

The Effectiveness of EMDR in Reducing Psychological Distress in Survivors of Natural Disasters: A Review

Fehmida Natha
Anna Daiches
Lancaster University

Natural disasters affect whole communities both at an individual level as well as economically and socially. However, the impact of natural disasters on an individual's mental health is substantial; yet, the response to one's mental health needs after a disaster is underdeveloped. Nevertheless, the Humanitarian Assistance Programme has attempted to address these needs by providing eye movement desensitization and reprocessing (EMDR) to natural disaster survivors. This systematic review provides evidence for the effectiveness and efficacy of EMDR in the treatment of psychological distress in survivors of natural disasters. Of the 8 studies reviewed, 4 were controlled trials and 1 study part-controlled. All the studies demonstrated statistical and clinical significance in reducing posttraumatic stress disorder (PTSD) symptoms, anxiety, depression, and other distress experienced by survivors of natural disasters. In addition, 4 of the 8 studies demonstrated clinical significance after just 1 session, presenting EMDR as resource-, time-, and cost-efficient intervention. Theoretical framework, adaptation in intervention, methodological issues, and quality assessment of studies are discussed. Implications for future research and clinical practice are also discussed.

Keywords: systematic review; EMDR; psychological distress; PTSD; natural disasters

Natural disasters are events that cause extensive damage and significantly disturb the context of whole communities (Katz, Pellegrino, Pandya, Ng, & DeLisi, 2002). Exposure to a disaster is a complex phenomenon. They affect individuals directly through risk to their own life and individual loss and indirectly because of the shared community damage and the consequential economic, social, and governmental disruptions (Norris & Wind, 2009). Research has suggested that some disaster survivors experience trauma and psychological distress (Ursano, Fullerton, Weisaeth, & Raphael, 2007). Literature regarding the psychological impact of disasters has often focused on the posttraumatic stress disorder (PTSD) construct. Reasons for this focus include the understanding gained from animal models, regarding fear conditioning, that have allowed understanding of the biological mechanisms underlying trauma. Another reason relates to treatment interventions based on learning theory which are successful in helping trauma survivors (Kirmayer, Lemelson, & Barad, 2007).

Trauma experienced after a disaster can cause various negative outcomes. A comprehensive review of the impact of natural disasters by Murthy, Bertolote, and Epping-Jordan (2001, as cited in Gelbach, 2008) found that PTSD was observed in participants within 74% of studies, followed by depression, anxiety, and other forms of distress. As a response to the declining mental health of disaster survivors, the Humanitarian Assistance Programme (HAP) was formed (North, 2007). The HAP trains mental health practitioners around the world in eye movement desensitization and reprocessing (EMDR) to meet the long-term emotional needs of disaster survivors. The mental health response to a disaster may be the most crucial aspect involved in the process of recovery (Ursano et al., 2007). This review focuses on EMDR as a treatment for survivors of natural disasters experiencing psychological distress. Here, psychological distress refers to any impairment and negative emotions experienced by survivors.

Psychological Distress in Survivors of Natural Disasters

The number of natural disasters occurring around the world has been increasing (Gelbach, 2008), and the death tolls for the most severe events have been profound. For example, the mortality rate for the 2004 Indian Ocean tsunami was more than 280,000 with an estimated further 100,000 individuals displaced by the event (Norris & Wind, 2009). Disasters resulting in higher death tolls yield higher postdisaster psychological distress. Rubonis and Bickman (1991) conducted a meta-analysis examining the relationship between disaster occurrence and psychological distress and found that there was a 17% increase in distress compared to the predisaster and control group. Furthermore, they found that increased death toll was strongly associated with psychological distress, explaining 20% of the variance when other factors were controlled for. It is likely that survivors of disasters with higher mortality rates are more likely to have had their own lives threatened, increasing the risk of psychological distress.

PTSD is the most prevalent diagnosis in survivors of natural disasters, with mental health services' response often targeting PTSD for intervention purposes. Symptoms of PTSD include negative reexperiencing, avoidance, emotional numbing, and hyperarousal (Terranova, Boxer, & Morris, 2009). Individuals receiving a diagnosis of PTSD may have had direct experience of the event or vicarious experience through witnessing others and exposure to horrifying images (North, 2007). A systematic review by Neria, Nandi, and Galea (2007) found postdisaster prevalence rates of PTSD to be substantial and concluded that it was the most common form of impairment in the aftermath of natural disasters. However, a recent review by Lo, Su, and Chou (2012) found that the association between PTSD and disasters varies widely. Specifically, the prevalence of PTSD in natural disaster survivors ranged from 8% to 34% in the 1999 Taiwan earthquake, 25% in the Turkey earthquake, and 74% in the 1988 earthquake in Armenia. Furthermore, research has also shown that specific vulnerability factors increase the risk of individuals developing psychological distress after natural disasters. These include being female (Garrison et al., 1995), preexisting mental health problems (Katz et al., 2002), low academic ability (La Greca, Silverman, & Wasserstein, 1998), lack of social support (Vernberg, Greca, Silverman, & Prinstein, 1996 as cited in North, 2007), and level of exposure (North, 2007). Accordingly, social cognitive theorists assert social support as a significant protective

factor against developing psychological distress. It is thought that helpful actions from other disaster survivors effectively model coping responses and provide encouragement for healthy adaptation (Benight & Bandura, 2004, as cited in Watson, 2007). This may reduce the likelihood of developing psychological distress.

However, apparent associations may be confounded by other associated risk factors (North, 2007). For example, North, Smith, and Spitznagel (1994) found low educational attainment to be related to PTSD in disaster survivors only because it was distinctive of women within the study who experienced PTSD symptoms more than males. Therefore, making causal inferences should be done so with caution. In addition, although research suggests that females are at increased risk for developing psychological distress, it is possible that males self-medicate more as an adaptive coping mechanism. This may make the detection of psychological distress in male survivors less likely. For example, Pollice, Bianchini, Roncone, and Casacchia (2011) administered a survey to 1,078 survivors of an earthquake in Italy. They found significant correlations between disaster exposure and substance misuse in males.

