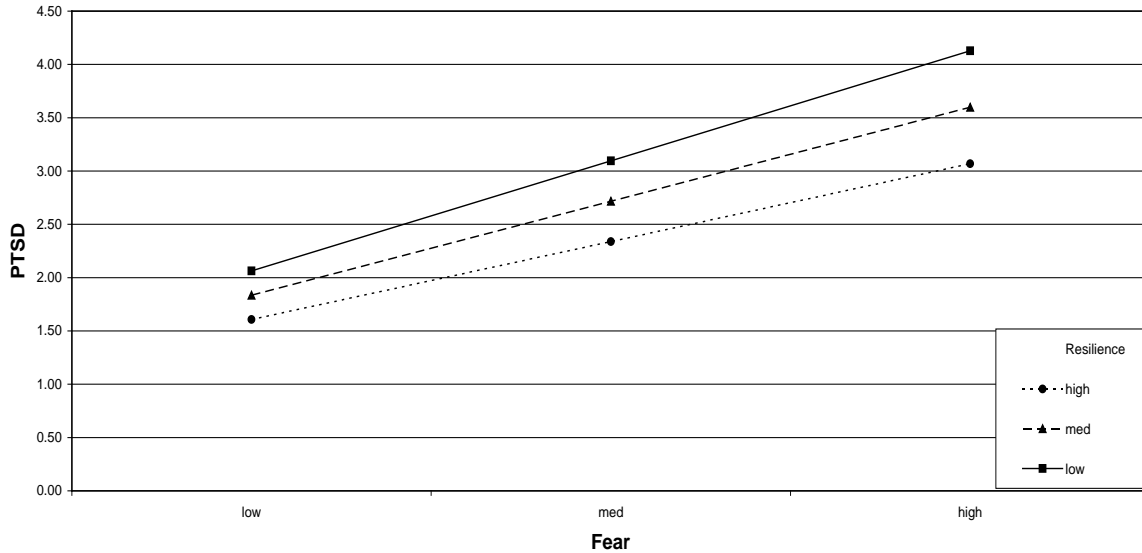
resilience did moderate the relationship between fear and PTSD. The resilience and fear interaction term explained a significant increase in the variance of PTSD symptoms,  $R^2$  change = .008,  $F(1, 491) = 6.78$ ,  $p = .009$ . The moderation interaction was graphed using an online computer programme (Jose, 2008) and is displayed in Figure 1. It is evident that resilience had a modest moderating effect, where each level of resilience (low, medium, high) alters the gradient of the slope, demonstrating that when resilience is at a high level, an increase in fear during earthquakes is associated with smaller increases in PTSD symptoms than when resilience was at a medium or low level.

### **Summary of Results.**

Significant differences were found between male and female mean scores for several measures. Overall, male adolescents reported lower scores for level of fear experienced during earthquakes and level of PTSD symptoms than females adolescents did, and there were medium effect sizes for these differences. Males also reported significantly lower scores for trauma exposure, functional impairment and psychosocial support than females did and there were small effect sizes for these differences. Conversely, males reported higher scores overall on the CD-RISC than females and there was a small effect size for this difference. There were also significant differences in the mean scores of schools on certain measures. Participants at two schools in the east of Christchurch, as well as those at Christchurch Girls High school had significantly higher scores on measures such as the CPSS, Functional Impairment, Fear and Trauma scale.

Figure 1.

Moderation of Fear and PTSD by Resilience



Hypothesis one was confirmed by evidence that clinically significant symptoms existed in 24% of the sample. Hypothesis two was confirmed by evidence of statistically significant negative correlations between each of the resilience measures and PTSD symptoms.

Hypothesis three was confirmed by the statistically significant positive correlation found between trauma exposure during the earthquakes and PTSD symptoms. Similarly, hypothesis four was confirmed by the statistically significant positive correlation found between fear experienced during the earthquakes and PTSD symptoms. Hypothesis five was not supported, as resilience was not found to significantly moderate the relationship between trauma exposure and PTSD symptoms. A related finding was that resilience moderated the relationship between fear and PTSD symptoms. The results presented in

this chapter have provided clear data for each of the hypotheses. Interpretations of these results are discussed in the following chapter.





## 4. Discussion

The findings of this study suggest that the Canterbury Earthquakes have had a significant negative impact on a considerable proportion of adolescents in the sample. This is suggested by the fact that a quarter of the sample reported clinically significant PTSD symptoms and 42% reported some impairment of daily functioning. However, the absence of PTSD symptoms and functional impairment in the majority of the sample may indicate the presence of resilience. Resilience factors that might contribute to these outcomes were indicated by correlations between measures of resilience and PTSD symptoms.

Correlations between trauma exposure, fear experienced during the earthquakes and PTSD symptoms provide insight into possible mechanisms for the development of PTSD. This chapter elaborates on these key findings. Each construct is discussed separately and the relevant hypotheses are referred to. Hypothesis five is discussed after hypothesis two, since the moderation analysis is integral to the discussion of resilience. Hypothesis three and four are then discussed after hypothesis five. Results are compared to existing literature and relevant interpretations are made. Practical applications of the research are suggested after which the limitations of the study are discussed. Finally, directions for further research are considered.

### Posttraumatic Stress Disorder

**Hypothesis one: Clinically significant PTSD symptoms would be present amongst 10% of the sample.** Establishing the prevalence of PTSD symptoms was a key objective of this project. It was deemed important since every disaster has a unique impact on the victims who experience it, and it is not possible to accurately estimate this impact

without appropriate research. Establishing the prevalence of PTSD symptoms within the adolescent population of Christchurch indicates the seriousness of impact and highlights the need for resources to address this impact.

Ten percent was chosen as a testing criterion for the hypothesis, since the majority of existing studies have found a prevalence rate higher than 10% for PTSD amongst children and adolescents after disaster (e.g., McFarlane, Van Hooff & Goodhew, 2009). Studies that reported less than 10% PTSD prevalence had typically been conducted after disasters such as floods or tornadoes, where the onset was more gradual than that of earthquakes, where there were few or no casualties, and where there was no continued threat comparable to aftershocks (McFarlane, et al., 2009; Norris et al., 2002a, 2002b). In contrast to the prevalence rates of populations that have been exposed to disasters, rates for PTSD amongst general populations have been found to be between 3% and 5% (Kessler, Chiu, Demler, Merikangas & Walters, 2005; Wang et al., 2011).

Twenty-four percent of the current sample reported clinically significant PTSD symptoms, which confirmed the first hypothesis. The percentage of adolescents with clinically significant PTSD in this sample is consistent with Norris et al. (2002a), who reported clinically significant PTSD in 21% to 56% of young people after various disasters. Norris et al. referred to these as high impact disasters because of the levels of PTSD and associated distress experienced by survivors. It could therefore be argued that the Canterbury Earthquakes, collectively, were a high impact disaster for adolescents, based on the proportion with clinically significant PTSD in this sample. Endorsement of the functional impairment scale, by 42% of the sample, provided further evidence of the far reaching impact that PTSD symptoms had on the sample. Impairment of diverse areas of

functioning such as schoolwork, relationships with friends or family, fun activities, duties at home, and general happiness was reported.

Foa et al. (2001) conducted a validation study for the CPSS after an earthquake in Northridge, California. The Northridge earthquake had several factors in common with the Canterbury earthquake of February 22, 2011. Both earthquakes had similar magnitudes, high peak ground accelerations and resultant damage, but the Northridge earthquake had a lower death toll of 54 than the February 22 Canterbury Earthquake. Higher levels of PTSD symptoms were being experienced by adolescents in Christchurch at the time of data collection in comparison to PTSD levels of children and adolescents after the Northridge earthquake

The fact that data was collected two years post disaster by Foa et al. compared to four months after the last destructive aftershock in the current study, could be a factor contributing to the higher levels of distress. Goenjian et al., (2011) argued that a reduction in PTSD symptoms could be expected during the first two years post disaster. Sample size may be an additional explanation, since Foa et al. had a fairly small sample size of 75 which may have been susceptible to small sample bias (Miles & Banyard, 2004). Despite these factors, it is also probable that adolescents in Christchurch were experiencing higher levels of PTSD symptoms due to greater trauma exposure suggested by a higher death toll, more extensive damage and higher magnitude aftershocks (Norris et al., 2002a, 2002b).

Findings of the level and prevalence of PTSD symptoms in this sample clearly indicate that the Canterbury earthquakes have had a significant impact on a meaningful proportion of adolescents who experienced them. The significant difference that existed between PTSD symptom scores for male and female adolescents is now considered.

**Gender differences.** The differences in PTSD scores between male and female adolescents are relevant to understanding the psychological effects of the trauma in this population and may inform intervention. A higher prevalence of PTSD amongst females after disasters is consistently reported (e.g., Nemeroff et al., 2006; La Greca et al., 1996) and a comprehensive review of the difference in PTSD rates across gender has previously been presented (Tolin & Foa, 2008). Tolin and Foa confirmed a higher prevalence of PTSD amongst females across many trauma types and discussed several factors that contribute to the gender difference. Factors with relevance to the current sample include: (a) a higher prevalence of externalised symptoms such as anger, aggression and substance use amongst males after trauma, compared to a higher prevalence of internalised symptoms such as anxiety and depression in females (b) genetic differences between males and females which result in different emotional and cognitive reactions during the trauma, with females experiencing a more pronounced fear response; (c) possible higher rates of prior sexual abuse amongst females, making PTSD in response to subsequent traumatic events more probable; and (d) under reporting of symptoms by males, influenced by socially constructed gender roles (Tolin & Foa, 2008).

Higher PTSD scores amongst female adolescents may indicate the need for PTSD intervention to be targeted toward females; however, findings that male adolescents may under-report symptoms and may manifest more externalised symptoms (Tolin & Foa, 2008), indicates an area of further research to ascertain the intervention needs of males.

**Difference in PTSD across schools.** When the PTSD scores between schools were

compared, significantly higher PTSD symptoms were experienced by participants at two high schools in the east of the city as well as those at a central city girls' high school. In addition, participants from the two eastern high schools had significantly higher scores on the Functional Impairment scale, the Trauma Exposure scale and the Fear Scale, whereas participants from Christchurch Girls' High school had significantly higher scores on the Fear scale and the PTSD scale alone. These findings suggest that different levels of impact were experienced by separate sub-sets of the sample and this may be explained by their geographic location in addition to their gender. The difference in earthquake effects as a function of location was not a focus of this study; however well established evidence suggests that proximity to the earthquake epicentre, amount of damage to immediate community, and availability of resources all impact on psychological outcomes after disaster (Norris et al., 2002a). These factors may explain the difference in the impact experienced by participants from the two schools in the east of the city. Resilience factors that may protect against this impact are discussed next.

## **Resilience**

**Hypothesis two: An inverse relationship would exist between measures of resilience and PTSD symptoms.** The absence of PTSD symptoms or associated functional impairment amongst the majority of this sample is an indication of psychological resilience (Masten, 2011; Bonanno & Gupta, 2009). However, this research was concerned with identifying specific factors which contributed to resilience. This is an important area of research because factors identified as protective may be increased through intervention, thereby reducing the risk of psychopathology after trauma (Masten, 2011). The relationship between measures of resilience and PTSD, as evidenced by correlations between these

constructs, was of interest in this study because an inverse relationship may signal the factors that protect adolescents against PTSD. Correlation does not, however, imply causation (Aaron, 2011) and similarly, a correlation between resilience factors and PTSD would not confirm that these resilience factors protect against PTSD. Significant correlations could, nevertheless, provide further evidence in support of specific protective factors and indicate worthwhile areas for future research.

Hypothesis two was confirmed by the inverse correlation found between each resilience measure and PTSD symptoms; however, only the CD-RISC made a significant contribution in predicting PTSD symptoms once demographic and other variables had been taken into account. This suggested that different resilience constructs were being measured by each scale. In this discussion, the term *resilience factor/s* is used rather than resilience, when referring to the constructs measured by the CD-RISC and READ. The term resilience factor/s is used because the CD-RISC and READ scales do not measure resilience itself, but rather they measure specific factors that are purported to protect against risk, thereby resulting in resilient outcomes (Connor & Davidson, 2003; Soest et al., 2010). It should also be remembered that these are merely potentially protective factors which may or may not be related to resilient outcomes for the adolescents in this study.

**Exploration of READ and CD-RISC resilience factors.** Consideration of the specific resilience factors measured by each resilience scale is necessary in order to identify which of these factors may protect against PTSD symptoms. The READ assesses factors related to an adolescent's personal competence, social competence, ability to plan and organise, social resources and family cohesion. These factors form its five subscales. The 10-item CD-RISC on the other hand, measures a single resilience factor: the ability to cope

with challenge and adversity. At this point it is important to note that both of these scales actually measure the respondent's *perception* of how each item of the scale applies to them. Although this is true with most self-report measures, the READ and CD-RISC allow for greater subjective interpretation than a measure such as the CPSS where items are more clearly quantified (Baker, Stabile, & Deri, 2004).

The READ was expected to have a larger inverse correlation with PTSD symptoms than the CD-RISC, because it measures a wider array of resilience factors than the CD-RISC, and a substantial body of literature suggests that resilience following disaster is best predicted by a combination of personal, social and environmental factors (Bonanno, Brewin, Kaniasty, & LaGreca, 2010; Rutter, 2012; Werner & Smith, 2001;). In particular, the Social Resources, Family Cohesion and Personal Competence subscales were expected to have significant inverse relationships with PTSD symptoms, since previous investigators have consistently found relationships between similar constructs and PTSD (Lambert, Benight, Harrison, & Cieslak, 2012; Kaniasty & Norris, 2009; Masten, Monn & Supkoff, 2011). The Personal Competence subscale did have a significant inverse correlation with PTSD symptoms; however, the other four READ subscales had negligible correlations with PTSD symptoms. This indicates that adolescents' perception of their social competence, of their ability to organise and plan, of their access to social resources, or of their family's cohesiveness, as measured by the READ, were not related to their PTSD symptoms in this sample. The correlation between the READ and PTSD symptoms was accounted for almost exclusively by the Personal Competence subscale. Specifically, the item "I am competent" had the highest correlation with PTSD symptoms of all the READ items.

**Lack of relationship between READ subscales and PTSD symptoms.** Conclusive explanations for the lack of correlation between the four READ subscales and PTSD symptoms cannot be made without further research; however, two plausible explanations are considered. The first is that the subscales did not have a relationship with PTSD at the time of data collection, but will become associated with later symptom recovery as time progresses. The second explanation is that the subscales are not valid predictors of PTSD symptoms and that this will not change over time. These explanations are each discussed.

The proposition that the subscales may measure factors that protect against PTSD, but that this association may only become visible as time progresses, is supported by findings of La Greca et al. (1996). In a longitudinal study conducted with children after Hurricane Andrew, these authors found evidence that social support (from parents, teachers and friends) accounted for a reduction in PTSD symptoms over time. Although there was a correlation between social support and PTSD three months after the disaster, this relationship was stronger 10 months after the disaster, suggesting that an increase in the relationship between the READ subscales and PTSD could occur over time in the current sample.

The second proposition, that uncorrelated READ subscales are not valid predictors of PTSD symptoms, may further be explained by measurement issues such as self-perception response bias, and the broad measurement targets of the READ not being specific to disaster-related resilience. These two possibilities are briefly explained. Self-perception bias occurs when a participant perceives themselves inaccurately and responds accordingly (Morgado, Raoux, Smith, Allilaire, & Widlöcher, 1989). McDermott et al., (2010) suggested that this may have been a factor reducing the relationship between family



resilience and PTSD in their study of children and adolescents exposed to a destructive cyclone. The authors suggested that respondents, who were parents in this case, may have experienced a perceptive bias as a consequence of the disaster which led them to report better family resilience than was actually the case. A related self-perception response bias, compounded by the disaster experience, could have occurred with the READ subscales if adolescents inadvertently, but systematically over-reported or under-reported factors measured by the READ because of the effect of the disaster experience. Self-perception bias would not affect the relationship between personal competence and PTSD to the same extent, because an individual's perception of their competence is a protective factor regardless of whether they are in fact competent or not (Benight, Cieslack & Waldrep, 2009). The broad scope of many of the READ items is the second factor that may have reduced the predictive validity of the four subscales in question. The READ was designed to measure resilience as a general construct, rather than resilience in response to disaster (Hjemdal et al., 2006). As such, none of the items relate specifically to the effects of disaster, and this may explain why the factors measured by the Social Competence, Structured Style, Family Cohesion and Social Resources subscales are not related to PTSD experienced by adolescents after the disaster.