Moreover, psychological distress in survivors includes major depressive disorder and generalized anxiety disorder (Kar & Bastia, 2006). The first 3 months in particular is the most significant risk period of developing depression (Katz et al., 2002). Level of exposure to the disaster also increases the risk of developing depression as well as prior stressful life events (Kendler, Karowski, & Prescott, 1998). Anxiety disorders such as panic and phobic disorders may also be experienced by survivors (Terranova et al., 2009). The cooccurrence of two or more mental health problems is also increasingly common. For example, Fan, Zhang, Yang, Mo, and Liu (2011) examined psychological distress in 2,250 adolescents 6 months after an earthquake in China. They found PTSD, anxiety, and depression often cooccurred in survivors. However, one of the major limitations of this study is the unavailability of data regarding preexisting mental health within the sample making it difficult to identify whether the disaster alone contributed toward symptoms.

Acute Interventions in Reducing Psychological Distress in Survivors of Natural Disasters

Psychological debriefings have been defined as group discussions which occur within 48–72 hours after a

traumatic event (Katz et al., 2002). The sessions encourage participants to explore thoughts, reactions, and coping strategies following a traumatic event (Watson, 2007). Debriefing after disasters is based on the belief that immediate processing of the event allows opportunity for survivors to cognitively structure the event accurately so that it is recalled in a less distressing manner (Watson, 2007). However, some research suggests that debriefing may be ineffective or even harmful, increasing the risk of developing long-term psychological symptoms (Bisson & Deahl, 1994). This has led some to suggest that it should be discontinued as an intervention (Bisson & Deahl, 1994).

In contrast, some evidence exists to support cognitive behavioral therapy (CBT) in reducing symptomatology associated with traumatic events (Seidler & Wagner, 2006). Similarly, De Roos et al. (2011) conducted a randomized comparison of CBT and EMDR to establish the effectiveness of both interventions in reducing trauma-related symptoms in children exposed to disasters. Although both approaches produced significant reductions in depression, anxiety, and PTSD symptoms, treatment gains of EMDR were reached in fewer sessions.

However, Hobfoll's (1989, as cited in Lo et al., 2012) conservation of resources (COR) theory posits resource loss is an important factor related to individual stress and mental health. Intervention implications from this theory suggest that an important part of the recovery process includes psychological and social resource investment (Watson, 2007). To what extent the aforementioned interventions tackle resource investment remains unclear.

Use of EMDR in the Treatment of Psychological Distress in Survivors of Natural Disasters

EMDR is a structured treatment intervention based on the adaptive information processing (AIP) model emphasizing the brain's memory storage and information processing system (Shapiro & Maxfield, 2002). The model hypothesizes that the basis of current psychological distress are the emotions and physical sensations related to the unprocessed traumatic event and their inappropriate storage within the memory system (Van Rood & de Roos, 2009). EMDR involves requesting the client to recall specific memories of the traumatic event while following the therapist-directed hand movements. It is thought that the bilateral stimulation and accessing the unprocessed trauma activates the brain's processing system and facilitates the assimilation of the traumatic memory into the larger

memory network (Solomon & Shapiro, 2008). Thus, the traumatic memory is no longer isolated, allowing adaptive processing to occur as a result of the new associations made within the brain.

Meta-analyses have established the efficacy of EMDR in the treatment of PTSD (Bisson & Andrew, 2009; Davidson & Parker, 2001). Equally, Roos, Benjamin, de Roos, Meijer, and Stams (2009) conducted a meta-analysis examining the efficacy of EMDR in children and found that EMDR is a beneficial treatment intervention. Furthermore, EMDR showed a small incremental value relative to children treated with CBT. In relation to disasters, EMDR has demonstrated effectiveness in reducing psychological distress including PTSD symptoms (Chemtob, Nakashima, & Carlson, 2002; Fernandez, Gallinari, & Lorenzetti, 2004), anxiety, depressive feelings, and fear. For example, Jayatunge (2008) illustrated that symptoms experienced in seven survivors of the 2004 tsunami such as depressive feelings, anxieties, intrusions, and nightmares were significantly reduced after EMDR. Psychosocial functioning was also restored after treatment, allowing survivors to lead productive lives. EMDR is also established as an efficient treatment intervention. For example, Ichii (1997) described a case where two female survivors of an earthquake, experiencing psychological distress, were successfully treated after a single session of EMDR. These effects were maintained at five months' follow-up.

EMDR-Related Protocols

What is referred to as "EMDR" occasionally varies between publications. Although the acronym suggests the use of the standard protocol, they are sometimes adapted. An example of an EMDR-related protocol in the field of natural disasters is used by Jarero, Artigas, and Hartung (2006) referred to as the EMDR Integrative Group Treatment Protocol (EMDR-IGTP). This was designed as a response to large-scale disasters and combined the eight standard EMDR sessions within a group therapy model, offering widespread reach to survivors of disasters. Another adaptation is the EMDR Protocol for Recent Critical Incidents (EMDR-PRECI). Differences between this and the standard protocol include asking the client to describe the traumatic event in a narrative form and conceptualizing the disaster as an extended event with a continuum of important marker incidents as an ongoing traumatic event rather than several separate events (Jarero, Artigas, & Luber, 2011). Moreover, the EMDR-PRECI primarily uses the butterfly hug (alternate tapping of crossed arms over the chest) and eye movements for bilateral stimulation,

whereas the standard protocol uses various forms of bilaterals. Some studies have also offered computerized EMDR (Abbasnejad, Mehani, & Zamyad, 2007). A bilateral stimulation software written by Manfield and Manfield (2002, as cited in Abbasnejad et al., 2007) called "There and Back" is a package offering visual, auditory, or tactile stimulation modes.

Rationale of the Present Review

Despite the fact that meta-analyses have confirmed the effectiveness of EMDR, the reviews have focused on PTSD only and have not been specific to natural disasters. As discussed, disaster survivors can sometimes experience various negative emotions. Furthermore, because of the increasing number of disasters around the world and the need to meet the emotional needs of disaster survivors, a specific review for natural disasters is warranted. In addition, because of cost and time issues, EMDR for survivors of natural disasters requires systematic evidence in order for it to be proposed as a viable and effective intervention within a disaster context.

Method

Selection of Studies

A search was conducted for published reports of EMDR for survivors of natural disasters. A three-step search strategy was employed for purposes of this systematic review. Initially, studies were searched from computerized databases, within the *Journal of EMDR Practice and Research* and the "Francine Shapiro Library" online. Secondly, the ancestry method was used to find additional studies on EMDR for survivors of natural disasters in the reference section of reviews, meta-analyses, and articles reporting on empirical studies. The final stage involved contacting the librarian of the Francine Shapiro Library and the United Kingdom president of the EMDR association enquiring whether they had access to any recently submitted articles within the area of natural disasters. An EMDR training manual with a list of all peer-reviewed EMDR related articles was also used.

A systematic literature search for relevant studies was conducted in five major bibliographical databases: PsychINFO, CINAHL, Medline, Academic Search Complete, and Science Direct. For all databases, three key concepts were used: "eye movement desensitization and reprocessing/EMDR" OR "psychological distress" AND "natural disasters." Extensive word variants were used for the three concepts and were used interchangeably. The search included the following

terms for specific psychological distress: "posttraumatic stress/PTSD" OR "stress" OR "trauma" OR "anxiety" OR "depression" OR "negative emotion" OR "fear" OR "grief" OR "intrusive thoughts" OR "psychopathology." Word variants for natural disasters were "critical incident" OR "crisis" OR "flood" OR "tsunami" OR "earthquake" OR "volcano" OR "hurricane." EMDR word variants were "EMD" OR "EMDR-PRECI" OR "EMDR Group Protocol" OR "EMDR-IGTP."

All abstracts were examined and studies potentially meeting the inclusion criteria were retrieved and examined more extensively.

Selection Criteria

Studies included in this systematic review were all quantitative studies measuring the effectiveness of EMDR in survivors of natural disasters. The decision to search only studies published in peer-reviewed and complete articles was made prior to searching between 1989 (inception of EMDR) and 2012. Specific criteria for inclusion were the following: (a) randomized and controlled trials (RCT), (b) nonrandomized and noncontrolled trials if they included either validated outcome measures or used thorough self-report instruments, (c) peer-reviewed articles available in English only, (d) use of the standard EMDR protocol as well as EMDR-related protocols, and (e) studies delivering EMDR to survivors of natural disasters experiencing various forms of psychological distress.

Excluded were non-peer-reviewed articles. This included case studies, editorials, and special issues. Articles were further excluded if they described EMDR as a treatment intervention for man-made disasters.

Of the 33 identified articles, 25 did not fulfill the inclusion criteria. These papers were either theoretical or discussion papers, case studies, or not published in peer-reviewed journals. Studies unrelated to the topic of this review, namely those falling under the man-made disaster category, were further excluded. Two studies were excluded based on not having the full text available in English and not providing any statistical analyses or reporting the values/means of outcome measures. Eight studies remained for purposes of this review.

Assessment of Quality

In this review, the quality of the studies was rated using the Revised Gold Standard (RGS) scale, predefined criteria used for evaluating methodology in treatment outcome research. Initially developed by Foa and Meadows (1997) with seven gold standard (GS) items, Maxfield and Hyer (2002) revised the

original GS scale by adding an additional three items. These were considered to provide further unique elements, allowing more accurate measurements of methodological shortcomings. As this review examined psychological distress (including PTSD), the original GS 1 and GS 10 were not included as part of the quality criteria because these items specifically measured PTSD. Therefore, eight GS items remained (see Table 1).

These criteria were scored using a 3-point Likert scale for each item: a score of 1 was given to a study that fully met the criteria, 0.5 was given when a study partially met the criteria, and 0 to a study that did not meet the specific criteria. The total possible score on the adapted RGS scale was 8. A study was considered to be of “high quality” with a score of 6 or more points, of “moderate quality” with a score of 4–5 points, and of “low quality” if a study scored less than 4 points.

TABLE 1. The Adapted Revised Gold Standard Scale

GS 1	Reliable and valid measures 0 : did not use reliable and valid measures .5: measures used inadequate to measure change 1 : reliable, valid, and adequate measures
GS 2	Use of blind independent assessor 0 : assessor was therapist .5: assessor was not blind 1 : assessor was blind and independent
GS 3	Assessor reliability 0 : no training in administration of instruments used in the study .5: training in administration of instruments used in the study 1 : training with performance supervision, or reliability checks
GS 4	Manualized, replicable, specific treatment 0 : treatment was not replicable or specific 1 : treatment followed EMDR training manual, Shapiro 1995
GS 5	Unbiased assignment to treatment 0 : assignment not randomized .5: only one therapist, OR semi-randomized designs 1 : unbiased assignment to treatment
GS 6	Treatment adherence 0 : treatment fidelity poor .5: treatment fidelity unknown, or variable 1 : treatment fidelity checked and accurate
GS 7	No confounded conditions 0 : most subjects receiving concurrent psychotherapy .5: a few subjects receiving concurrent psychotherapy, or unspecified and no exclusion for current treatment 1 : no subjects receiving concurrent psychotherapy
GS 8	Use of multimodal measures 0 : self-report measures only .5: self-report plus interview or physiological or behavioral measures 1 : self-report plus two or more other types of measures

Note. GS = Gold Standard. Adapted from “The Relationship Between Efficacy and Methodology in Studies Investigating EMDR Treatment of PTSD,” by L. Maxfield and L. Hyer, 2002, *Journal of Clinical Psychology*, 58, p. 31.