#### **Relationship of the CD-RISC and personal competence with PTSD Symptoms.**

The relationship of both the CD-RISC and the Personal Competence subscale with PTSD symptoms aligns with previous research and signals areas for intervention. The relationship between the CD-RISC and PTSD symptoms is considered first. Statistically significant correlations between the CD-RISC and PTSD symptoms have previously been found in adult samples (Bensimon, 2012; Wang et al., 2010; Wren et al., 2011); and in an

adolescent sample (Fincham et al., 2009). As previously discussed, the CD-RISC assesses a respondent's cognitions about their ability to cope with challenge and adversity. The relationship between these and the disaster experience are easy to ascertain and it seems logical that these perceptions would have an influence on the severity of PTSD symptoms. The last item, "I am able to handle unpleasant or painful feelings like sadness, fear and anger", had the highest correlation with PTSD symptoms. The direct relationship of this item with PTSD symptoms can be ascertained on face value and is supported by evidence of the role that emotional awareness and regulation has in protecting against PTSD (Wagnild & Collins, 2009). Findings from this study suggest that the 10-item CD-RISC is a valid measure of adolescents' resilience after earthquakes.

Although the same evidence was not found for the validity of the READ in measuring adolescent resilience after the Canterbury earthquakes, the relationship between the Personal Competence subscale and PTSD symptoms suggest personal competence to be a resilience factor. Previous research has found similar constructs such as general self-efficacy (Hirschel & Schulenberg, 2009), self concept (Saigh, Yasik, Oberfield, & Halamandaris, 2008), and mastery (Kaniasty, 2006) to be associated with PTSD. Additionally, the resilience construct measured by the CD-RISC has similarities to the construct of perceived personal competence, and the relationship between the CD-RISC and PTSD has been demonstrated in this study as well as in previous studies (e.g. Bensimon, 2012; Fincham et al., 2009, Wang et al., 2010). Finally, Soest et al. (2010) found the Personal Competence subscale to have significant correlations with anxiety and depression and these correlations were higher than those of the other READ subscales. The association between anxiety, depression and PTSD has been clearly evidenced (Ursano, Fullerton & Benedek,

2009). The results of the current study suggest that perceived personal competence, as measured by the READ, may be a protective factor against PTSD.

**Theoretical Support.** The relationship of both the CD-RISC and the Personal Competence subscale with PTSD is supported by social cognitive theory (Bandura, 1991) which has self-efficacy as a key construct. Self-efficacy is defined as the “perception of capability to enact certain behaviour” (Benight et al., 2009, p 162). The Personal Competence subscale relates to general self-efficacy, the perception of capability across a broad range of domains, whereas the CD-RISC relates to coping self efficacy, or the perception of capability to cope with the demands of disaster (Benight and Bandura, 2004). Previous research suggests that both general and coping self efficacy mitigate the risk of psychological distress after disaster (Benight, Swift, Sanger, Smith, & Zeppelin, 1999; Masten, 2011). The relationship of both CD-RISC and personal competence factors with PTSD in the current study aligns with these findings.

**Hypothesis five: Resilience scores would moderate the relationship between the level of trauma exposure and PTSD symptoms.** A moderation analysis was conducted to test hypothesis five. It is discussed here out of sequence since the findings are relevant to the current discussion of resilience. Contrary to hypothesis five, resilience, as measured by the CD-RISC did not moderate the relationship between Trauma Exposure and PTSD. This means that the effect of trauma exposure on PTSD symptoms remained constant irrespective of changes in the level of CD-RISC scores, and higher CD-RISC scores did not act as a buffer between trauma exposure and PTSD. A similar finding was reported by Zahradnik et al. (2009) who conducted a moderation analysis using a different measure of

resilience as the moderating variable, exposure to violence as the predicting variable, and PTSD symptoms measured by the CPSS as the dependant variable. No significant moderating effect was found between these variables. The failure of the CD-RISC factors to moderate between trauma exposure and PTSD in the current study may be explained by the nature of the correlation between trauma exposure and PTSD symptoms. Much of the correlation appears to be accounted for by very low levels of trauma exposure being related to very low levels of PTSD and conversely, very high levels of trauma exposure being related to very high levels of PTSD with less correlation occurring in the mid-range scores. In the case of low levels of trauma exposure, and low levels of PTSD symptoms, the interaction of the CD-RISC would have little effect. On the other hand, with very high levels of trauma exposure, higher CD-RISC scores may do little to prevent PTSD symptoms from occurring, and a moderation effect would not occur. This explanation is supported by Fincham et al. (2009) who found that the 25-item CD-RISC scores moderated the relationship between PTSD and childhood abuse and neglect, but did not moderate the relationship between high levels of stress from community violence and PTSD. They posited that different cognitive processes may be activated for adolescents exposed to very high levels of stress rendering them vulnerable to PTSD regardless of resilience factors.

An unexpected finding in the current study was that the CD-RISC score moderated the relationship between fear experienced during earthquakes and PTSD symptoms. This meant that higher CD-RISC scores acted as a buffer between the level of fear experienced by the adolescent and their resulting PTSD symptoms. This can be interpreted in light of the cognitive mechanism of fear. Fear occurs as a reflexive reaction for many people during an earthquake, where the brain's cortex, responsible for thinking and reasoning, is bypassed

by the amygdala, which governs fear memories and is crucial in the activation of a fight, flight or freeze response (Orsini & Maren, 2012). Genetics and conditioning determine the level of fear experienced at the sudden onslaught of an earthquake and this is largely outside the realm of conscious control (Mueller-Pfeiffer et al., 2010). Nevertheless, there is evidence to suggest that adaptive cognitions after trauma mitigate the effects of the fear response, leading to more effective coping (Belus, Brown-Bowers, & Monson, 2012; Maren, 2005). It may be that coping cognitions measured by the CD-RISC, reduce an adolescent's fear following the initial earthquake, thereby decreasing the likelihood of PTSD symptoms, and increasing the likelihood of a resilient response. The CD-RISC's moderation of the relationship between fear and PTSD supports this possibility.

**Difference in resilience across gender.** There was a significant difference in resilience measured by the CD-RISC between male and female adolescents and this difference had a small effect size. This gender difference has been found in some studies (e.g. Wren et al., 2011) but not others (e.g., Fincham et al., 2009). It may be that pre-disaster CD-RISC base rates were higher for males than females in this sample. Systematic over-reporting by males due to culturally constructed gender roles may be another explanation for the difference (Tolin & Foa 2008). A third possibility is that a variable such as PTSD, has had an effect on CD-RISC scores after the earthquakes had occurred, so that adolescents with higher levels of PTSD symptoms perceived themselves as less able to cope than they did before the earthquakes, whereas those with low or no PTSD symptoms perceived themselves as more able to cope than they did before.

## Trauma Exposure

**Hypothesis 3: A positive relationship would exist between trauma exposure during the Canterbury earthquakes and PTSD symptoms.** A positive relationship was found between trauma exposure and PTSD symptoms which confirmed hypothesis three. This meant that adolescents who were exposed to more traumatic factors had a greater likelihood of experiencing higher levels of PTSD symptoms than those who had experienced fewer traumatic factors. This relationship remained constant when individual demographics were controlled for. The relationship between trauma exposure and PTSD has been well established in a wide range of studies with various age groups across diverse traumas. Norris and Wind (2009) provide a comprehensive review of such studies and concluded that factors such as the amount of lives lost, injury, threat to life, witnessing of horror, resource loss, housing issues and displacement all have significant, quantifiable effects on PTSD after disaster. The Trauma Exposure scale used in this study was based on a scale developed by (Metin Başoğlu, Şalcioğlu, & Livanou, 2007) and measured exposure factors such as being in a collapsed building or trapped, being injured, witnessing injury or having family members injured, the death of acquaintances or family members, house damage and subsequent displacement. These trauma exposure factors are not exhaustive; but they are clearly linked to PTSD symptoms. Findings from this study support previous studies that found evidence of the relationship between these specific factors and PTSD symptoms (Metin. Başoğlu et al., 2004; Basoglu & Salcioglu, 2011)

**Gender differences in trauma exposure.** Females had a higher mean trauma exposure score than males. The difference in the endorsement of items across gender is an unexpected finding, since there is no theoretical reason to suggest that females would have

been exposed to higher levels of trauma than males. Chi-square goodness of fit tests conducted for each item revealed that two items were the main contributors to the overall difference in male and female scores: Thirty-eight percent of females knew someone who had died, whereas only 24.8% of males did. Similarly, 18.2% of females reported that someone in their family had been injured, whereas only 10.7% of males did. One explanation for the differences may be that female adolescents in general, have larger social networks than males (Gorrese & Ruggieri, 2012), and a greater sensitivity to the injury or pain of others (Mestre, Samper, Frías, & Tur, 2009). The suggestion that female adolescents have larger social networks could explain why females knew more people who had died than males did. A combination of these two factors, larger social networks and greater emotional sensitivity could explain why females reported having more people in their families that were injured. They may keep more contact with extended family than males and may become aware that someone in their family has been injured, even if it is a slight injury.

The relationship of trauma exposure and PTSD found for adolescents in this study is congruent with other literature, and also adds to existing literature since it confirms the relationship between trauma exposure and PTSD amongst a unique segment of the population, namely adolescents, exposed to a unique natural disaster, the Canterbury earthquakes. A further contribution is made by the significant difference found between male and female reports of two specific types of exposure.

## Fear during earthquakes

**Hypothesis four: A positive relationship would exist between fear experienced during the Canterbury earthquakes and PTSD symptoms.** The level of fear experienced during the earthquakes was found to have a strong relationship with PTSD for this sample, confirming hypothesis four. Two items comprised the fear scale and hierarchical multiple regression revealed that together they accounted for more variance in PTSD symptoms than any other variable in this study. This finding corresponds with that of Başoğlu and Şalcioğlu (2011) who found that the level of fear experienced by an individual during an earthquake was a superior predictor of PTSD than trauma exposure. This was also supported by Marshall et al. (2007) who found that it was the subjective perception of threat rather than actual threat that resulted in fear and ultimately the development of psychopathology after the 9/11 terrorist attacks. The fact that the *DSM-IV-TR* (APA, 2000) requires intense fear, horror or helplessness to be experienced in response to a stressor for the diagnosis of PTSD, further emphasizes the essential role of fear in the development of PTSD. Although both items of fear had a relationship with PTSD symptoms, the item that assessed the level of fear at the most recent aftershock had a stronger relationship with PTSD than the other item which assessed the highest level of fear during a major earthquake. This finding could be explained as follows: While most adolescents would have habituated to the ongoing aftershocks, and their fear would have abated, some adolescents may have experienced sustained fear in response to the aftershocks, perceiving these as fearful events that they had little control over. This response is described as learned helplessness (Seligman & Maier, 1976; Maier, 2001). Adolescents who have not habituated to the constant exposure of aftershocks are more likely to report higher levels of



fear during the aftershocks, and correspondingly, are more likely to experience higher levels of PTSD (Rachmin & Levitt, 1988). This difference in response to ongoing exposure may account for the higher correlation between fear experienced during an aftershock and PTSD.

**Gender differences.** Females had significantly higher fear scores than males. This finding contributes to the extant literature on gender differences in psychopathology after exposure to trauma (Tolin & Foa, 2008; Nemeroff et al. 2006). The fact that females experienced higher levels of fear and also had higher PTSD symptoms than males provides further evidence that fear experienced during the earthquakes are one mechanism in the development of PTSD. Higher levels of fear experienced by females are most likely explained by a combination of casual factors relating to genetics and learned behaviour (Hetzl-Riggin & Roby, 2013). Differences have been found in the neural fear circuitry of the male and female brain, (Lebron-Milad et al., 2012), and this suggests a genetic basis for the difference in the fear response. On the other hand, the role of learning in fear differences across gender is supported by the finding that females retain emotional memories to a greater extent than males and access these memories more readily (Galli, Wolpe, & Otten, 2011). Genetic and learning are not mutually exclusive but will have a reciprocal influence on each other in determining the difference between male and female fear response. Findings from the current study suggest that by the stage of adolescence differences in fear reactions are firmly entrenched and these are related to different psychological outcomes for male and female adolescents who experienced the Canterbury earthquakes.

### **Access of Psychosocial Support**

The Psychosocial Support scale was designed to ascertain the types of psychosocial support that had been accessed by the sample and the extent to which these had been accessed. Four items were designed to ascertain the proportion of the sample that had spoken to a school counsellor, another counsellor, a parent/caregiver or a friend/family member for support for earthquake related stress. Respondents could also indicate if they had experienced no earthquake related stress, in which case they were not required to complete the four psychosocial support items. Two additional items were included to ascertain what proportion of adolescents knew relaxation/stress reduction techniques, and what proportion wanted to learn relaxation/stress reduction techniques. These items were included because certain programmes were available which taught mindfulness and relaxation techniques to adolescents in schools and it was useful to ascertain what proportion of adolescents might access such programmes.

Forty one percent of males and 30% of females reported that they had experienced no earthquake related stress and therefore did not require support. Only 11.5% of the total sample had accessed support from a school counsellor. In comparison, a study with a large adult sample found that only 7% of those with full PTSD accessed treatment within the first year of onset. The average time between onset and the access of treatment in that study was 12 years (Wang et al. 2005). It was encouraging to see that 41% of the current sample had spoken to their parents, and a similar proportion had spoken to friends or family members about their earthquake related stress.

**Gender differences.** It was expected that fewer males would access psychosocial support compared to females, since fewer males reported high PTSD symptoms, and the mean score for PTSD was lower for males than it was for females. The chi-square goodness

of fit tests revealed that the difference in the percentage of males and females who accessed support was of a similar ratio to the difference in mean PTSD scores between males and females. This was true for each item, (school counsellor, other counsellor, parent, friend/family), and meant that when PTSD symptoms were taken into account the percentage of males that accessed psychosocial support was comparable to the percentage of females who did. It is noteworthy that the proportion of males who reported knowing relaxation techniques was higher than the proportion of females who endorsed this item. It might be expected that more females would know relaxation techniques given that females have experienced higher levels of PTSD symptoms. It would be useful to ascertain what relaxation techniques participants did know, how they had learned these and how effective they found them in managing symptoms. One quarter of the males indicated that they were interested in learning relaxation/stress reduction techniques and one third of the females indicated this. The higher proportion of females willing to learn these techniques was again to be expected given the higher levels of PTSD symptoms amongst the female sample. Nevertheless, these proportions indicate that a programme teaching such skills will be well received by a sufficient proportion of the population. The amount of psychosocial support accessed shared statistically significant medium-sized correlations with PTSD symptoms and the Fear scale. This is a predictable finding which suggests that participants who had higher

PTSD scores and experienced higher levels of fear during the earthquakes were also more likely to access psychosocial support.

### **Practical Application**

The primary aim of this study was that it could be of an applied nature in the reduction of psychological distress amongst adolescents. One way that the study made a practical contribution was by providing effective screening for PTSD, where adolescents who had clinically significant levels of PTSD and were willing to be approached by counselling staff were offered this support.

Forty seven adolescents received such support, the majority of whom had not previously engaged with counselling services. This demonstrated the feasibility and benefit of early psychological screening for adolescents after disaster. Schools are the most logical place to conduct such initiatives. It is suggested that a screening procedure be designed and planned with schools on a national basis prior to disaster, since prior planning will increase the logistical feasibility of such an initiative in the wake of disaster (Norris, 2006). In addition to measures of distress such as PTSD and functional impairment, protective factors should also be measured to indicate resilience amongst the population and to specify protective factors that could be enhanced through intervention. Appropriate interventions and strategies for wide-scale delivery of these interventions should also be planned prior to disaster.