Results

Type of Studies

The eight studies consisted of four RCTs (Abbasnejad et al., 2007; Chemtob et al., 2002; Grainger, Levin, Allen-Byrd, Doctor, & Lee, 1997; Jarero et al., 2011), one part-controlled study (Konuk et al., 2006), and three uncontrolled studies (Aduriz, Bluthgen, & Knopfler, 2011; Fernandez, 2007; Jarero et al., 2006). The one part-controlled study compared the post-treatment scores of the early-treated group with the pretreatment scores of the late-treated group. The four RCTs used a waitlist/delayed-treatment control group. Refer to Table 2 for an overview of the study characteristics.

Designs

All studies used a pretest–posttest design and collected follow-up data. However, only 21 participants were available at follow-up for one study (Konuk et al., 2006) from the 41 initially treated. The period of follow-up measurements ranged from 1 month to 1 year.

Participants

The total sample in this review composed of 362 participants. The gender of participants was stated in all studies, besides that of Fernandez (2007) who treated 22 participants. Of the remaining 340 participants, 147 were males and 193 were females. The age range was 6–80 years, with four studies targeting child survivors only (Aduriz et al., 2011; Chemtob et al., 2002; Fernandez, 2007; Jarero et al., 2006), who were all recruited through their schools.

Type of Psychological Distress and Preexisting and Cooccurrence of Mental Health

The type of psychological distress in participants varied from clinical diagnosis of PTSD (Chemtob et al., 2002; Fernandez 2007; Konuk et al., 2006), participants presenting with PTSD symptoms as indicated by self-report measures (Aduriz et al., 2011; Grainger et al., 1997; Jarero et al., 2006; Jarero et al., 2011), or both diagnosed PTSD/PTSD symptoms as well as anxiety and depressive symptoms (Abbasnejad et al., 2007; Chemtob et al., 2002). Abbasnejad et al. (2007) also included participants presenting with phobia, grief, fear, and other “unpleasant emotions.” However, it is unclear whether this was assessed by clinicians prior to referral for EMDR treatment or self-reported symptoms. The duration of the symptoms in participants

varied from 2 weeks (Jarero et al., 2011) after the disaster (where the aim was to deliver EMDR as an early intervention) to 3 1/2 years (Chemtob et al., 2002), where a previous psychotherapy treatment administered 1 year prior was ineffective in reducing stress symptoms.

No studies reported on both preexisting and the cooccurrence of two or more mental health problems besides Jarero et al. (2006). The authors gathered a full clinical history from parents and teachers of the participants. However, the study did not explicitly state which additional symptoms besides PTSD these children were experiencing or the nature of the preexisting mental health problem. Furthermore, Konuk et al. (2006) set to exclude all participants who exhibited psychosis, exhibited dissociative disorders, or posed a risk to themselves and others. However, these were not detected within the participant pool. Moreover, Fernandez (2007) only used an assessment of PTSD supported by the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID–1). Overall, the reporting of preexisting and the cooccurrence of mental health problems was relatively poor across studies.

Single or Combined Treatment. No studies besides that of Konuk et al. (2006) reported whether or not their participants received additional treatment alongside EMDR. Specifically, within their pool, some participants were on prescribed medication prior or during treatment. Nonetheless, five of the six participants on medication spontaneously discontinued use between the treatment and follow-up. Statistical analyses further indicated that medication had no additive or detrimental impact on EMDR treatment.

Results of the Studies

Overall, EMDR demonstrated statistical and clinical significance in reducing psychological distress across studies. Significant differences were found between pretreatment, posttreatment, and follow-up mean scores (refer to Table 3).

Attrition. No participants declined treatment across the studies. There was no attrition in four studies (Abbasnejad et al., 2007; Grainger et al., 1997; Jarero et al., 2006; Jarero et al., 2011) with participants completing the full treatment programme. Within the Aduriz et al. (2011) and Chemtob et al. (2002) studies, 2 people dropped out and 2 did not complete treatment, respectively. Within the Fernandez (2007) and Konuk et al. (2006) studies, 3 people dropped out and 10 people dropped out and 7 did not complete treatment, respectively. These 7 did not complete posttreatment outcome measures even though they

TABLE 2. Characteristics of the Studies in the Present Review

Authors	Disaster	N	Study Type	Type of Psychological Distress	EMDR Protocol	Number of Treatment Sessions	Measures Used	Follow-up	Makes Claim Regarding Effectiveness
Abbasnejad et al. (2007)	Earthquake, Bam, Iran	41	Randomized controlled trial	PTSD symptoms, anxiety, depression, fear, phobia, grief, and other unpleasant feelings	Computerized EMDR (“There and Back”)	4	BDI, BAI, and SUD	1 month	Yes, if appropriate
Aduriz et al. (2011)	Flood, Sante Fe, Argentina	124	Uncontrolled	PTSD symptoms	EMDR-IGTP	1	CRTES, SUD	3 months	Yes, if appropriate
Chemtob et al. (2002)	Hurricane Iniki, Hawaii	32	Randomized controlled trial	PTSD, anxiety, and depression	Standard protocol	3	CRI, RCMAS, CDI	6 months	Yes, if appropriate
Fernandez (2007)	Earthquake, Molise, Italy	22	Uncontrolled field study	PTSD	Standard protocol	8	SCID-1 supported assessment	1 year	Yes, if appropriate
Grainger et al. (1997)	Hurricane Andrew, Florida	40	Randomized controlled trial	PTSD symptoms	Standard protocol	1	IES, SUD	1 and 3 months	Yes, if appropriate
Jarero et al. (2006)	Flood, Mexico	44	Uncontrolled field study	PTSD symptoms	EMDR-IGTP	1	CRTES SUD	1 month	Yes, if appropriate
Jarero et al. (2011)	Earthquake, Mexico	18	Randomized controlled field study	PTSD symptoms	EMDR-PRECI	1	IES	3 months	Yes, if appropriate
Konuk et al. (2006)	Earthquake, Marmara, Turkey	41 (21 available at follow-up)	Part-controlled	PTSD	Standard protocol	5	PSS-SR, SUD, VOC	6 months	Yes, if appropriate

Note. BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory; SUD = Subjective Units of Disturbance; CRTES = Child’s Reaction to Traumatic Events Scale; CRI = Children’s Reaction Inventory; RCMAS = Revised Children’s Manifest Anxiety Scale; CDI = Child Depression Inventory; SCID-1 = Structured Clinical Interview for DSM-IV Axis I Disorders; IES = Impact of Events Scale; PSS-SR = PTSD Symptom Scale–Self-Report; VOC = Validity of Cognitions.

TABLE 3. Mean Scores of Outcome Measures at Pretreatment, Posttreatment, and Follow-up

Authors	Measures	Condition	Pretreatment		Posttreatment		Follow-up		Significance
			M	SD	M	SD	M	SD	
Abbasnejad et al. (2007)	BDI	Experimental	33.51	6.63	16.42	4.54	15.42	5.75	$p < .001$
		Delayed	34.45	6.56	31.55	8.84	—	—	
	BAI	Experimental	33.80	5.69	16.19	6.54	13.57	6.27	$p < .001$
		Delayed	33.60	7.02	31.8	8.58	—	—	
	SUD	Experimental	7.19	1.36	2.57	1.03	2.21	1.32	$p < .001$
		Delayed	7.37	1.03	6.40	2.12	—	—	
Aduriz et al. (2011)	CRTES	Experimental	26.40	—	—	—	10.80	—	$p < .001$
	SUD	Experimental	7.20	—	2.19	—	—	—	$p < .001$
Chemtob et al. (2002)	CRI	Experimental	36.54	11.57	16.47	12.98	10.59	8.23	$p < .001$
		Delayed	39.60	21.04	22.60	20.21	18.87	20.39	
	RCMAS	Experimental	18.00	5.87	14.29	8.26	10.00	8.28	$p < .001$
		Delayed	18.07	8.17	11.78	10.99	13.57	9.47	
	CDI	Experimental	55.94	9.86	48.71	13.03	48.35	14.22	$p < .01$
		Delayed	59.73	19.84	53.87	21.82	51.67	18.34	
Fernandez (2007)	SCID-1 supported assessment	Experimental	—	—	—	—	—	—	$p < .01$
Grainger et al. (1997)	IES	Experimental	37.39	—	21.60	—	24.33	—	$p < .001$
		Delayed	18.73	—	21.57	—	—	—	
	SUD	Experimental	7.72	1.58	1.94	2.05	—	—	$p < .001$
		Delayed	34.36	—	37.91	—	—	—	
Jarero et al. (2006)	CRTES	Experimental	32.77	—	—	—	8.27	—	Clinically significant
	SUD	Experimental	9.24	—	1.29	—	—	—	
Jarero et al. (2011)	IES	Experimental	54.22	11.00	24.89	4.83	22.67	4.85	$p < .001$
		Delayed	55.67	8.37	49.22	8.03	22.78	5.47	
Konuk et al. (2006)	PSS-SR	Combined means of early- and late-treated group	34.29	7.96	5.37	4.76	7.76	7.79	$p < .001$
	SUD	Combined	8.15	2.21	0.42	0.79	—	—	$p < .01$
	VOC	Combined	2.34	1.44	6.42	1.08	—	—	

Note. BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory; SUD = Subjective Units of Disturbance; CRTES = Child's Reaction to Traumatic Events Scale; CRI = Children's Reaction Inventory; RCMAS = Revised Children's Manifest Anxiety Scale; CDI = Child Depression Inventory; SCID-1 = Structured Clinical Interview for DSM-IV Axis I Disorders; IES = Impact of Events Scale; PSS-SR = PTSD Symptom Scale–Self-Report; VOC = Validity of Cognitions.

continued with the therapy. Accordingly, these studies only included within the analyses the participants who completed pre- and postmeasures and the full treatment programme. Furthermore, Konuk et al.'s (2006) was the only study that attempted to follow-up participants who did not complete the programme. Within the Jarero et al. (2011) study, EMDR was only administered to the 18 adults who scored higher than 44 on the Impact of Events Scale (IES; Horowitz, Wilner, & Alvarez, 1979) after an initial crisis management briefing intervention to 53 company employees.

Outcome Measures. All studies used one or a combination of primary and secondary outcome measurements. Three studies (Chemtob et al., 2002; Fernandez 2007; Konuk et al., 2006) ensured PTSD status in participants through the PTSD Symptom Scale–Self-Report (PSS-SR; Foa et al., 1993), the Child Reaction Index (CRI; Pynoos et al., 1987), and a directly administered questionnaire prepared by the National Institute of Health and Clinical Excellence (NICE, 2005) supported by the SCID-1. However, Konuk et al. (2006) do not indicate the name of the assessment. The CRI is a clinician-administered interview for assessing PTSD in children and has good test–retest reliability and an alpha level of .87 within Chemtob et al.'s (2002) study. Abbasnejad et al. (2007) used the Persian version of the Beck Depression Inventory (BDI) and the Beck Anxiety Inventory (BAI) as secondary outcome measures.

Moreover, four studies (Aduriz et al., 2011; Grainger et al., 1997; Jarero et al., 2006; Jarero et al., 2011) used the IES or the children version of the scale: the Child's Reaction to Traumatic Events Scale (CRTES; Jones, 1997). These self-report measures assess the intrusion and avoidance clusters of PTSD. The IES and the CRTES demonstrate high test–retest reliability, validity, and good internal consistency.

Some studies also included additional “process measures”—the Subjective Unit of Disturbance (SUD) scale and Validity of Cognitions (VOC) scores—where participants were assessed on these measures at various points of the treatment. Of the studies that used the same measures, there were differences in the times at which the measure was given (either before and after each treatment session only or repeatedly after each EMDR phase). This methodological issue limits any comparisons that can be made between study findings.