This study suggests the need for immediate and ongoing intervention for Christchurch adolescents. There was evidence to suggest that the sample approximated the population of Christchurch adolescents. Therefore, approximately a quarter of the adolescents in Christchurch could be expected to have had clinically significant PTSD symptoms, and approximately 40% could be expected to have had some impairment to their daily functioning. These are considerable segments of the adolescent population. Evidence that PTSD symptoms subside over time in a large proportion of adolescents, even

without specific intervention, (Goenjian et al., 2011; Norris et al., 2002) is encouraging. However, related evidence also indicates that debilitating symptoms persist over time in a smaller proportion of adolescents (Goenjian et al., 2011; Norris et al., 2002). Furthermore, long term secondary stressors after major disasters can be a catalyst for psychological difficulties other than PTSD (McFarlane & De Girolamo, 2007). Short term and long term intervention is therefore required in order to alleviate distress and enhance coping amongst adolescents in Christchurch. Four practical applications of this study's findings are now discussed in relation to interventions.

First, the clear relationship between fear experienced during earthquakes and PTSD symptoms indicates that this fear should be a primary target for those with high PTSD symptoms. Behavioural and cognitive-behavioural interventions that target earthquake-related fear through various forms of exposure and cognitive restructuring have been used effectively with adolescents, and hold the most promise for effective outcomes (Başoğlu & Şalcioğlu, 2011; Cohen, Mannarino, & Deblinger, 2010).

Second, the relationship between the CD-RISC and PTSD symptoms, as well as the moderating effect that the CD-RISC had on fear and PTSD symptoms, suggest an additional focus for intervention. An adolescent's perception of their ability to cope with adversity as measured by the CD-RISC, may be enhanced through appropriate intervention (Benight & Bandura, 2004; Davidson, 2011). As these perceptions have a cognitive behavioural basis, effective intervention would use cognitive-behavioural processes in order to enhance them (Cohen et al., 2010).

Third, the difference between male and female reactions was very clear. Higher PTSD symptom scores for females may suggest a greater need for intervention to address

these symptoms amongst females. Higher reporting of two trauma exposure items suggests that females may experience more vicarious trauma due to more extensive social networks and more sensitivity to pain or emotions of others (Gorrese & Ruggieri, 2012; Mestre, 2009). Males, on the other hand, may have more externalising symptoms not detected by PTSD measures (Tolin & Foa, 2008). Interventions, particularly group interventions, need to address the needs of male and female adolescents separately. Intervention for males should, nevertheless, not be neglected. Four times as many male adolescents commit suicide compared to female adolescents in New Zealand (New Zealand Ministry of Health, 2009). This indicates that interventions for males are essential; however, as this study and other literature suggests, identifying male adolescents who require intervention may be more difficult than it is for females. (Haen, 2011; Sharry & Owens, 2000)

The fourth practical application for interventions concerns the accessing of professional psychosocial support. The access of professional counselling support was low, given the proportion of the sample with clinically significant PTSD symptoms. Efforts should be made to validate common psychological distress that might be experienced post disaster, and to normalise counselling support and other therapeutic interventions within schools. Particularly for male adolescents, more innovative methods of psychosocial support may be necessary. The proportion of the sample that accessed support from parents, family and friends is encouraging. Information explaining effective methods of support was disseminated to parents and other supporters by various agencies following the earthquakes. This information should continue to be updated and disseminated so that supporters are aware of the likely signs of ongoing distress and can intervene

appropriately.

### **Study limitations**

Several limitations of this study may affect the generalisability of its findings. These include the cross sectional design of the study, the likelihood of two forms of bias, the sole use of self-report measures, and the lack of comparison data for New Zealand adolescents. These limitations are now examined.

A cross-sectional design was used for this study where data was collected at a single time-point. This does not allow for conclusions to be made about the direction of relationship between variables, the causality of variables or the change in variables over time. A longitudinal study where data is collected at various time-points could provide important additional information regarding the trajectory of PTSD and the influence of resilience factors over time. A cross sectional design was used for this study since it allowed for the collection, analysis and interpretation of data in a timely manner. This allowed the dissemination of initial findings to parties such as schools and social service agencies within two months of data collection, enabling them to act promptly in response to the information. Longitudinal studies with the same population are a recommended area for future research.

Two forms of bias were likely in this study, sampling bias and response bias. Although an effort was made to select a sample that would be representative of the population, and some indication of its representativeness was ascertained, a non-probability sampling method was used and non-probability samples are vulnerable to sampling bias (Christensen, 2011). One indicator of sampling bias in this study was the disproportionate number of participants from one high school compared to those from the

five other high schools who completed the questionnaire online. This occurred because of the different administration methods, where adolescents at one high school were given the opportunity to complete the questionnaire during school time. The online questionnaire had the advantage that participants could complete it at a time that was convenient for them, and this did not impact on school time; however, it meant that more motivation was necessary for its completion. Adolescents who were motivated enough to complete it may have had higher motivation for a variety of reasons including higher psychological distress. Online scores were not significantly different to pencil and paper scores when statistical analyses were completed. However, this alone cannot confirm that a self-selection sampling bias was not present. True random sampling is very difficult to achieve in practice and would have been impossible in the current study for a variety of reasons including those related to ethics, since the name and contact details of each adolescent in the Christchurch area would have been required in order to draw a random sample. A realistic method of reducing the bias in this study would have been to encourage all randomly selected schools to administer the questionnaire during school time. Certain challenges were associated with this, for example, ethically the questionnaire was not to interfere with lesson delivery, and some schools did not have a sufficient time slot outside lesson delivery to allow for its administration. However, with careful planning in collaboration with the schools, administration at school but outside of class time may have been a possibility.

A separate form of bias, response bias, may also have occurred in this study. Self-perception bias, where participants respond according to inaccurate perceptions of themselves was previously discussed. A related form of bias is social desirability bias,



where a participant will respond according to a perceived socially desirable response. An example in the current study may be a male adolescent who thinks that experiencing fear during the earthquake is a sign of weakness and therefore responds that he experienced no fear. Measures to detect socially desirable responding are available (e.g. Paulhus, 1991; Balanced Inventory of Desirable Responding). However, a decision was made not to include such measures in the questionnaire, since they would have increased the total amount of items, and this may have resulted in other reliability issues such as invalid responding or lower completion rates. Additionally, the items of the social desirability measures did not address the specific type of biased responding that may have occurred with adolescents for the measures used in this study. Another form of response bias is acquiescence bias which is the tendency for a participant to agree with items (Watson, 1992). The measures used in this study are vulnerable to acquiescence bias since they do not contain reversed items which require the participant to disagree with an item measuring a similar construct. Two validation questions were built into the questionnaire in order to detect responding which occurred in a positive direction where the respondent had obviously not properly read or understood the question. These strategies may have reduced acquiescence bias, since respondents would have become aware that not all items are measured in the same direction. However, these items would probably not have been able to mitigate acquiescence bias completely, because there were only two of them throughout the questionnaire. The inclusion of reverse scored items in measures of both PTSD and resilience would be the most effective method of reducing acquiescence bias.

Self-report questionnaires were the only method of data collection used for this study. Self-report questionnaires are susceptible to the response biases described above. In

addition, they have been criticised for providing too narrow a perspective of the area being studied (Denzin & Lincoln, 2003). While clinical interviews may be criticised for the same reasons; they have the advantage that the respondent can ask to have questions clarified if required, and the interviewer can verify responses by asking confirmation questions. Furthermore, a clinical diagnosis of PTSD requires a face to face interview by a trained clinician. The use of face to face clinical interviews would have been beneficial to confirm the accuracy of questionnaire data. Qualitative methods may have allowed further depth of inquiry which may have resulted in new understandings and theories (Denzin & Lincoln, 1994). For example, a grounded theory approach would have allowed hypothesis to be generated from data gained through unstructured interviews with adolescents and this may have resulted in new questions and theories that have not yet been considered (Carey, 2012). A mixed methods design (Cohen & Manion, 2000), where both quantitative and qualitative methodologies are used, may have strengthened the findings of this study. Unfortunately the resources required for this exceeded those available to the study.

No validation studies had been carried out for any of the measures with adolescents in New Zealand and as such, no pre-disaster norms exist for the New Zealand adolescent population. This meant that post-disaster scores found for this sample could not be compared to pre-disaster scores for New Zealand adolescents. This could be remedied by conducting well designed pre-disaster validation studies of PTSD and resilience measures with adolescents in New Zealand. An alternative method to address the limitation of comparison data in this study would have been to select a comparison sample made up of adolescents from other areas in New Zealand that had not been exposed to the earthquakes. This was considered during study design, but a decision was made to concentrate resources

on maximising the size of the sample of adolescents in Christchurch. This allowed the robust application of parametric statistics to test hypotheses, and also to maximise the reach to adolescents who had high levels of PTSD and might request psychosocial support. While the measures used had not been validated with New Zealand adolescents, sufficiently thorough validation studies for the three primary measures had been conducted with adolescents in other countries. These studies indicated sound psychometric properties and provided adequate comparison data. Although validation studies had been conducted for the three primary scales, two of the scales, the Fear and Trauma Exposure scales had been adapted from measures used in previous studies. As such, the adapted versions did not have existing evidence of reliability or validity. This was also true for the Psychosocial Support scale which had been developed for the purposes of this study. Although these scales demonstrated adequate inter-item correlation in the present study, the absence of previous validation studies limits the confidence that can be placed in their findings. Some of the limitations discussed above highlight areas requiring further research. These suggestions are now discussed.

### **Directions for future research**

Four specific directions for future research are suggested. These are the implementation of a longitudinal study, the validation of measurement scales, further investigation of gender difference, and the evaluation of interventions.

A longitudinal study which further investigates the constructs related to PTSD and resilience in this population of adolescents is crucial in order to gain a more thorough understanding of the mechanisms by which the constructs operate. Longitudinal

investigation could elicit important information about the trajectory of psychopathology and resilience factors. Investigating the trajectory over time is not possible with a cross sectional study. The causative processes that act on variables can be determined by tracking change in the relationship between variables over time. The conclusions drawn from such longitudinal research will provide knowledge that can be applied both locally and globally to ensure better outcomes for adolescents after disaster. Longitudinal investigations of this nature have recently been called for by various authors in the disaster field (Kaniasty & Norris, 2009; Furr et al., 2010).

In general, the measures used in this study showed evidence of adequate reliability and validity with this sample of New Zealand adolescents. The READ was an exception where the lack of correlation between four of its subscales and PTSD brought its predictive validity into question. Validation studies of these measures with New Zealand adolescents in non-disaster areas are therefore imperative. This would reiterate the reliability and validity of such measures, and would also provide pre-disaster base rates that would improve the accuracy of screening post-disaster. Validation studies such as these require a significant amount of resource; however, it could be argued that the potential benefits outweigh the costs.

The difference in reactions found between male and female adolescents in this study corresponds with previous research. However, more research in this area is likely to uncover new knowledge about the mechanisms of post traumatic reactions in both females and males. Further research into constructs such as fear in response to trauma exposure, will allow conclusions to be drawn about causal and protective factors in males and females. The rapidly evolving genetic and bio-psychological research fields continue to

contribute knowledge of the genetic and brain-based factors that may account for the difference in post-traumatic reactions between males and females. These findings could also illuminate the different cognitive mechanisms that need to be targeted for male or female PTSD intervention.

In the wake of a major disaster, when severe psychological effects of the trauma may be extensive, there can be a tendency to implement any available psychological intervention with the precept that any intervention is better than no intervention. At these times the Hippocratic dictum should be applied: "first do no harm". Certain post-disaster interventions that have been widely implemented in the past have later been found to have had negative effects on those who received them (Rose, Bisson, Churchill & Wessely, 2002). It is therefore essential that interventions be designed according to sound psychological theories, be reviewed and critiqued by other experts, and be evaluated in pilot groups before wider scale implementation occurs. Once implementation has occurred, there is a need for ongoing evaluation, and this evaluation should be built into the implementation strategy. Several interventions built on sound psychological theories have been applied to adolescent populations after disaster and have had positive outcome evaluations in other countries. These include but are not limited to Psychological first aid (Kantor & Beckert, 2011), Control Focused Behaviour therapy (Başoğlu & Şalcioğlu, 2011), Trauma Focused Cognitive Behavioural Therapy (Cohen et al., 2010), the Erase Stress Programme (Berger & Gelkopf, 2009) and Mindfulness Based Stress Reduction for Teens (Biegl, Brown, Shapiro, & Schubert, 2009).

## **Conclusion**

The findings of this study suggest that the Canterbury earthquakes have had a

substantial psychological impact on the adolescents who experienced them. This is evident from the fact that 24% of the sample reported clinically significant PTSD symptoms, and 42% reported some impairment in daily functioning because of PTSD symptoms. Resilience is evident from the absence of significant PTSD symptoms in the majority of the sample, and the extent to which self-reported resilience factors were endorsed. Perceptions of ability to cope with adversity as measured by the CD-RISC-10, and perceptions of personal competence as measured by the READ, hold promise as factors of resilience which may protect against PTSD. The robust relationship found between fear and PTSD symptoms suggests that fear experienced during earthquakes acts as a mechanism in the development of PTSD, making it an appealing target for further research and intervention. Likewise, the correlation of trauma exposure with PTSD suggests that the degree of trauma an adolescent has been exposed to during and after earthquakes, plays a critical role in the development of PTSD. It was clearly evident that females experienced higher levels of PTSD symptoms than males in this sample. This was also true for levels of fear experienced during the earthquakes. These findings add to the extant literature on gender differences in relation to the psychological impact of trauma. Findings relating to psychosocial support accessed by the sample suggest the important role that friends and caregivers play in supporting adolescents suffering with PTSD symptoms. Furthermore, findings of accessed psychosocial support revealed that a minority of those with clinically significant PTSD symptoms accessed formal counselling support. Education for natural supporters such as friends and caregivers is necessary, and the normalisation of professional support is also important.

This study contributes new knowledge related to a specific segment of the

population, who are at a critical stage of life development and have been exposed to a significant and unique disaster. Knowledge gained from this study is applicable to intervention that aims at relieving psychological distress not only of Christchurch adolescents, but also of other adolescents who experience disaster. This study highlights directions for future research and provides information for effective intervention.

## References

- Abbott, P. L. (2009). *Natural disasters / Patrick L. Abbott*: Dubuque, IA : McGraw-Hill, 2009  
7th ed.
- Abrahams, M. J., Price, J., Whitlock, F. A., & Williams, G. (1976). The Brisbane floods,  
January 1974: their impact on health. *Medical Journal of Australia*, 2(25-26), 936-939.
- Adler, A. (1943). Neuropsychiatric complications in victims of Boston's Coconut Grove  
disaster. *Journal of the American Medical Association*, 123, 1098-1101. doi:  
10.1001/jama.1943.02840520014004
- Ahmad, S., Feder, A., Lee, E. J., Wang, Y., Southwick, S. M., Schlackman, E., . . . Charney,  
D. S. (2010). Earthquake impact in a remote South Asian population: Psychosocial  
factors and posttraumatic symptoms. *Journal of Traumatic Stress*, 23(3), 408-412.
- Aiken, L. S. (1991). *Multiple regression : testing and interpreting interactions*. Newbury Park,  
Calif.: Sage Publications.
- American Psychiatric Association. (1952). *Diagnostic and statistical manual of mental  
disorders* (1st ed.). Washington, DC: Author: American Psychiatric Association.
- American Psychiatric Association. (1968). *Diagnostic and statistical manual of mental  
disorders* (2nd ed.). Washington, DC: Author: American Psychiatric Association.
- American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental  
disorders* (3rd ed.). Washington, DC: Author: American Psychiatric Association.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental  
disorders* (4th ed.,text rev.). Washington, DC: Author.
- Anders, C. J. (2012). From Irritable Heart to Shellshock, How Post-Traumatic Stress  
Became a Disease *History*. Retrieved June 21, 2012, from [www.io9.com](http://www.io9.com)
- Anthony, J. L., Lonigan, C. J., Vernberg, E. M., La Greca, A. M., Silverman, W. K., &  
Prinstein, M. J. (2005). Multisample Cross-Validation of a Model of Childhood  
Posttraumatic Stress Disorder Symptomatology. *Journal of Traumatic Stress*, 18(6),  
667-676. doi: 10.1002/jts.20075
- Aron, A. (2011). *Statistics for the behavioral and social sciences : a brief course* (5th ed ed.).  
Upper Saddle River, NJ: Prentice Hall/Pearson.