Statistical Analyses. Of the four RCTs and one part-controlled study, analysis of between-group differences and within-group differences indicated that EMDR was effective in reducing psychological distress. Four studies used analysis of variance (ANOVA; Aduriz et al., 2011; Chemtob et al., 2002; Grainger et al., 1997; Konuk et al., 2006), two studies used *t* tests (Abbasnejad et al., 2007; Jarero et al., 2011), and one study used a Wilcoxon matched-pairs signed rank test (Fernandez 2007). The remaining study only reported the means, concluding EMDR as clinically significant (Jarero et al., 2006). In addition, Chemtob et al. (2002) also measured the number of visits by the school nurse after treatment and the children's perception of the helpfulness of treatment. Fernandez (2007) did not report any means and standard deviations, only providing the statistical significance of the comparison of the first and last measure.

Quality Assessment

The assessment of methodological quality is presented in Table 4. The overall quality of the studies was “high” to “moderate.” Four studies were rated as “high” quality (Chemtob et al., 2002; Fernandez 2007; Jarero et al., 2011; Konuk et al., 2006). The four

TABLE 4. Quality Assessment of Selected Studies Using the Revised Gold Standard Scale

Authors	#1	#2	#3	#4	#5	#6	#7	#8	Quality Score
Abbasnejad et al. (2007)	1	0	.5	0	1	.5	.5	0	3.5
Aduriz et al. (2011)	1	0	.5	0	0	.5	.5	0	2.5
Chemtob et al. (2002)	1	0	1	1	1	1	.5	1	6.5
Fernandez (2007)	1	1	1	1	0	1	.5	.5	6
Grainger et al. (1997)	1	0	1	1	1	.5	.5	.5	5.5
Jarero et al. (2006)	1	0	.5	1	0	1	.5	0	4
Jarero et al. (2011)	1	0	1	1	1	1	1	0	6
Konuk et al. (2006)	1	0	1	1	.5	1	.5	1	6

studies were controlled or part-controlled and used two or more well-validated measures. In addition, the four studies delivered the treatment as per the standard protocol (Shapiro, 1995) manual allowing easy replication of the study. In particular, Fernandez (2007) was the only study to implement blind evaluators for purposes of diagnosis and assessment, thus reducing expectancy and demand biases into the evaluation. The two studies which were rated as “low” quality (Abbasnejad et al., 2007; Aduriz et al., 2011) implemented an adapted version of the standard protocol and used self-report measures only. Two studies were also uncontrolled studies. All but one study scored .5 on RGS 7 because they did not specify if participants were receiving concurrent psychotherapy or did not indicate this as part of the exclusion criteria. Half the studies relied on self-report measures only. Some studies did not clearly comment on how the authors ensured treatment fidelity or the level of training of assessors. However, because the practitioners were members of a mental health response team, it is assumed that the level of training would be sufficient enough to deliver EMDR and would ensure adherence to the treatment programme. Thus, these studies were awarded a score of .5.

Furthermore, only two studies reported on confounding factors such as gender (Aduriz et al., 2011) and education (Konuk et al., 2006). Scores for SUD’s were significantly higher for girls than boys, and low educational attainment was inversely correlated to pretreatment intrusive imagery, hypervigilance, and nightmares. No studies commented on power issues or reported effect sizes. Although all studies demonstrated the effectiveness of EMDR (both statistically and clinically significant), most studies relied on sample sizes of less than 45. Therefore, the reporting and discussion of power and effect sizes would have been important.

Discussion

Summary of Findings

This systematic review provides evidence for the effectiveness and efficacy of EMDR in reducing psychological distress in survivors of natural disasters. This conclusion is based on eight studies: four RCTs, one part-controlled, and three uncontrolled studies. Although, most of the studies focused on PTSD symptoms, the findings are not restricted to this presentation alone. Statistical and clinical significance was shown in reducing anxiety, depression, fear, grief, and phobia. In addition, four of the eight studies targeted child survivors, allowing the findings to

be generalized across age groups. All studies implemented a pretest–posttest design and gathered follow-up data. Results were maintained at follow-up where many of the participants would have been experiencing the aftershocks of the disaster. This is in line with Shapiro’s (2001) AIP model: Adequately processing a traumatic event alters how this memory is stored within memory network so that a trauma is no longer triggered by a similar event.

Moreover, the number of EMDR sessions were relatively short, ranging from one to eight, reducing the likelihood that other factors (e.g., change in life circumstances) influenced the outcome of these studies. Some of the studies within this review administered only one session of the standard or related protocols, which suggests EMDR is a time- and cost-effective treatment in reducing psychological distress within the context of a natural disaster. This review therefore demonstrates EMDR as a viable treatment option in response to a disaster crisis.

Nevertheless, because three studies were uncontrolled and one part-controlled, whether or not the observed effects were a placebo effect or caused by spontaneous recovery cannot be dismissed. However, the likelihood of this is minimized because participants within the studies experienced symptoms ranging from 2 weeks to 3 1/2 years postdisaster. Furthermore, two studies (Chemtob et al., 2002; Jarero et al., 2011) specified that their participants received a previous psychotherapy (1 year before) or a crisis management briefing, which were both ineffective in reducing psychological distress. Therefore, EMDR can be considered more effective than other trauma processing interventions.

Limitations of the Present Research

Although RCTs provide the most valid information in treatment outcome studies, within natural disaster research, this would be difficult to operationalize because of the ethical and logistical constraints. Yet, four of the eight studies within this review were controlled, which employed a waitlist/delayed-treatment design. Nevertheless, a recurrent criticism of waitlist designs is that they do not adequately control for demand characteristics, potentially implying that any intervention is better than no intervention. This issue is only mitigated within the studies that stated previous psychotherapy as ineffective (as the symptoms were persistent).

Second, four studies (three of which were rated as high quality) reported some participants dropped out of the study or did not complete the treatment

within their samples. Thus, they only included participants within the statistical analyses who completed the full treatment programme. Consequently, this introduces selection bias into the results favoring the intervention and minimizes the external validity of these studies. Future research should implement an intention-to-treat methodology, including participants not completing the full treatment programme within the analyses. This would maintain the validity of the study. Because of these limitations, confidence in drawing inferences from the studies is minimized.

Furthermore, the reporting of confounding factors was poor across studies with the exception of Aduriz et al. (2011) and Konuk et al. (2006). Lack of education has been associated with increased vulnerability within a disaster context (Garrison et al., 1995), and Konuk et al. (2006) found that less education was associated with more negative outcomes. The knowledge gained from education may protect an individual from feelings of loss and lack of control and provide a better sense of coping. Because four of the studies composed of child participants recruited through schools, a certain level of education is assumed. Hence, the discussion of education would have been helpful because education variables may have interacted with the effectiveness of the treatment. However, it is acknowledged that collecting information on education would be very difficult within a disaster setting. These issues will be discussed later.

Similarly, social/family support is considered as a significant protective factor against developing psychological distress (Vernberg et al., 1996) and no studies controlled for this variable. Nonetheless, Fernandez (2007) allowed parents to attend EMDR sessions with children. Therefore, controlling for this variable would have been integral because the support provided by adults during therapy may have facilitated the recovery process. However, because disasters affect families and whole communities, the anxieties of parents and other adults could be transferred to children, potentially causing further distress. Allowing parents to remain present in the treatment process may have been beneficial in this instance. This was also considered in Aduriz et al.'s (2011) study where debriefing and psychoeducation were provided to parents, teachers, and school authorities. In relation to social cognitive theory (Benight & Bandura, 2004, as cited in Watson, 2007), the proactive role of significant others within the treatment programme may be important. It can promote and maintain successful resolution of distress, and adults can model effective coping responses to children (Watson, 2007).

In addition, no studies reported on preexisting mental health besides Jarero et al. (2006), and one study ensured the exclusion of participants with specific presentations. Although studies demonstrated statistical and clinical significance, a proportion of participants remained within the high-stress category at follow-up in some studies. Data regarding previous unprocessed traumatic memories and preexisting mental health would therefore have been helpful to ascertain how previous trauma may have impeded the EMDR intervention.

Clinical Implications and the Challenges of Working Within a Natural Disaster Context

Statistical and clinical significance was demonstrated across all studies, with four studies rated as high quality. Although the remaining studies were rated as either moderate or low quality, the challenges of responding to victims' mental health needs within a natural disaster context limit the ability to increase the methodological quality of the studies as per the RGS criteria. For example, there are limited resources after natural disasters (Gelbach, 2008), thus arranging for blind evaluators and a range of measures (besides self-report) would be difficult.

Moreover, the priority for mental health response after a natural disaster is to attend to the primary mental health needs of victims and to provide psychoeducation and stabilization, which are considered to be effective in reassuring overwhelmed victims and allow processing of traumatic memories, respectively (Gelbach, 2008). As such, obtaining full clinical histories, gauging preexisting mental health difficulties, and establishing whether victims are receiving concurrent psychotherapy would be an impossible task when working with distressed, overwhelmed, and displaced individuals. Therefore, taking into account the context in which EMDR practitioners are working within, it can be recommended that the use of the standard protocol, guaranteeing a good level of training of the practitioners, and ensuring that they receive regular supervision can aid the effectiveness of EMDR. Gelbach (2008) also suggests that supervisors and researchers should make concerted effort to delineate new research and findings to practitioners which can be implemented within practice. Despite the methodological shortcomings of the studies reviewed, this review still highlights that EMDR is an efficacious treatment in response to the mental health needs of natural disaster victims.

Furthermore, research suggests that females present with increased vulnerability within a disaster

context because of the gender division of labor, low socioeconomic status, and the lack of political influence (Garrison et al., 1995). Aduriz et al. (2011) was the only study to report on gender differences, with females more vulnerable to traumatic stress than males. Female vulnerability is further heightened in the face of a disaster, when caregiving demands increase and resources decrease. Hence, mental health response should ensure this population is targeted and deliver gender-fair practice.

Although this review demonstrates the effectiveness of EMDR in survivors of natural disasters, Hobfoll's (1989, as cited in Lo et al., 2012) COR theory states that an important part of the recovery process includes social resource investment. Interventions often focus at the individual level, whereas disasters cause widespread damage, affecting communities, larger society, and the structural context in which survivors live. Although EMDR does not specifically target the wider ecology of disasters, it can be argued that stable mental health can increase an individual's ability to help in the disaster response and the rebuilding of communities thereafter. A case study (Jayatunge, 2008) illustrates this, where EMDR restored psychosocial functioning allowing survivors to lead productive lives.

Conclusions

This review provides evidence for the effectiveness and efficacy of EMDR in reducing psychological distress in survivors of natural disasters. All studies reviewed demonstrated statistical and clinical significance in reducing psychological distress in survivors of natural disasters. Nevertheless, studies were mediocre in methodology and design, which reduced the overall "quality" of the studies. However, as noted previously, the nature of disasters makes some of the RGS criteria difficult to operationalize. This includes the use of blind evaluators, using a range of measures besides self-report measures, and the reporting of pre-existing mental health problems and concurrent psychotherapy. Despite these limitations, the benefit of EMDR in restoring mental health functioning in the plight of a real-life crisis and presenting as a resource-, time-, and cost-efficient intervention mitigates some of these issues. The effectiveness of EMDR is further highlighted where previous intervention in two studies did not resolve psychological distress in survivors. Overall, the findings of this review suggest that EMDR should most certainly be considered as a treatment intervention by mental health response after natural disasters.