- Baker, M., Stabile, M., & Deri, C. (2004). What do self-reported, objective, measures of health measure? *The Journal of Human Resources*, 39(4), 1067-1093. doi: 10.2307/3559039
- Bandura, A. (1991). Social cognitive theory of moral thought and action. In W. M. Kurtines & J. L. Gewirtz (Eds.), *Handbook of moral behavior and development, Vol. 1: Theory; Vol. 2: Research; Vol. 3: Application*. (pp. 45-103). Hillsdale, NJ England: Lawrence Erlbaum Associates, Inc.
- Bandura, A. (2012). Social cognitive theory. In P. A. M. Van Lange, A. W. Kruglanski & E. T. Higgins (Eds.), *Handbook of theories of social psychology (Vol 1)*. (pp. 349-373). Thousand Oaks, CA: Sage Publications Ltd.
- Başoğlu, M., Kiliç, C., Şalcioğlu, E., & Livanou, M. (2004). Prevalence of Posttraumatic Stress Disorder and Comorbid Depression in Earthquake Survivors in Turkey: An Epidemiological Study. *Journal of Traumatic Stress*, 17(2), 133-141. doi: 10.1023/B:JOTS.0000022619.31615.e8
- Basoglu, M., & Salcioglu, E. (2011). A Mental Healthcare Model for Mass Trauma Survivors : Control-Focused Behavioral Treatment of Earthquake, War and Torture Trauma Retrieved from <http://MASSEY.ebib.com.au/patron/FullRecord.aspx?p=674632>
- Başoğlu, M., Şalcioğlu, E., & Livanou, M. (2007). A randomized controlled study of single-session behavioural treatment of earthquake-related post-traumatic stress disorder using an earthquake simulator. *Psychological medicine*, 37(2), 203-213. doi: 10.1017/s0033291706009123
- Belus, J., Brown-Bowers, A., & Monson, C. (2012). Thinking About Your Thoughts: Investigating Different Cognitive Change Strategies. *Current Psychology*, 31(4), 423-432. doi: 10.1007/s12144-012-9155-0
- Benight, C. C., & Bandura, A. (2004). Social cognitive theory of posttraumatic recovery: The role of perceived self-efficacy. *Behaviour Research and Therapy*, 42(10), 1129-1148. doi: 10.1016/j.brat.2003.08.008
- Benight, C. C., Cieslak, R., & Waldrep, E. E. (2009). Theoretical frameworks for understanding mental health consequences of disasters. In Y. Neria, S. Galea & F. H. Norris (Eds.), *Mental health and disasters* (pp. xvi, 624 p. :). Cambridge ; New York: Cambridge University Press.

- Benight, C. C., Swift, E., Sanger, J., Smith, A., & Zeppelin, D. (1999). Coping self-efficacy as a mediator of distress following a natural disaster. *Journal of Applied Social Psychology, 29*(12), 2443-2464. doi: 10.1111/j.1559-1816.1999.tb00120.x
- Bennet, A. (2011, March 2). EQC 'could deal with another big one'. *The New Zealand Herald*. Retrieved from <http://www.nzherald.co.nz>
- Bensimon, M. (2012). Elaboration on the association between trauma, PTSD and posttraumatic growth: The role of trait resilience. *Personality and Individual Differences, 52*(7), 782-787. doi: 10.1016/j.paid.2012.01.011
- 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*(6), 364-371. doi: 10.1159/000235976
- Biegel, G. M., Brown, K. W., Shapiro, S. L., & Schubert, C. M. (2009). Mindfulness-Based Stress Reduction for the Treatment of Adolescent Psychiatric Outpatients: A Randomized Clinical Trial. *Journal of Consulting and Clinical Psychology, 77*(5), 855-866.
- Bloch, D. A., Silber, E., & Perry, S. E. (1956). Some factors in the emotional reaction of children to disaster. *The American Journal of Psychiatry, 113*, 416-422.
- Bonanno, G. A. (2012). Uses and abuses of the resilience construct: Loss, trauma, and health-related adversities. *Social Science & Medicine, 74*(5), 753-756. doi: 10.1016/j.socscimed.2011.11.022
- Bonanno, G. A., Brewin, C. R., Kaniasty, K., & La Greca, A. M. (2010). Weighing the costs of disaster: Consequences, risks, and resilience in individuals, families, and communities. *Psychological Science in the Public Interest, 11*(1), 1-49. doi: 10.1177/1529100610387086
- Bonanno, G. A., & Gupta, S. (2009). Resilience after disaster. In Y. Neria, S. Galea & F. H. Norris (Eds.), *Mental Health and Disasters*. New York: Cambridge University Press.
- Borden, K., & Cutter, S. (2008). Spatial patterns of natural hazards mortality in the United States. *International Journal of Health Geographics, 7*(1), 64.
- Braga, L. L., Fiks, J. P., Mari, J. J., & Mello, M. F. (2008). The importance of the concepts of disaster, catastrophe, violence, trauma and barbarism in defining posttraumatic stress disorder in clinical practice. *BMC Psychiatry, 8*. doi: 10.1186/1471-244x-8-68
- Brett, E. A. (2007). The Classification of Posttraumatic Stress Disorder. In B. A. van der

- Kolk, A. C. McFarlane & L. Weisaeth (Eds.), *Traumatic Stress: the effects of overwhelming experience on mind, body, and society* (pp. 117-128). New York: The Guilford Press.
- Bronfenbrenner, U., & Crouter, A. C. (1983). The evolution of environmental models in developmental research In P. H. Mussen (Ed.), *Handbook of child psychology* (4th ed.). New York: Wiley.
- Bronk, K. C. (2011). Neuropsychology of adolescent development (12 to 18 years old). In A. S. Davis (Ed.), *Handbook of pediatric neuropsychology*. (pp. 47-57). New York, NY US: Springer Publishing Co.
- Brown, E. J. (2005). Correlates and treatment of stress disorder in children and adolescents. *Psychiatric Annals*, 35(9), 759-765.
- Bruwer, B., Emsley, R., Kidd, M., Lochner, C., & Seedat, S. (2008). Psychometric properties of the Multidimensional Scale of Perceived Social Support in youth. *Comprehensive Psychiatry*, 49(2), 195-201. doi: 10.1016/j.comppsy.2007.09.002
- Bryant, R. A. (2003). Early predictors of posttraumatic stress disorder. *Biological Psychiatry*, 53(9), 789-795. doi: 10.1016/s0006-3223(02)01895-4
- Burns, R. A., Anstey, K. J., & Windsor, T. D. (2011). Subjective well-being mediates the effects of resilience and mastery on depression and anxiety in a large community sample of young and middle-aged adults. *Australian and New Zealand Journal of Psychiatry*, 45(3), 240-248. doi: 10.3109/00048674.2010.529604
- Campbell-Sills, L., Cohan, S. L., & Stein, M. B. (2006). Relationship of resilience to personality, coping, and psychiatric symptoms in young adults. *Behaviour Research and Therapy*, 44(4), 585-599. doi: 10.1016/j.brat.2005.05.001
- Campbell-Sills, L., Forde, D. R., & Stein, M. B. (2009). Demographic and childhood environmental predictors of resilience in a community sample. *Journal of Psychiatric Research*, 43(12), 1007-1012. doi: 10.1016/j.jpsychires.2009.01.013
- Campbell-Sills, L., & Stein, M. (2007). Psychometric analysis and refinement of the Connor-Davidson Resilience Scale (CD-RISC): validation of a 10-item measure of resilience. *Journal of Traumatic Stress*, 20, 1019-1028.
- Campbell-Sills, L., & Stein, M. B. (2007). Psychometric analysis and refinement of the Connor-Davidson Resilience Scale (CD-RISC): Validation of a 10-item measure of resilience. *Journal of Traumatic Stress*, 20(6), 1019-1028. doi: 10.1002/jts.20271

- Campbell, H. (2011). Technically it's just an aftershock, *New Zealand Herald*. Retrieved from <http://www.nzherald.co.nz>
- Carey, M. A. (2012). Review of 'Essentials of accessible grounded theory' and 'Grounded theory: A practical guide'. *Qualitative Health Research*, 22(10), 1444-1445. doi: 10.1177/1049732312456303
- Catani, C., Jacob, N., Schauer, E., Kohila, M., & Neuner, F. (2008). Family violence, war, and natural disasters: A study of the effect of extreme stress on children's mental health in Sri Lanka. *BMC Psychiatry*, 8. doi: 10.1186/1471-244x-8-33
- Christensen, L. B. (2011). *Research methods, design, and analysis* (11th ed ed.). Boston, MA: Allyn & Bacon/Pearson.
- Church, J. S. (1974). The Buffalo Creek disaster: Extent and range of emotional and/or behavioral problems. *Omega: Journal of Death and Dying*, 5(1), 61-63. doi: 10.2190/thab-gj8f-grrm-l6k1
- Cicchetti, D., & Garmezy, N. (1993). Milestones in the development of resilience. . *Development and Psychopathology*, 5(4), 497-774.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed ed.). Hillsdale, N.J.: L. Erlbaum Associates.
- Cohen, J. A., Mannarino, A. P., & Deblinger, E. (2010). Trauma-focused cognitive-behavioral therapy for traumatized children. In J. R. Weisz & A. E. Kazdin (Eds.), *Evidence-based psychotherapies for children and adolescents* (2nd ed.). (pp. 295-311). New York, NY US: Guilford Press.
- Cohen, P. (2011). Early life and the development of resilience. *The Canadian Journal of Psychiatry / La Revue canadienne de psychiatrie*, 56(8), 445-446.
- Comer, J. S., & Kendall, P. C. (2007). Terrorism: The Psychological Impact on Youth. *Clinical Psychology: Science and Practice*, 14(3), 179-212. doi: 10.1111/j.1468-2850.2007.00078.x
- Connor, K. M., & Davidson, J. R. T. (2003). Development of a new resilience scale: The Connor-Davidson Resilience Scale (CD-RISC). *Depression and Anxiety*, 18(2), 76-82. doi: 10.1002/da.10113
- Connor, K. M., Vaishnavi, S., Davidson, J. R. T., Sheehan, D. V., & Sheehan, K. H. (2007). Perceived stress in anxiety disorders and the general population: A study of the Sheehan Stress Vulnerability Scale. *Psychiatry Research*, 151(3), 249-254. doi:

- Costello, E. J., Mustillo, S., Erkanli, A., Keeler, G., & Angold, A. (2003). Prevalence and Development of Psychiatric Disorders in Childhood and Adolescence. *Archives of General Psychiatry*, 60(8), 837-844. doi: 10.1001/archpsyc.60.8.837
- Davidson, J. R. T. (2011). *Overview: Connor-Davidson Resilience Scale*. Unpublished Manual for the Connor-Davidson Resilience Scale.
- Dayton-Johnson, J. (2004). Natural Disasters and Adaptive Capacity. *OECD Development Centre*, 1-38. Retrieved from www.oecd.org website:
- Dell'Osso, L., Carmassi, C., Massimetti, G., Conversano, C., Daneluzzo, E., Riccardi, I., . . . Rossi, A. (2011). Impact of traumatic loss on post-traumatic spectrum symptoms in high school students after the L'Aquila 2009 earthquake in Italy. *Journal of Affective Disorders*, 134(1-3), 59-64. doi: 10.1016/j.jad.2011.06.025
- Denzin, N. K., & Lincoln, Y. S. (Eds.). (2003). *The landscape of qualitative research : theories and issues* (2nd ed ed.). Thousand Oaks, Calif.: Sage.
- Ederer, E. (1989). Friendship relations and social-environmental activities in male and female early adolescents. *Psychologische Beitrage*, 31(1-2), 234-245.
- Ehrlich, K. B., Dykas, M. J., & Cassidy, J. (2012). Tipping points in adolescent adjustment: Predicting social functioning from adolescents' conflict with parents and friends. *Journal of Family Psychology*, 26(5), 776-783. doi: 10.1037/a0029868
- Ekşi, A., Braun, K. L., Ertem-Vehid, H., Peykerli, G., Saydam, R., Toparlak, D., & Alyanak, B. (2007). Risk factors for the development of PTSD and depression among child and adolescent victims following a 7.4 magnitude earthquake. *International Journal of Psychiatry in Clinical Practice*, 11(3), 190-199. doi: 10.1080/13651500601017548
- Engel, G. L. (1977). The need for a new medical model: a challenge for biomedicine. *Science*(196), 129-136.
- Erikson, K. T. (1976). Loss of communality at Buffalo Creek. *The American Journal of Psychiatry*, 133(3), 302-305.
- Esquivel, G. B., Doll, B., & Oades-Sese, G. V. (2011). Introduction to the special issue: Resilience in schools. [10.1002/pits.20585]. *Psychology in the Schools*, 48(7), 649-651.
- Fincham, D. S., Altes, L. K., Stein, D. J., & Seedat, S. (2009). Posttraumatic stress disorder symptoms in adolescents: risk factors versus resilience moderation. *Comprehensive Psychiatry*, 50(3), 193-199. doi: 10.1016/j.comppsy.2008.09.001

- Fink, H. F. (1968). Development arrest as a result of Nazi persecution during adolescence. *The International Journal of Psychoanalysis*, 49(2-3), 327-329.
- Foa, E. B., Cashman, L., Jaycox, L., & Perry, K. (1997). The validation of a self-report measure of posttraumatic stress disorder: The Posttraumatic Diagnostic Scale. *Psychological Assessment*, 9(4), 445.
- Foa, E. B., Johnson, K. M., Feeny, N. C., & Treadwell, K. R. H. (2001). The Child PTSD Symptom Scale: A preliminary examination of its psychometric properties. *Journal of Clinical Child Psychology*, 30(3), 376-384. doi: 10.1207/s15374424jccp3003\_9
- Frazier, P. A., Tix, A. P., & Barron, K. E. (2004). Testing Moderator and Mediator Effects in Counseling Psychology Research. *Journal of Counseling Psychology*, 51(1), 115-134. doi: 10.1037/0022-0167.51.1.115
- Friborg, O., Hjemdal, O., Rosenvinge, J. H., & Martinussen, M. (2003). A new rating scale for adult resilience: what are the central protective resources behind healthy adjustment? *International Journal of Methods in Psychiatric Research*, 12(2), 65-76. doi: 10.1002/mpr.143
- Friborg, O., Hjemdal, O., Rosenvinge, J. H., Martinussen, M., Aslaksen, P. M., & Flaten, M. A. (2006). Resilience as a moderator of pain and stress. *Journal of Psychosomatic Research*, 61(2), 213-219. doi: http://dx.doi.org/10.1016/j.jpsychores.2005.12.007
- Furr, J. M., Comer, J. S., Edmunds, J. M., & Kendall, P. C. (2010). Disasters and youth: A meta-analytic examination of posttraumatic stress. *Journal of Consulting and Clinical Psychology*, 78(6), 765-780. doi: 10.1037/a0021482  
10.1037/a0021482.supp (Supplemental)
- Galli, G., Wolpe, N., & Otten, L. J. (2011). Sex differences in the use of anticipatory brain activity to encode emotional events. *The Journal of Neuroscience*, 31(34), 12364-12370. doi: 10.1523/jneurosci.1619-11.2011
- Garnezy, N. (1971). Vulnerability research and the issue of primary prevention. *American Journal of Orthopsychiatry*, 41(1), 101-116. doi: 10.1111/j.1939-0025.1971.tb01111.x
- Garnezy, N., & Streitman, S. (1974). Children at risk: the search for the antecedents of schizophrenia. Part I. Conceptual models and research methods. *Schizophr Bull*(8), 14-90.

- Gerull, F. C., & Rapee, R. M. (2002). Mother knows best: effects of maternal modelling on the acquisition of fear and avoidance behaviour in toddlers. *Behaviour Research and Therapy*, 40(3), 279-287. doi: [http://dx.doi.org/10.1016/S0005-7967\(01\)00013-4](http://dx.doi.org/10.1016/S0005-7967(01)00013-4)
- Glenn, C. M. (1979). Natural disasters and human behavior: Explanation, research, and models. *Psychology: A Journal of Human Behavior*, 16(2), 23-36.
- Gleser, G. C., Green, B. L., & Winget, C. N. (1978). Quantifying interview data on psychic impairment of disaster survivors. *Journal of Nervous and Mental Disease*, 166(3), 209-216. doi: 10.1097/00005053-197803000-00007
- GNS Science. (2011). *New Zealand Earthquakes*. Retrieved from <http://www.gns.cri.nz/Home/Learning/Science-Topics/Earthquakes/New-Zealand-Earthquakes>
- Goenjian, A. K., Roussos, A., Steinberg, A. M., Sotiropoulou, C., Walling, D., Kakaki, M., & Karagianni, S. (2011). Longitudinal study of PTSD, depression, and quality of life among adolescents after the Parnitha earthquake. *Journal of Affective Disorders*, 133(3), 509-515. doi: 10.1016/j.jad.2011.04.053
- Goenjian, A. K., Walling, D., Steinberg, A. M., Karayan, I., Najarian, L. M., & Pynoos, R. (2005). A prospective study of posttraumatic stress and depressive reactions among treated and untreated adolescents 5 years after a catastrophic disaster. *Am J Psychiatry*, 162(12), 2302-2308. doi: 10.1176/appi.ajp.162.12.2302
- Gorrese, A., & Ruggieri, R. (2012). Peer attachment: A meta-analytic review of gender and age differences and associations with parent attachment. *Journal of Youth and Adolescence*, 41(5), 650-672. doi: 10.1007/s10964-012-9759-6
- Gough, H. R., Wilks, S. E., & Prattini, R. J. (2010). Spirituality among Alzheimer's caregivers: Psychometric reevaluation of the Intrinsic Spirituality Scale. *Journal of Social Service Research*, 36(4), 278-288. doi: 10.1080/01488376.2010.493848
- Green, B., & Solomon, S. (1995). The mental health impact of natural and technological disasters. In J. Freedy & S. Hobfoll (Eds.), *Traumatic Stress: From Theory to Practice* (pp. 163-180). New York: Plenum.
- Green, B. L. (1990). Defining Trauma: Terminology and generic stressor dimensions. *Journal of Applied Social Psychology*, 20, 1632-1642.

- Green, B. L., Grace, M. C., Lindy, J. D., & Gleser, G. C. (1990). Buffalo Creek survivors in the second decade: Comparison with unexposed and nonlitigant groups. *Journal of Applied Social Psychology, 20*(13, Pt 1), 1033-1050. doi: 10.1111/j.1559-1816.1990.tb00388.x
- Green, B. L., & Solomon, S. D. (1995). The mental health impact of natural and technological disasters. In J. R. Freedy & S. E. Hobfoll (Eds.), *Traumatic stress: From theory to practice*. (pp. 163-180). New York, NY US: Plenum Press.
- Haen, C. (2011). Boys and therapy: The need for creative reformulation. In C. Haen (Ed.), *Engaging boys in treatment: Creative approaches to the therapy process*. (Vol. 9, pp. 3-40). New York, NY US: Routledge/Taylor & Francis Group.
- Harper, D. (2001). Online Etymology Dictionary. Retrieved from <http://www.etymonline.com>
- Hartevelt, J. (2011, June 15). June 13 earthquakes: Morale, costs get a shake-up, *Stuff.co.nz*. Retrieved from <http://www.stuff.co.nz>
- Hawkins, S. S., & Radcliffe, J. (2006). Current Measures of PTSD for Children and Adolescents. *Journal of Pediatric Psychology, 31*(4), 420-430. doi: 10.1093/jpepsy/jsj039
- Hetzel-Riggin, M. D., & Roby, R. P. (2013). Trauma type and gender effects on PTSD, general distress, and peritraumatic dissociation. *Journal of Loss and Trauma, 18*(1), 41-53. doi: 10.1080/15325024.2012.679119
- Hirschel, M. J., & Schulenberg, S. E. (2009). Hurricane Katrina's impact on the Mississippi Gulf Coast: General self-efficacy's relationship to PTSD prevalence and severity. *Psychological Services, 6*(4), 293-303. doi: 10.1037/a0017467
- Hizli, F. G., Taskintuna, N., Isikli, S., Kilic, C., & Zileli, L. (2009). Predictors of posttraumatic stress in children and adolescents. *Children and Youth Services Review, 31*(3), 349-354. doi: 10.1016/j.childyouth.2008.08.008
- Hjemdal, O., Friborg, O., Braun, S., Kempnaers, C., Linkowski, P., & Fossion, P. (2011). The Resilience Scale for Adults: Construct Validity and Measurement in a Belgian Sample. *International Journal of Testing, 11*(1), 53-70. doi: 10.1080/15305058.2010.508570



- Hjemdal, O., Friborg, O., Stiles, T. C., Martinussen, M., & Rosenvinge, J. H. (2006). A new scale for adolescent resilience: grasping the central protective resources behind healthy development. *Measurement and Evaluation in Counseling and Development*(39), 84–96.
- Hoaglin, D. C., & Iglewicz, B. (1987). Fine tuning some resistant rules for outlier labeling. *Journal of American Statistical Association*, 82, 1147-1149.
- Horowitz, M. J., Wilner, N., & Alvarez, W. (1979). Impact of Event Scale: A measure of subjective stress. *Psychosomatic Medicine*, 41(3), 209-218.
- Howell, D. C. (2004). *Fundamental statistics for the behavioral sciences*. Belmont, CA: Thomson-Brooks/Cole.
- International Federation of Red Cross and Red Crescent Societies. (2010). *World Disasters Report 2010: Focus on urban risk*. Retrieved from [www.ifrc.org/Global/Publications/disasters/WDR/WDR2010-full.pdf](http://www.ifrc.org/Global/Publications/disasters/WDR/WDR2010-full.pdf)
- Jorgensen, I. E., & Seedat, S. (2008). Factor structure of the Connor-Davidson Resilience Scale in South African adolescents. *International Journal of Adolescent Medicine and Health*, 20, 23-32.
- Jørgensen, I. E., & Seedat, S. (2008). Factor structure of the Connor-Davidson Resilience Scale in South African adolescents. *International Journal of Adolescent Medicine and Health*, 20(1), 23-32. doi: 10.1515/ijamh.2008.20.1.23
- Kam, W. Y., & Pampanin, S. (2011). *General building performance in the Christchurch CBD: a contextual report*. Christchurch: University of Canterbury.
- Kaniasty, K. (2006). Sense of mastery as a moderator of longer-term effects of disaster impact on psychological distress. In J. Strelau & T. Klonowicz (Eds.), *People under extreme stress*. Hauppauge, New York: Nova Science Publishers.
- Kaniasty, K., & Norris, F. H. (2009). Distinctions that matter: received social support, perceived social support, and social embeddedness after disasters. In Y. Neria, S. Galea & F. H. Norris (Eds.), *Mental Health and Disasters*. New York: Cambridge University Press.
- Kantor, E. M., & Beckert, D. R. (2011). Psychological first aid. In F. J. Stoddard, Jr., A. Pandya & C. L. Katz (Eds.), *Disaster psychiatry: Readiness, evaluation, and treatment*. (pp. 203-212). Arlington, VA US: American Psychiatric Publishing, Inc.

- Karairmak, O. (2010). Establishing the psychometric qualities of the Connor-Davidson Resilience Scale (CD-RISC) using exploratory and confirmatory factor analysis in a trauma survivor sample. *Psychiatry Research*, *179*, 350-356.
- Kay, M. (2011, March 2). Christchurch earthquake ACC bill \$370m., *Stuff.co.nz*. Retrieved from <http://www.stuff.co.nz/national/christchurch-earthquake/4722701/Christchurch-earthquake-ACC-bill-370m>
- Kessler, R. C., Avenevoli, S., McLaughlin, K. A., Green, J. G., Lakoma, M. D., Petukhova, M., . . . Merikangas, K. R. (2012). Lifetime co-morbidity of DSM-IV disorders in the US National Comorbidity Survey Replication Adolescent Supplement (NCS-A). *Psychological medicine*, *42*(9), 1997-2010. doi: 10.1017/s0033291712000025
- Kessler, R. C., Chiu, W. T., Demler, O., & Walters, E. E. (2005). Prevalence, Severity, and Comorbidity of 12-Month DSM-IV Disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry*, *62*(6), 617-627. doi: 10.1001/archpsyc.62.6.617
- Kessler, R. C., McLaughlin, K. A., Koenen, K. C., Petukhova, M., & Hill, E. D. (2012). The importance of secondary trauma exposure for post-disaster mental disorder. *Epidemiology and Psychiatric Sciences*, *21*(1), 35-45. doi: 10.1017/s2045796011000758
- Khoshouei, M. S. (2009). Psychometric evaluation of the Connor-Davidson Resilience Scale (CD-RISC) using Iranian students. *International Journal of Testing*, *9*, 60-66.
- Kohrt, B., Jordans, M., Tol, W., Luitel, N., Maharjan, S., & Upadhaya, N. (2011). Validation of cross-cultural child mental health and psychosocial research instruments: adapting the Depression Self-Rating Scale and Child PTSD Symptom Scale in Nepal. *BMC Psychiatry*, *11*(1), 127.
- Kordich Hall, D. (2010). *Compendium of selected resilience and related measures for children and youth*. Reaching In...Reaching Out. The Child and Family Partnership. Toronto.
- Kumpfer, K. L. (1999). Factors and processes contributing to resilience: The resilience framework. In M. D. Glantz & J. R. Johnson (Eds.), *Resilience and development: Positive life adaptations*. (pp. 179-225). New York: Plenum.
- Kypri, K., Chalmers, D. J., & Langley, J. D. (2002). Adolescent injury mortality in New Zealand and opportunities for prevention. *International Journal of Adolescent Medicine and Health*, *14*(1), 27-41.

- La Greca, A. M., Silverman, W. K., Vernberg, E. M., & Prinstein, M. J. (1996). Symptoms of posttraumatic stress in children after Hurricane Andrew: A prospective study. *Journal of Consulting and Clinical Psychology, 64*(4), 712-723. doi: 10.1037/0022-006x.64.4.712
- Lambert, J. E., Benight, C. C., Harrison, E., & Cieslak, R. (2012). The Firefighter Coping Self-Efficacy Scale: Measure development and validation. *Anxiety, Stress & Coping: An International Journal, 25*(1), 79-91. doi: 10.1080/10615806.2011.567328
- Lebron-Milad, K., Abbs, B., Milad, M., Linnman, C., Rougemont-Bucking, A., Zeidan, M., Goldstein, J. (2012). Sex differences in the neurobiology of fear conditioning and extinction: a preliminary fMRI study of shared sex differences with stress-arousal circuitry. *Biology of Mood & Anxiety Disorders, 2*(1), 7.
- Little, R. J. A. (1987). *Statistical analysis with missing data*. New York: Wiley.
- Liu, M., Wang, L., Shi, Z., Zhang, Z., Zhang, K., & Shen, J. (2011). Mental health problems among children one-year after Sichuan earthquake in China: A follow-up study. *PLoS ONE, 6*(2). doi: 10.1371/journal.pone.0014706
- Loughnan, S., Leidner, B., Doron, G., Haslam, N., Kashima, Y., Tong, J., & Yeung, V. (2010). Universal biases in self-perception: Better and more human than average. *British Journal of Social Psychology, 49*(3), 627-636. doi: 10.1348/014466610x487779
- Luthar, S. S., Cicchetti, D., & Becker, B. (2000). The construct of resilience: A critical evaluation and guidelines for future Work. *Child Development, 71*(3), 543-562. doi: 10.1111/1467-8624.00164
- Mahan, A. L., & Ressler, K. J. (2012). Fear conditioning, synaptic plasticity and the amygdala: Implications for posttraumatic stress disorder. *Trends in Neurosciences, 35*(1), 24-35. doi: 10.1016/j.tins.2011.06.007
- Maier, S. F. (2001). Exposure to the stressor environment prevents the temporal dissipation of behavioral depression/learned helplessness. *Biological Psychiatry, 49*(9), 763-773. doi: 10.1016/s0006-3223(00)01095-7
- Maren, S. (2005). Building and Burying Fear Memories in the Brain. *The Neuroscientist, 11*(1), 89-99. doi: 10.1177/1073858404269232
- Marshall, R. D., Bryant, R. A., Amsel, L., Suh, E. J., Cook, J. M., & Neria, Y. (2007). The psychology of ongoing threat: Relative risk appraisal, the September 11 attacks, and terrorism-related fears. *American Psychologist, 62*(4), 304-316.

- Masten, A. S. (2011). Resilience in children threatened by extreme adversity: Frameworks for research, practice, and translational synergy. *Development and Psychopathology*, 23(2), 493-506. doi: 10.1017/s0954579411000198
- Masten, A. S., Herbers, J. E., Cutuli, J. J., & Lafort, T. L. (2008). Promoting competence and resilience in the school context. *Professional School Counseling*, 12(2), 76-84. doi: 10.5330/PSC.n.2010-12.76
- Masten, A. S., Monn, A. R., & Supkoff, L. M. (2011). Resilience in children and adolescents. In S. M. Southwick, B. T. Litz, D. S. Charney & M. J. Friedman (Eds.), *Resilience and Mental Health: Challenges Across the Lifespan*. Cambridge, UK: Cambridge University Press.
- McDermott, B. M., Cobham, V. E., Berry, H., & Stallman, H. M. (2010). Vulnerability factors for disaster-induced child post-traumatic stress disorder: The case for low family resilience and previous mental illness. *Australian and New Zealand Journal of Psychiatry*, 44(4), 384-389. doi: 10.3109/00048670903489916
- McFarlane, A. C., & De Girolamo, G. (2007). The Nature of Stressors and the Epidemiology of Posttraumatic Reactions. In B. A. van der Kolk, A. C. McFarlane & L. Weisaeth (Eds.), *Traumatic Stress: the effects of overwhelming experience on mind, body, and society* (pp. 129-154). New York: The Guilford Press.
- McFarlane, A. C., & Norris, F. H. (2006). Definitions and Concepts in Disaster Research. In F. H. Norris, S. Galea, M. J. Friedman & P. J. Watson (Eds.), *Methods for disaster mental health research*. (pp. 3-19). New York, NY US: Guilford Press.
- McFarlane, A. C., Van Hooff, M., & Goodhew, F. (2009). Anxiety disorders and PTSD. In Y. Neria, S. Galea & F. H. Norris (Eds.), *Mental Health and Disasters*. New York: Cambridge University Press.
- McFarlane, A. C., & Yehuda, R. A. (1996). Resilience, vulnerability, and the course of posttraumatic reactions. In B. A. van der Kolk, A. C. McFarlane & L. Weisaeth (Eds.), *Traumatic stress: The effects of overwhelming experience on mind, body, and society*. (pp. 155-181). New York, NY US: Guilford Press.
- Melick, M. E. (1978). Self-reported effects of a natural disaster on the health and well-being of working class males. *Crisis Intervention*, 9(1), 12-31.

- Mestre, M. V., Samper, P., Frías, M. D., & Tur, A. M. (2009). Are women more empathetic than men? A longitudinal study in adolescence. *The Spanish Journal of Psychology*, *12*(1), 76-83.
- Miles, J., & Banyard, P. (2007). *Understanding and using statistics in psychology : a practical introduction : or, how I came to know and love the standard error*. Los Angeles ; London: Sage.
- Miller, T. W., & Kraus, R. F. (1994). Natural and environmental disasters: Psychological issues and clinical responses. *Integrative Psychiatry*, *10*(3), 128-132.
- Milne, G. (1977). Cyclone Tracy: II. The effects on Darwin children. *Australian Psychologist*, *12*(1), 55-62. doi: 10.1080/00050067708255860
- Morey, R. A., Petty, C. M., Cooper, D. A., LaBar, K. S., & McCarthy, G. (2008). Neural systems for executive and emotional processing are modulated by symptoms of posttraumatic stress disorder in Iraq War veterans. *Psychiatry Research: Neuroimaging*, *162*(1), 59-72. doi: 10.1016/j.psychresns.2007.07.007
- Morgado, A., Raoux, N., Smith, M., Allilaire, J. F., & Widlöcher, D. (1989). Subjective bias in reports of poor work adjustment in depressed patients. *Acta Psychiatrica Scandinavica*, *80*(6), 541-547. doi: 10.1111/j.1600-0447.1989.tb03023.x
- Mueller-Pfeiffer, C., Martin-Soelch, C., Blair, J. R., Carnier, A., Kaiser, N., Rufer, M., . . . Hasler, G. (2010). Impact of emotion on cognition in trauma survivors: What is the role of posttraumatic stress disorder? *Journal of Affective Disorders*, *126*(1-2), 287-292. doi: 10.1016/j.jad.2010.03.006
- Murphy, S. (1986). Perceptions of stress, coping and recovery one and three years after a natural disaster. *Issues in Mental Health Nursing*(8), 63-77.
- Narayan, A. J., & Masten, A. S. (2012). Children and adolescents in disaster, war, and terrorism: Developmental pathways to psychopathology and resilience. In C. S. Widom (Ed.), *Trauma, psychopathology, and violence: Causes, consequences, or correlates?* (pp. 131-160). New York, NY US: Oxford University Press.
- Nemeroff, C. B., Bremner, J. D., Foa, E. B., Mayberg, H. S., North, C. S., & Stein, M. B. (2006). Posttraumatic stress disorder: A state-of-the-science review. *Journal of Psychiatric Research*, *40*(1), 1-21. doi: 10.1016/j.jpsychires.2005.07.005
- Neria, Y., Galea, S., & Norris, F. H. (Eds.). (2009). *Mental health and disasters*. Cambridge ; New York: Cambridge University Press.

- Neria, Y., Nandi, A., & Galea, S. (2008). Post-traumatic stress disorder following disasters: A systematic review. *Psychological Medicine: A Journal of Research in Psychiatry and the Allied Sciences*, 38(4), 467-480. doi: 10.1017/s0033291707001353
- New Zealand Ministry of Education. (2012). Retrieved from <http://www.minedu.govt.nz/Parents/AllAges/EducationInNZ/SchoolsInNewZealand/SchoolDecileRatings>
- New Zealand Ministry of Health. (2009). *Suicide facts: Deaths and intentional self-harm hospitalisations 2010*. Retrieved from <http://www.health.govt.nz/publication/suicide-facts-deaths-and-intentional-self-harm-hospitalisations-2010>
- Newman, C. J. (1976). Children of disaster: Clinical observations at Buffalo Creek. *The American Journal of Psychiatry*, 133(3), 306-312.
- Norris, F. H. (2006a). Disaster Research Methods: Past Progress and Future Directions. *Journal of Traumatic Stress*, 19(2), 173-184. doi: 10.1002/jts.20109
- Norris, F. H. (2006b). *Methods for disaster mental health research*. New York: The Guilford Press.
- Norris, F. H., Friedman, M. J., & Watson, P. J. (2002 b). 60,000 disaster victims speak: Part II. Summary and implications of the disaster mental health research. *Psychiatry: Interpersonal and Biological Processes*, 65(3), 240-260. doi:10.1521/psyc.65.3.240.20169
- Norris, F. H., Friedman, M. J., Watson, P. J., Byrne, C. M., Diaz, E., & Kaniasty, K. (2002 a). 60,000 disaster victims speak: Part I. An empirical review of the empirical literature, 1981-2001. *Psychiatry: Interpersonal and Biological Processes*, 65(3), 207-239. doi: 10.1521/psyc.65.3.207.20173
- Orsini, C. A., & Maren, S. (2012). Neural and cellular mechanisms of fear and extinction memory formation. *Neuroscience and Biobehavioral Reviews*, 36(7), 1773-1802. doi: 10.1016/j.neubiorev.2011.12.014
- Pallant, J. (2007). *SPSS survival manual : a step by step guide to data analysis using SPSS for Windows (Version 15)* (3rd ed ed.). Crows Nest, N.S.W.: Allen & Unwin.
- Pallant, J. F. (2011). *SPSS Survival Manual* (4th ed ed.). Crows Nest, NSW: Allen & Unwin.
- Parker, G. (1977). Cyclone Tracy and Darwin evacuees: On the restoration of the species. *The British Journal of Psychiatry*, 130, 548-555. doi: 10.1192/bjp.130.6.548

- Paulhus, D. L. (1991). Measurement and control of response bias. In J. P. Robinson, P. R. Shaver & L. S. Wrightsman (Eds.), *Measures of personality and social psychological attitudes* (pp. 17-59). San Diego, CA, US: Academic Press.
- Penick, E. C., Powell, B. J., & Sieck, W. A. (1976). Mental health problems and natural disaster: Tornado victims. *Journal of Community Psychology, 4*(1), 64-67. doi: 10.1002/1520-6629(197601)4:1<64::aid-jcop2290040103>3.0.co;2-0
- Phillips, B. D. (2005). Disaster as a Discipline: The Status of Emergency Management Education in the U.S. *International Journal of Mass Emergencies and Disasters, 23*(1), 111-140.
- Pietrzak, R. H., Johnson, D. C., Goldstein, M. B., Malley, J. C., & Southwick, S. M. (2009). Psychological resilience and postdeployment social support protect against traumatic stress and depressive symptoms in soldiers returning from Operations Enduring Freedom and Iraqi Freedom. *Depression and Anxiety, 26*(8), 745-751. doi: 10.1002/da.20558
- Price, J. M., & Zwolinski, J. (2010). The nature of child and adolescent vulnerability: History and definitions. In R. E. Ingram & J. M. Price (Eds.), *Vulnerability to psychopathology: risk across the lifespan (2nd ed.)*. (pp. 18-38). New York, NY US: Guilford Press.
- Pronin, E. (2007). Perception and misperception of bias in human judgment. *Trends in cognitive sciences, 11*(1), 37-43.
- Pynoos Rs, F. C. N. K., & et al. (1987). Life threat and posttraumatic stress in school-age children. *Archives of General Psychiatry, 44*(12), 1057-1063. doi: 10.1001/archpsyc.1987.01800240031005
- Pynoos, R. S., Steinberg, A. M., & Goenjian, A. (2007). Traumatic Stress in Childhood and Adolescence: Recent Developments and Current Controversies. In B. A. van der Kolk, A. C. McFarlane & L. Weisaeth (Eds.), *Traumatic Stress: the overwhelming experience on mind, body and society*. New York: The Guilford Press.
- Quarantelli, E. L. (1954). The nature and conditions of panic. *American Journal of Sociology, 60*, 267-275. doi: 10.1086/221536
- Quinn, P. (2003). *Earthquakes : feeling the Earth move / [writer: Pat Quinn]*: Wellington, N.Z. : Learning Media, 2003.

- Rachamim, L., Helpman, L., Foa, E. B., Aderka, I. M., & Gilboa-Schechtman, E. (2011). Validation of the child posttraumatic symptom scale in a sample of treatment-seeking Israeli youth. *Journal of Traumatic Stress, 24*(3), 356-360. doi: 10.1002/jts.20639
- Rachman, S., & Levitt, K. (1988). Panic, fear reduction and habituation. *Behaviour Research and Therapy, 26*(3), 199-206. doi: [http://dx.doi.org/10.1016/0005-7967\(88\)90001-0](http://dx.doi.org/10.1016/0005-7967(88)90001-0)
- Rangell, L. (1976). Discussion of the Buffalo Creek disaster: The course of psychic trauma. *The American Journal of Psychiatry, 133*(3), 313-316.
- Rasch, D., & Guiard, V. (2004). The robustness of parametric statistical methods. *Psychology Science, 46*(2), 175-208.
- Roberts, S. Resilience as a protective factor against the development of PTSD symptoms following combat exposure in OIF/OEF veterans. Poster presentation, Veterans Affairs HSR&D National Meeting, 2007.
- Rubonis, A. V., & Bickman, L. (1991). Psychological impairment in the wake of disaster: The disaster-psychopathology relationship. *Psychological Bulletin, 109*(3), 384-399. doi: 10.1037/0033-2909.109.3.384
- Rutter, M. (1990). Psychosocial resilience and protective mechanisms. In J. E. Rolf, A. S. Masten, D. Cicchetti, K. H. Nuechterlein & S. Weintraub (Eds.), *Risk and protective factors in the development of psychopathology*. (pp. 181-214). New York, NY US: Cambridge University Press.
- Rutter, M. (2012). Achievements and challenges in the biology of environmental effects. *PNAS Proceedings of the National Academy of Sciences of the United States of America, 109*(Suppl 2), 17149-17153. doi: 10.1073/pnas.1121258109
- Saigh, P. A., Yasik, A. E., Oberfield, R., & Halamandaris, P. V. (2008). The self-concept of traumatized children and adolescents with or without PTSD. *Behaviour Research and Therapy, 46*(10), 1181-1186. doi: 10.1016/j.brat.2008.05.003
- Şalcioğlu, E., Başoğlu, M., & Livanou, M. (2007). Effects of live exposure on symptoms of posttraumatic stress disorder: The role of reduced behavioral avoidance in improvement. *Behaviour Research and Therapy, 45*(10), 2268-2279. doi: 10.1016/j.brat.2007.04.012



- Sammis, C. G., & Sornette, D. (2002). Positive feedback, memory, and the predictability of earthquakes. *Proceedings of the National Academy of Sciences of the United States of America*, 99(Suppl 1), 2501-2508. doi: 10.1073/pnas.012580999
- Sapp, M. (2005). *Basic psychological measurement, research designs, and statistics without math*. Springfield, Ill.: Charles C. Thomas Publishers.
- Scali, J., Gandubert, C., Ritchie, K., Soulier, M., Ancelin, M.-L., & Chaudieu, I. (2012). Measuring resilience in adult women using the 10-items Connor-Davidson Resilience Scale (CD-RISC). Role of trauma exposure and anxiety disorders. *PLoS ONE*, 7(6). doi: 10.1371/journal.pone.0039879
- Schlenger, W. E., & Silver, R. C. (2006). Web-Based Methods in Disaster Research. In F. H. Norris, S. Galea, M. J. Friedman & P. J. Watson (Eds.), *Methods for Disaster Mental Health Research*. New York: The Guilford Press.
- Science, G. (2011). New Zealand Earthquakes. Retrieved 25 August 2012, from <http://www.gns.cri.nz/Home/Learning/Science-Topics/Earthquakes/New-Zealand-Earthquakes>
- Seligman, M. E. P., & Maier, S. F. (1976). Failure to escape traumatic shock. *Journal of Experimental Psychology* (74), 1-9.
- Shader, R. I., & Schwartz, A. J. (1966). Management of reactions to disaster. *Social Work*, 11(2), 99-104.
- Shalev, A. Y. (2007). Stress versus Traumatic Stress From Acute Homeostatic Reactions to Chronic Psychopathology. In B. A. van der Kolk, A. C. McFarlane & L. Weisaeth (Eds.), *Traumatic Stress: the effects of overwhelming experience on mind, body, and society* (pp. 77-101). New York: The Guilford Press.
- Sharry, J., & Owens, C. (2000). 'The rules of engagement': A case study of a group with 'angry' adolescents. *Clinical Child Psychology and Psychiatry*, 5(1), 53-62. doi: 10.1177/1359104500005001006
- Simenauer, E. (1968). Late psychic sequelae of man-made disasters. *The International Journal of Psychoanalysis*, 49(2-3), 306-309.
- Smid, G. E., van der Velden, P. G., Gersons, B. P. R., & Kleber, R. J. (2012). Late-onset posttraumatic stress disorder following a disaster: A longitudinal study. *Psychological Trauma: Theory, Research, Practice, and Policy*, 4(3), 312-322. doi: 10.1037/a0023868

- Smith, B., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The brief resilience scale: Assessing the ability to bounce back. *International Journal of Behavioral Medicine, 15*(3), 194-200. doi: 10.1080/10705500802222972
- Soest, T., Mossige, S., Stefansen, K., & Hjemdal, O. (2010). A validation study of the resilience scale for adolescents (READ). *Journal of Psychopathology and Behavioral Assessment, 32*(2), 215-225. doi: 10.1007/s10862-009-9149-x
- Spring, M., Westermeyer, J., Halcon, L., Savik, K., Robertson, C., Johnson, D. R., . . . Jaranson, J. (2003). Sampling in difficult to access refugee and immigrant communities. *Journal of Nervous and Mental Disease, 191*(12), 813-819. doi: 10.1097/01.nmd.0000100925.24561.8f
- Stanovich, K. E., West, R. F., & Toplak, M. E. (2012). Judgment and decision making in adolescence: Separating intelligence from rationality. In V. F. Reyna, S. B. Chapman, M. R. Dougherty & J. Confrey (Eds.), *The adolescent brain: Learning, reasoning, and decision making*. (pp. 337-378). Washington, DC US: American Psychological Association.
- Staub, E., & Vollhardt, J. (2008). Altruism Born of Suffering: The Roots of Caring and Helping After Victimization and Other Trauma. *American Journal of Orthopsychiatry, 78*(3), 267-280.
- Stein, S., & Wysession, M. (2003). *An introduction to seismology, earthquakes, and earth structure*. Malden, MA: Blackwell Publishers.
- Steinberg, A. M., Brymer, M. J., Steinberg, J. R., & Pfefferbaum, B. (2006). Conducting Research with Children and Adolescents after Disaster. In F. H. Norris, S. Galea, M. J. Friedman & P. J. Watson (Eds.), *Methods for Disaster Mental Health Research*. New York: The Guilford Press.
- Streiner, D. L., & Norman, G. R. (2006). "Precision" and "Accuracy": Two terms that are neither. *Journal of Clinical Epidemiology, 59*(4), 327-330. doi: <http://dx.doi.org/10.1016/j.jclinepi.2005.09.005>
- Stroebe, M. S., Schut, H., & Van den Bout, J. (Eds.). (2013). *Complicated grief: scientific foundations for health care professionals*. Hove, East Sussex New York: Routledge.
- SurveyGizmo. (Computer Software). Retrieved 2011 <http://www.surveygizmo.com>
- Tabachnick, B. G., & Fidell, L. S. (2012). *Using multivariate statistics* (6th ed.). Boston: Pearson Education.

- Tarter, R. E., & Vanyukov, M. (1999). Re-visiting the validity of the construct of resilience. In M. D. Glantz & J. R. Johnson (Eds.), *Resilience and development: Positive life adaptations*. (pp. 85-100). New York: Plenum.
- Tedeschi, R. G., Calhoun, L. G., & Cann, A. (2007). Evaluating Resource Gain: Understanding and Misunderstanding Posttraumatic Growth. *Applied Psychology, 56*(3), 396-406. doi: 10.1111/j.1464-0597.2007.00299.x
- Titchener, J. L., & Kapp, F. T. (1976). Family and character change at Buffalo Creek. *The American Journal of Psychiatry, 133*(3), 295-299.
- Tolan, P. T. (1996). How resilient is the concept of resilience? *The Community Psychologist, 29*, 12-15.
- Tolin, D. F., & Foa, E. B. (2008). Sex differences in trauma and posttraumatic stress disorder: A quantitative review of 25 years of research. *Psychological Trauma: Theory, Research, Practice, and Policy, 5*(1), 37-85. doi: 10.1037/1942-9681.s.1.37
- Tukey, J. W. (1977). *Exploratory Data Analysis*. Reading, MA: Addison-Wesley.
- Ungar, M., & Liebenberg, L. (2011). Assessing resilience across cultures using mixed methods: Construction of the Child and Youth Resilience Measure. *Journal of Mixed Methods Research, 5*(2), 126-149. doi: 10.1177/1558689811400607
- Ursano, R. J., Fullerton, C. S., & Benedek, D. M. (2009). What is psychopathology after disasters? Considerations about the nature of the psychological and behavioural consequences of disasters. In Y. Neria, S. Galea & F. H. Norris (Eds.), *Mental Health and Disasters*. New York: Cambridge University Press.
- Van Beynen, M. (2010, September 11). The day of reckoning; amazing response, *The Christchurch Press*. Retrieved from <http://innz.natlib.govt.nz/>
- van der Kolk, B. A., McFarlane, A. C., & Weisaeth, L. (1996). *Traumatic stress: The effects of overwhelming experience on mind, body, and society*. New York, NY US: Guilford Press.
- Vande Kemp, H. (2003). Alexandra Adler, 1901-2001. *The Feminist Psychologist (Society for the Psychology of Women), 30*(2). Retrieved from
- Wagnild, G. M., & Collins, J. A. (2009). Assessing resilience. *Journal of Psychosocial Nursing and Mental Health Services, 47*(12), 28-33. doi: 10.3928/02793695-20091103-01
- Wagnild, G. M., & Young, H. M. (1993). Development and psychometric evaluation of the Resilience Scale. *Journal of Nursing Measurement, 1*(2), 165-178.

- Wang, L., Zhang, Y., Wang, W., Shi, Z., Shen, J., Li, M., & Xin, Y. (2009). Symptoms of posttraumatic stress disorder among adult survivors three months after the Sichuan earthquake in China. *Journal of Traumatic Stress, 22*(5), 444-450. doi: 10.1002/jts.20439
- Wang, M., Elhai, J. D., Dai, X., & Yao, S. (2012). Longitudinal invariance of posttraumatic stress disorder symptoms in adolescent earthquake survivors. *Journal of Anxiety Disorders, 26*(2), 263-270. doi: 10.1016/j.janxdis.2011.12.009
- Wang, P. S., Aguilar-Gaxiola, S., Alonso, J., Lee, S., Schoenbaum, M., Üstün, T. B., . . . Tsang, A. (2011). Assessing mental disorders and service use across countries: The WHO World Mental Health Survey Initiative. In D. A. Regier, W. E. Narrow, E. A. Kuhl & D. J. Kupfer (Eds.), *The conceptual evolution of DSM-5*. (pp. 231-266). Arlington, VA US: American Psychiatric Publishing, Inc.
- Wang, P. S., Lane, M., Olfson, M., Pincus, H. A., Wells, K. B., & Kessler, R. C. (2005). Twelve-Month Use of Mental Health Services in the United States: Results From the National Comorbidity Survey Replication. *Archives of General Psychiatry, 62*(6), 629-640. doi: 10.1001/archpsyc.62.6.629
- Watson, D. (1991). Correcting for acquiescent response bias in the absence of a balanced scale an application to class consciousness. *Sociological Methods & Research, 21*(1), 55-88. doi: doi: 10.1177/0049124192021001003
- Werner, E. E. (1989). High-risk children in young adulthood: A longitudinal study from birth to 32 years. *American Journal of Orthopsychiatry, 59*(1), 72-81. doi: 10.1111/j.1939-0025.1989.tb01636.x
- Werner, E. E., & Smith, R. S. (1982). *Vulnerable but invincible: a longitudinal study of resilient children and youth*. New York: McGraw-Hill.
- Werner, E. E., & Smith, R. S. (2001). *Journeys from childhood to midlife: Risk, resilience, and recovery*. Ithaca, NY US: Cornell University Press.
- Wingo, A. P., Wrenn, G., Pelletier, T., Gutman, A. R., Bradley, B., & Ressler, K. J. (2010). Moderating effects of resilience on depression in individuals with a history of childhood abuse or trauma exposure. *Journal of Affective Disorders, 126*(3), 411-414. doi: 10.1016/j.jad.2010.04.009

- Wrenn, G. L., Wingo, A. P., Moore, R., Pelletier, T., Gutman, A. R., Bradley, B., & Ressler, K. J. (2011). The effect of resilience on posttraumatic stress disorder in trauma-exposed inner-city primary care patients. *Journal of the National Medical Association, 103*(7), 560-566.
- Wright, M. O. D., Masten, A. S., & Narayan, A. J. (2013). Resilience processes in development: Four waves of research on positive adaptation in the context of adversity. In S. Goldstein & R. B. Brooks (Eds.), *Handbook of resilience in children (2nd ed.)*. (pp. 15-37). New York, NY US: Springer Science + Business Media.
- Xu, J., & Liao, Q. (2011). Prevalence and predictors of posttraumatic growth among adult survivors one year following 2008 Sichuan earthquake. *Journal of Affective Disorders, 133*(1-2), 274-280. doi: 10.1016/j.jad.2011.03.034
- Yelland, C., Robinson, P., Lock, C., La Greca, A. M., Kokegei, B., Ridgway, & Lai, B. (2010). Bushfire impact on youth *Journal of Traumatic Stress, 23*, 274-277.
- Yu, X.-n., Lau, J. T. F., Mak, W. W. S., Zhang, J., & Lui, W. W. S. (2011). Factor structure and psychometric properties of the Connor-Davidson Resilience Scale among Chinese adolescents. *Comprehensive Psychiatry, 52*(2), 218-224. doi: 10.1016/j.comppsy.2010.05.010
- Yu, X.-n., Lau, J. T. F., Zhang, J., Mak, W. W. S., Choi, K. C., Lui, W. W. S., & Chan, E. Y. Y. (2010). Posttraumatic growth and reduced suicidal ideation among adolescents at month 1 after the Sichuan Earthquake. *Journal of Affective Disorders, 123*(1-3), 327-331. doi: 10.1016/j.jad.2009.09.019
- Yule, W. (1992). Resilience and vulnerability in child survivors of disasters. In B. Tizard & V. P. Varma (Eds.), *Vulnerability and resilience in human development: A festschrift for Ann and Alan Clarke*. (pp. 182-198). London England: Jessica Kingsley Publishers.
- Zahradnik, M., Stewart, S. H., O'Connor, R. M., Stevens, D., Ungar, M., & Wekerle, C. (2010). Resilience moderates the relationship between exposure to violence and posttraumatic reexperiencing in Mi'kmaq youth. *International Journal of Mental Health and Addiction, 8*(2), 408-420. doi: 10.1007/s11469-009-9228-y
- Zheng, Y., Fan, F., Liu, X., & Mo, L. (2012). Life events, coping, and posttraumatic stress symptoms among Chinese adolescents exposed to 2008 Wenchuan earthquake, China. *PLoS ONE, 7*(1). doi: 10.1371/journal.pone.0029404

Zimmerman, D. W., & Zumbo, B. D. (1992). The relative power of parametric and non-parametric tests. In G. Keren & C. Lewis (Eds.), *A Handbook for Data Analysis in the Behavioral Sciences*:

## Appendix A

### Tables of Results

Table A1.

#### Demographics of Sample

Demographic Variable	<i>n</i>	Percent
Gender		
Male	252	48.0%
Female	273	52.0%
Age		
13	77	5.2%
14	104	20.6%
15	125	24.4%
16	93	18.4%
17	76	15.0%
18 and older	30	5.9%
School		
Hillmorton High School	356	67.7%
Christchurch Girls' High School	63	12.0%
Christchurch Boys' High School	45	8.6%
Linwood College	27	5.2%
Aranui High School	20	3.8%
Unlimited Paenga Tawhiti	14	2.7%
Ethnicity		
New Zealand European	384	78.0%
Asian	34	6.5%
Maori	31	5.7%
Asian	26	5.1%
Pacific Island	24	4.5%
Other	26	5.1%
25 km from epicentre		
September 4	465	90.6%
February 22	474	92.4%
June 13	486	94.7%
In City Centre February 22	80	15.6%

*Note.*  $N=525$ . Age:  $M = 15.2$ ;  $SD = 1.48$

Table A2.

## Endorsement of Trauma Exposure Scale Items by Males, Females and Total Sample

Item	Males	Females	Total Sample	$\chi^2$
Building you were in collapsed	2.6%	2.3%	2.4%	0.64
Trapped in a building or under rubble	0.9%	0.8%	0.8%	0.16
Injury to self	11.0%	12.1%	11.6%	0.04
Witnessed injury of others	24.0%	26.5%	25.4%	0.04
Injury of family members	10.7%	18.2%	14.7%	6.17*
Death of acquaintance	24.8%	38.8%	32.2%	4.06*
Death of family member	1.7%	2.7%	2.2%	3.24
House slightly damaged	67.8%	65.8%	72.0%	0.16
House severely damaged	4.2%	6.5%	5.3%	1.44
Had to move out of house	7.8%	11.7%	9.9%	3.24

Note.  $N = 509$ , males  $n = 245$ , females  $n = 255$ .  $\chi^2 =$  Chi-squared goodness of fit analysis for difference in male and female proportions of trauma exposure scale items. Proportion of males and females in sample used as criterion for expected frequencies. \* $p < 0.05$ .

Table A3.

## Endorsement of Psychosocial Support Scale Items for Males, Females and Total Sample

Item	Males	Females	Total Sample	$\chi^2$
Spoken to School Counsellor	8.4	14.2	11.5	0.01
Spoken to another Counsellor	4.2	5.6	4.9	1.54
Spoken to Parent/Caregiver	35.7	45.3	40.8	2.10
Spoken to Friends/Family	31.5	53.0	42.9	0.01
Know relaxation techniques	46.6	45.3	45.9	8.40*
Interested in learning relaxation techniques	24.6	33.1	29.1	1.54

Note.  $N = 509$ , males  $n = 245$ , females  $n = 255$ . Chi-squared goodness of fit analysis for difference in male and female proportions of psychosocial support accessed. Proportion of male and female mean PTSD score used for expected frequencies. \* $p < 0.05$



Table A4.

## Endorsement of Fear Scale Items for Males, Females and Total Sample

Item	Males	Females	Total Sample	$\chi^2$
Any of the Earthquakes				
Medium Fear	27.7%	25.4%	26.5%	0.4
Strong Fear	29.9%	33.0%	27.1%	0.1
Extreme Fear/Terror	5.2%	14.8%	10.3%	19.4**
Recent aftershock				
Medium Fear	15.0%	25.6%	21.5%	5.8*
Strong Fear	8.3%	21.2%	15.8%	16.0**
Extreme Fear/Terror	0.4%	3.8%	2.2%	59.4**

Note.  $N = 509$ , males  $n = 245$ , females  $n = 255$ .  $\chi^2$  = Chi-squared goodness of fit analysis for difference in male and female proportions. Proportion of males and females in sample used as criterion for expected frequencies. \* $p < 0.05$ , \*\* $p < 0.001$ .

Table A5.

## Pearson Product-Moment Correlation for Primary Measures

Measure	1	1a	1b	1c	2	3	4	4a	4b	4c	4d	4e	5	6	7
1. CPSS	-														
1a. Re-experiencing Subscale (CPSS)	.90**	-													
1b. Arousal Subscale (CPSS)	.90**	.73**	-												
1c. Avoidance Subscale (CPSS)	.92**	.76**	.71**	-											
2. Functional Impairment	.61**	.52**	.54**	.58**	-										
3. CD-RISC 10	-.32	-.29**	-.27**	-.31	-.28**	-									
4. READ TOTAL	-.11*	-.03	-.11*	-.14*	-.21**	.65**	-								
4a. Personal Competence Subscale (READ)	-.21**	-.17*	-.18**	-.21*	-.21**	.65**	.74**	-							
4b. Structured Style Subscale (READ)	.08	.09*	.07	.05	-.06	.42**	.62**	.50**	-						
4c. Family Cohesion) Subscale READ	-.08	.01	-.11*	-.09*	-.19**	.45**	.85**	.48**	.39**	-					
4d. Social Resources Subscale (READ)	-.03	.01	-.02	-.08	-.15**	.39**	.67**	.37**	.35**	.50**	-				
4e. Social Competence Subscale (READ)	-.07	.01	-.08	-.17**	-.11*	.55**	.71**	.52**	.29	.46**	.39**	-			
5. Trauma Exp.	.34*	.32**	.31**	.30**	.26**	-.18**	-.71	.06	.00	-.10*	-.05	.02	-		
6. Fear Scale	.57**	.60**	.51**	.47**	.30**	-.19**	.10*	.08	.15**	.90*	.16*	.05	.32**	-	
7. Psychosocial Support Scale	.30**	.32**	.29**	.22**	.19**	.04	.14**	.01	.08	.17	.19**	.25	.12**	.31**	- -

Note.  $n = 496 - 513$ . CPSS=Child Post-traumatic Symptom Scale; CD-RISC 10 = Connor-Davidson 10-item Resilience Scale; READ = Resilience Scale for Adolescents. \*  $p < .05$  \*\* $p < .01$  (2- tailed)

# Appendix B

## Questionnaire



### Earthquake Questionnaire

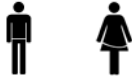
There are 84 questions in total. It takes most people between 15 and 25 minutes to complete.

Please read each question carefully and answer honestly. There is no right or wrong answer.

#### Personal Information

1. Age .....

2. Gender (Circle one)



3. School: .....

4. Year at school (Circle one) Yr 9 Yr10 Yr11 Yr12 Yr13

5. What ethnic group do you most identify with (Tick one)

NZ European/Pakeha

Maori

Pacific Island

Other (Please state) .....

6. Were you within 25 km of Christchurch during the September 4<sup>th</sup> earthquake (the first one)?

YES / NO (Circle one)

7. Were you within 25 km of Christchurch during the February 22<sup>nd</sup> earthquake (the second big one)

YES / NO

8. Were you in the Christchurch city centre during the February 22<sup>nd</sup> earthquake?

YES / NO

9. Were you within 25 km of Christchurch during the June 13<sup>th</sup> (Monday) aftershocks?

YES / NO

### (Child Posttraumatic Stress Scale, CPSS)

Below is a list of problems that people sometimes have after experiencing an earthquake. Read each one carefully and circle the number that best describes how often that problem has bothered you **IN THE LAST 2 WEEKS**.

---

1. Having upsetting thoughts or images about the earthquake that came into your head when you didn't want them to

*(How often in last 2 weeks?)*

0	1	2	3
Not at all	Once in a while	Half the time	Almost Always

---

2. Having bad dreams or nightmares

*(How often in last 2 weeks?)*

0	1	2	3
Not at all	Once in a while	Half the time	Almost Always

---

3. Acting or feeling as if the earthquake was happening again (hearing something or seeing a picture about it and feeling as if you are there again)

*(How often in last 2 weeks?)*

0	1	2	3
Not at all	Once in a while	Half the time	Almost Always

---

4. Feeling upset when you think about it or hear about the earthquake (for example, feeling scared, angry, sad, guilty, etc)

*(How often in last 2 weeks?)*

0	1	2	3
Not at all	Once in a while	Half the time	Almost Always

---

5. Having feelings in your body when you think about or hear about the earthquake (for example, breaking out into a sweat, heart beating fast)

*(How often in last 2 weeks?)*

0	1	2	3
Not at all	Once in a while	Half the time	Almost Always

---

6. Trying not to think about, talk about, or have feelings about the earthquake

*(How often in last 2 weeks?)*

0	1	2	3
Not at all	Once in a while	Half the time	Almost Always

---

7. Trying to avoid activities, people, or places that remind you of the earthquake

*(How often in last 2 weeks?)*

0	1	2	3
Not at all	Once in a while	Half the time	Almost Always

---

8. Not being able to remember an important part of the earthquake

*(How often in last 2 weeks?)*

0	1	2	3
Not at all	Once in a while	Half the time	Almost Always

---

9.	Having much less interest in doing things you used to do ( <i>How often in last 2 weeks?</i> )			
	0	1	2	3
	Not at all	Once in a while	Half the time	Almost Always
10.	Not feeling close to people around you ( <i>How often in last 2 weeks?</i> )			
	0	1	2	3
	Not at all	Once in a while	Half the time	Almost Always
11.	Not being able to have strong feelings (for example, being unable to cry or unable to feel happy) ( <i>How often in last 2 weeks?</i> )			
	0	1	2	3
	Not at all	Once in a while	Half the time	Almost Always
12.	Feeling as if your future plans or hopes will not come true (for example, you will not have a job or get married or have kids) ( <i>How often in last 2 weeks?</i> )			
	0	1	2	3
	Not at all	Once in a while	Half the time	Almost Always
13.	Having trouble falling or staying asleep ( <i>How often in last 2 weeks?</i> )			
	0	1	2	3
	Not at all	Once in a while	Half the time	Almost Always
14.	Feeling irritable or having fits of anger ( <i>How often in last 2 weeks?</i> )			
	0	1	2	3
	Not at all	Once in a while	Half the time	Almost Always
	<b>(validity question)</b>			
15.	Being completely mute (not being able to speak at all) ( <i>How often in last 2 weeks?</i> )			
	0	1	2	3
	Not at all	Once in a while	Half the time	Almost Always
16.	Having trouble concentrating (for example, losing track of a story on the television, forgetting what you read, not paying attention in class) ( <i>How often in last 2 weeks?</i> )			
	0	1	2	3
	Not at all	Once in a while	Half the time	Almost Always
17.	Being overly careful (for example, checking to see who is around you and what is around you) ( <i>How often in last 2 weeks?</i> )			
	0	1	2	3
	Not at all	Once in a while	Half the time	Almost Always
18.	Being jumpy or easily startled (for example, when someone walks up behind you) ( <i>How often in last 2 weeks?</i> )			
	0	1	2	3
	Not at all	Once in a while	Half the time	Almost Always

**(Functional Impairment Scale)**

Indicate below if the problems you related in Part 1 have gotten in the way of any of the following areas of your life DURING THE PAST 2 WEEKS

	Yes	No	
19.	Y	N	Chores and duties at home
20.	Y	N	Relationships with friends
21.	Y	N	Fun and out of school-time activities
22.	Y	N	Doing your prayers
23.	Y	N	Schoolwork
24.	Y	N	Relationships with your family
25.	Y	N	General happiness with your life

**(Resilience Scale for Adolescents; READ)**

The next questions are about your life in general.

For each item please mark an “x” in the box that best indicates how true the following statements have been for you over the last month. There are no right or wrong answers, just what’s true for you.

		Not True at all	Rarely True	Sometimes true	Often True	True nearly all the time
1.	(Structured Style item 1) I am at my best when I have clear aims and objectives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	(Social Resources item 1) I have some friends/family members that usually encourage me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	(Family Cohesion item 1) In my family we share views of what is important in life	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	(Social Competence item 1) I easily make others feel comfortable around me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	(Personal Competence item 1) I know how to reach my goals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	(Structured Style item 2) I always make a plan before I start something new	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

		Not True at all	Rarely True	Sometimes True	Often True	True nearly all the time
7.	(Social Resources item 2) My friends always stick together	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	(Family Cohesion item 2) I feel comfortable with my family	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	(Social Competence item 2) I easily find new friends	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.	(Personal Competence item 2) When it is impossible for me to change certain things I stop worrying about them	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.	(Structured Style item 3) I am good at organizing my time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.	(Social Resources item 3) I have some close friends/ family members that really care about me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.	(Family Cohesion Item 3) In my family we agree on most things	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14.	(Personal Competence item 3) I feel competent (able to do most things)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.	(Social Resources item 4) I always have someone that can help me when I need it	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16.	(Personal Competence item 4) When I have to choose between several options I almost always know what will be right for me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17.	(Family Cohesion item 4) My family view the future as positive, even when very sad things happen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18.	(Social Competence item 3) I always find something fun to talk about	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19.	(Family Cohesion item 5) In my family we support each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20.	(Social Competence item 4) I always find something comforting to say to others when they are sad	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.	(Personal Competence item 5) When things go badly I have a tendency to find something good that can come out of it	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22.	(Family Cohesion item 6) In my family we like to do things together	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23.	(Social Resources item 5) I have some close friends/family members that value my qualities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**(Connor-Davidson 10-item Resilience Scale, CD-RISC 10)**

		Not True at all	Rarely True	Sometimes true	Often True	True nearly all the time
1.	I am able to adapt when changes occur.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	I can deal with whatever comes my way.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	Having to cope with stress can make me stonger.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	I tend to bounce back after illness, injury, or other hardships.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	I believe I can achieve my goals, even if there are obstacles.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	Under pressure, I stay focused and think clearly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	I am not easily discouraged by failure.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	(validity question) I have not smiled once since I was born	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	I think of myself as a strong person when dealing with life's challenges and difficulties.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.	I am able to handle unpleasant or painful feelings like sadness, fear, and anger.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



**(Psychosocial Support Scale)**

**Support for Earthquake Related Stress**

**1. If the school counselor wanted to check-in with you about this survey, would that be ok with you?** Yes / No (this will only happen if survey shows that support might be useful for you)

**2. What support have you had since the earthquake?**

Spoken to School Counsellor about my earthquake related stress Yes / No

Spoken to a Telephone Counselor about my earthquake related stress Yes / No

Spoken to another Counselor about my earthquake related stress Yes / No

Spoken to my Parent or Caregiver about my earthquake related stress. Yes / No

Spoken to my Friends or other family members about my earthquake related stress Yes / No

I have felt NO stress since the earthquake and did not need support  
Yes / No

**3. Do you know any relaxation skills or exercises that help you when you are stressed?**  
Yes / No

**4. Are you interested in learning relaxation techniques (such as breathing and body awareness) that can help you when you are stressed?**  
Yes / No

**Please write your name below if you would like to be contacted by a counselor. You will only be contacted if your scores show that you might need some extra support.**

First Name: \_\_\_\_\_ Last Name: \_\_\_\_\_

**The 10 questions on the next page are about what happened to you, your friends and your family during the earthquakes. They might get you thinking about the experience again. If you are ok with this turn to the next page. If you think that this might be too distressing for you, you could finish this questionnaire here.**

*If you are going to stop here, then thank you for your time.*

**(Trauma Exposure Questionnaire)**

**Intensity of Earthquake Experience**

Please read each statement and circle which answer applies to you.

1. Did the building you were in collapse during any of the earthquakes? Yes / No
2. Were you trapped in a building or under rubble? Yes / No
3. Did you get injured during any of the earthquakes? Yes / No
4. Did you see anyone get injured during any of the earthquakes? Yes / No
5. Did anyone in your family get injured during the earthquakes? Yes / No
6. Did anyone you know die in the earthquake? Yes / No
7. Did anyone in your family die in the earthquake? Yes / No
8. How was your house after the earthquakes? No damage Slight Damage Medium Damage Severe Damage
9. Have you had to move out of your house because of the earthquakes? Yes / No

**(Fear Scale)**

1. What is the highest level of fear you experienced during any of the earthquakes?

1	2	3	4	5
No fear at all	Slight Fear	Medium Fear	Strong Fear	Extreme Fear/Terror

2. Think back to the most recent strong aftershock (magnitude 4.0 – 5.3) that you felt. What was your highest level of fear during this aftershock?

1	2	3	4	5
No fear at all	Slight Fear	Medium Fear	Strong Fear	Extreme Fear/Terror

**Thank you for the time taken to complete this survey**

## Appendix C

School of Psychology  
Private Bag 11222  
Palmerton North  
4442

### Stress and Coping of Teenagers after the Christchurch Earthquakes



#### **PARTICIPANT INFORMATION SHEET**

**My name is Tim Heetkamp and I am doing a research study for my Masters degree in psychology at Massey University. I am inviting you to take part in this research, but first I need to give you some important information about it:**

The aim of the research is to learn more about the stress and coping ability of teenagers after the Christchurch Earthquakes. I hope that it will help more teenagers get the support they may need. By participating you will be helping others. I also hope it will be helpful for you. There are incentives (prize draws) for participating.

#### **This is what's involved if you participate:**

You would be asked to fill in a questionnaire on the internet that has about 90 questions in it. Most of the questions are short so it only takes between 15 and 25 minutes to complete. You may be allowed to complete it at school, outside of normal class time, or you could do it on a computer away from school. The questions are about your experience of the earthquake, how you have been since the earthquake, and how you deal with life's challenges in general.

#### **Why you?**

All students from 6 selected Christchurch high schools are being invited to be part of this research to represent how teenagers in Christchurch have been coping.

#### **What's in it for you?**

By doing this research you will be helping others your age. All the results will be added together to show an average. Then teens that have high scores in certain things can be offered support. The information will also be made available to international researchers who help with disasters in other countries. I have also arranged some incentives for participating. There will be draws for a brand new iPod Nano, double movie passes, vouchers to Westfield and the Roxx .

#### **A part that might feel uncomfortable:**

In the last part of the questionnaire there are ten "Yes / No" questions that will ask you about how intense your experience of the earthquake was. There will be some direct questions about the effects of the earthquake on you, your friends and family. There is a question about whether anyone you knew died in the earthquake. These questions may bring up memories about what happened in the earthquake. You will be warned before these questions come up and you could leave them out if you think they might upset you.

Please Turn Over...

## **Counseling support and confidentiality:**

School counsellors and other qualified counsellors know about this research and will be available if you want to talk to them before or after completing the questionnaire. *Youthline* also has an excellent phone, text and email counseling service *Ph: 0800 37 66 33; Txt: 234; email: talk@youthline.co.nz*

The questionnaire asks whether you are ok to be contacted by a school counselor if the result of your questionnaire shows it might be useful for you. You can say Yes or No to this. If you say No, then you will not be contacted. You will only need to write your name on the questionnaire if you are ok with being contacted or want to be contacted. Otherwise your questionnaire will be anonymous (no-name).

If you are okay with being contacted, your name and the information you have given in the questionnaire will be kept confidential by me (the researcher), the school counselor, or another qualified counselor. No one else will find out any information about you. If a counselor or other support worker contacted you, this would be done in a way that is careful to protect your privacy.

## **Reporting of Results:**

All the results of the questionnaires will be entered into a special computer programme (SPSS) to be analyzed. They will then be interpreted and reported. A summary of the research findings will be put on a public website that you will be able to access. No person will be able to be identified in any of the research reports or summaries.

## **Your Rights:**

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- leave any particular question unanswered
- withdraw from the study before completing the questionnaire
- ask any questions about the study at any time during participation
- provide information on the understanding that your name will not be used unless you give permission to the researcher
- be given access to a summary of the project findings when it is concluded

## **What to do now:**

If you want to be part of this research, you need to show this information sheet to your parent/caregiver. They will have to give their consent for you to participate by signing their part of the consent form (University research regulations). You will also have to fill in and sign your part of the consent form. You will need to return the consent form to school and drop it in the red box provided. The questionnaire will then be emailed to you.

## **Project Contacts:**

**If you have any questions about this study, please contact myself or my supervisor.**

- *Tim Heetkamp (Researcher): Phone 03 3822219 or 027 6921627; or email: tim.heetkamp@fastmail.us*
- *Ian de Terte (Supervisor): Phone 04 801-5799 Ext 62033 or email: I.deTerte@massey.ac.nz*

## **Committee Approval Statement**

This project has been reviewed and approved by the Massey University Human Ethics Committee: Southern B, Application 11/33. If you have any concerns about the conduct of this research, please contact Dr Nathan Matthews, Acting Chair, Massey University Human Ethics Committee: Southern B, telephone 06 350 5799 xt 8729, email [humanethicsouthb@massey.ac.nz](mailto:humanethicsouthb@massey.ac.nz)

## Stress and Coping of Teenagers after the Christchurch Earthquakes

### PARENTAL INFORMATION SHEET



**My name is Tim Heetkamp and I am doing a research study for my Masters degree in psychology at Massey University. I am inviting your teenager to take part in this research, but to do this they will also need your consent. Here is some important information about it:**

The aim of the research is to learn more about the stress and coping ability of teenagers after the Christchurch Earthquakes.

#### **This is what is required for participation:**

Your teenager would be asked to complete a questionnaire on the internet or on paper, (depending on what school they are from) that has about 90 questions in it. Most of the questions are short so it only takes between 15 and 25 minutes to complete. They may be allowed to complete it at school, outside of normal class time, or may need to complete it on a computer away from school. The questions are about their experience of the earthquake, how they have been since the earthquake, and how they deal with life's challenges in general.

#### **Why your teenager?**

All students from 6 selected Christchurch high schools are being invited to be part of this research to represent how teenagers in Christchurch have been coping.

#### **A part that might feel uncomfortable:**

In the last part of the questionnaire there are ten "Yes / No" questions that will ask your teenager about how intense their experience of the earthquake was. There will be some direct questions about the effects of the earthquake on them, their friends and family. There is a question about whether anyone they knew died in the earthquake. These questions may bring up memories about what happened in the earthquake. They will be warned before these questions come up and are able to leave them out if they think they might find them distressing. They are under no obligation to complete the questionnaire or any of its parts.

#### **Counseling support and confidentiality:**

School counsellors and other qualified counsellors know about this research and will be available to participants before and after completing the questionnaire.

The questionnaire has a question which asks your teenager whether he or she consents to being contacted by a school counselor if the result of the questionnaire shows it might be useful for them.

If they do not consent to being contacted, they do not enter their name on the questionnaire and it remains completely anonymous.

If they give their consent to being contacted, they will be asked to enter their name onto the questionnaire. This information will be kept confidential, and if the questionnaire scores suggest that counseling support would be useful, your teenagers information will be communicated confidentially with the counselor. No one else will be able to access any information about their identity. If a counselor worker contacted your teenager, this would be done in a way that is careful to protect their privacy.

### **Reporting of Results:**

All the results of the questionnaires will be analyzed by computer. They will then be interpreted and reported. A summary of the research findings will be put on a website for public access. No person will be able to be identified in any of the research reports or summaries.

### **Participant Rights:**

Potential participants or their parents/caregivers are under no obligation to accept this invitation. If they decide to participate, they will have the right to:

- leave any particular question unanswered
- withdraw from the study before completing the questionnaire
- ask any questions about the study at any time during participation
- provide information on the understanding that their name will not be used unless they give permission to the researcher
- be given access to a summary of the project findings when it is concluded

### **What to do now:**

If you and your teenager consent to participate in the research, you will both need to sign the consent form, and your teenager will need to bring it to school and drop it in the red box provided. The questionnaire will then be emailed to them, or they will receive a paper copy from school.

### **Project Contacts:**

**If you have any questions about this study, please contact myself or my supervisor.**

- *Tim Heetkamp (Researcher): Phone 03 38222 19 or 027 692 1627;  
or email: [tim.heetkamp@fastmail.us](mailto:tim.heetkamp@fastmail.us)*
- *Ian de Terte (Supervisor): Phone 04 801-5799 Ext 62033  
or email: [I.deTerte@massey.ac.nz](mailto:I.deTerte@massey.ac.nz)*

### **Committee Approval Statement**

This project has been reviewed and approved by the Massey University Human Ethics Committee: Southern B, Application 11/33. If you have any concerns about the conduct of this research, please contact Dr Nathan Matthews, Acting Chair, Massey University Human Ethics Committee: Southern B, telephone 06 350 5799 xt 8729, email [humanethicssouthb@massey.ac.nz](mailto:humanethicssouthb@massey.ac.nz)

# PLEASE COMPLETE THIS FORM AND RETURN IT TO SCHOOL BY AUGUST 31 2011

Stress and Coping of Teenagers after the Christchurch Earthquakes

## STUDENT AND PARENTAL CONSENT FORM

*Student AND Caregiver must sign this for student to participate*

*Return this to Red Box at School*

### STUDENT CONSENT

I have read the Information Sheet and understand what the research involves. I understand that I may contact the researcher (Tim Heetkamp) to ask further questions at any time.

I agree to participate in this study under the conditions set out in the Information Sheet.

Print Full Name: \_\_\_\_\_

Email Address: \_\_\_\_\_

*Please print clearly – the questionnaire will be emailed to you using this address. Prize draws will also use this address.*

Signature: \_\_\_\_\_

---

### PARENTAL CONSENT

I have read the Information Sheet and understand what the research involves. I understand that I may contact the researcher (Tim Heetkamp) to ask further questions at any time.

I agree to \_\_\_\_\_ (student's name) participating in this study under the conditions set out in the Information Sheet.

Print Full Name: \_\_\_\_\_

Relationship to student: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

---

*Researcher: Tim Heetkamp; Ph: 027 692 162 ;(03) 3862 159 xt 733 or email: tim\_heetkamp@fastmail.*

## Appendix D

### Email message acknowledging benefit of research feedback

-----Original Message-----

From: Sarah Maindonald [mailto:maindons@hillmorton.school.nz]  
Sent: 22 May 2012 19:35  
To: heetkamps@xnet.co.nz; Ann Brokenshire  
Subject: Re: Research Questions

On Tue, May 22, 2012 at 4:01 PM,  
<maindons@hillmorton.school.nz> wrote:  
>

Kia ora Tim,

> Sorry I've been so non communicative, had an incredibly busy term 1  
> and finally seems to be abating, a little!

> Thanks so much for your research - we identified students who I don't  
> think would otherwise have accessed support.  
>

> Arohanui  
> Sarah Maindonald

HOD Counselling  
Hillmorton High School  
>