References

- Abbasnejad, M., Mehani, N. K., & Zamyad, A. (2007). Efficacy of "eye movement desensitization and reprocessing" in reducing anxiety and unpleasant feelings due to earthquake experience. *Psychological Research, 9*, 104–117.
- Aduriz, M. E., Bluthgen, C., & Knopfler, C. (2011). Helping child flood victims using group EMDR intervention in Argentina: Treatment outcome and gender differences. *International Perspectives in Psychology, Research, Practice, Consultation, 1*, 58–67. <http://dx.doi.org/10.1037/2157-3883.1.S.58>
- Bisson, J., & Andrew, M. (2009). Psychological treatment of post-traumatic stress disorder (PTSD). *Cochrane Database of Systematic Reviews 2009, 3*, 1–99. <http://dx.doi.org/10.1002/14651858.CD003388.pub3>
- Bisson, J. I., & Deahl, M. P. (1994). Psychological debriefing and prevention of posttraumatic stress—More research is needed. *British Journal of Psychiatry, 165*, 717–720. <http://dx.doi.org/10.1192/bjp.165.6.717>
- Chemtob, C. M., Nakashima, J., & Carlson, J. G. (2002). Brief treatment for elementary school children with disaster-related posttraumatic stress disorder: A field study. *Journal of Clinical Psychology, 58*, 99–112. <http://dx.doi.org/10.1002/jclp.1131>
- Davidson, P. R., & Parker, K. C. H. (2001). Eye movement desensitization and reprocessing (EMDR): A meta-analysis. *Journal of Consulting and Clinical Psychology, 69*, 305–316. <http://dx.doi.org/10.1037/0022-006X.69.2.305>
- De Roos, C., Greenwald, R., den Hollander-Gijsman, M., Noorthoorn, E., van Buuren, S., & de Jongh, A. (2011). A randomised comparison of cognitive behavioural therapy (CBT) and eye movement desensitisation and reprocessing (EMDR) in disaster exposed children. *European Journal of Psychotraumatology, 2*, 1–11. <http://dx.doi.org/10.3402/ejpt.v2i0.5694>
- Fan, F., Zhang, Y., Yang, Y., Mo, L., & Liu, X. (2011). Symptoms of posttraumatic stress disorder, depression, and anxiety among adolescents following the 2008 Wenchun earthquake in China. *Journal of Traumatic Stress Studies, 24*, 44–53. <http://dx.doi.org/10.1002/jts.20599>
- Fernandez, I. (2007). EMDR as treatment of post-traumatic reactions: A field study on child victims of an earthquake. *Educational and Child Psychology, 24*, 65–73. Retrieved from <http://www.coe.int/t/dg4/majorhazards/ressources/virtuallibrary/materials/italy/ECP%20fernandez.pdf>
- Fernandez, I., Gallinari, E., & Lorenzetti, A. (2004). A school-based EMDR intervention for children who witnessed the Pirelli Building airplane crash in Milan, Italy. *Journal of Brief Therapy, 2*, 129–136. Retrieved from http://scholar.google.co.uk/scholar?hl=en&q=A+schoolbased+EMDR+intervention+for+children+who+witnessed+the+Pirelli+Building+airplane+crash+in+Milan%2C+Italy&btnG=&as_sdt=1%2C5&as_sdtp

- Fernandez, I. (2007). EMDR as treatment of post-traumatic reactions: A field study on child victims of an earthquake. *Educational and Child Psychology, 24*, 65–73.
- Foa, E. B., & Meadows, A. (1997). Psychosocial treatments for posttraumatic stress disorder: A critical review. *Annual Review Psychology, 48*, 449–480. <http://dx.doi.org/10.1146/annurev.psych.48.1.449>
- Foa, E. B., Riggs, D. S., Dancu, C. V., & Rothbaum, B. O. (1993). Reliability and validity of a brief instrument for assessing posttraumatic stress disorder. *Journal of Traumatic Stress, 6*, 459–473.
- Garrison, C. Z., Bryant, E. S., Addy, C. L., Spurrier, P. G., Freedy, J. R., & Kilpatrick, D. G. (1995). Posttraumatic stress disorder in adolescents after Hurricane Andrew. *Journal of the American Academy of Child and Adolescent Psychiatry, 34*, 1193–1201. <http://dx.doi.org/10.1097/00004583-199509000-00017>
- Gelbach, R. A. (2008). Trauma, research, and EMDR: A disaster responder's wish list. *Journal of EMDR Practice and Research, 2*, 146–155. <http://dx.doi.org/10.1891/1933-3196.2.2.146>
- Grainger, R. D., Levin, C., Allen-Byrd, L., Doctor R. M., & Lee, H. (1997). An empirical evaluation of eye movement desensitization and reprocessing (EMDR) with survivors of a natural disaster. *Journal of Traumatic Stress, 10*, 665–667. <http://dx.doi.org/10.1002/jts.2490100412>
- Horowitz, M. J., Wilner, N. R., & Alvarez, W. (1979). Impact of event scale. A measure of subjective stress. *Psychosomatic Medicine, 41*, 209–218.
- Ichii, M. (1997). Application of eye movement desensitization and reprocessing (EMDR) to survivors of the great Hanshin-Awaji earthquake: Treatment with less stress for stress disorder. *Journal of Biofeedback Research, 24*, 38–44. Retrieved from http://emdr.nku.edu/emdr_subject.php?subject=Natural%20Disasters
- Jarero, I., Artigas, L., & Hartung, J. (2006). EMDR Integrative Group Treatment Protocol: A post-disaster trauma intervention for children and adults. *Traumatology, 12*, 121–129. <http://dx.doi.org/10.1177/1534765606294561>
- Jarero, I., Artigas, L., & Luber, M. (2011). The EMDR protocol for recent critical incidents: Application in a disaster mental health continuum of care context. *Journal of EMDR Practice and Research, 5*, 82–94. <http://dx.doi.org/10.1891/1933-3196.5.3.82>
- Jayatunge, R. M. (2008). Combating tsunami disaster through EMDR. *Journal of EMDR Practice and Research, 2*, 140–145. <http://dx.doi.org/10.1891/1933-3196.2.2.140>
- Jones, R. (1997). Child's reaction to traumatic events scale (CRTES). In Wilson, J., Keane, T. (Eds.), *Assessing psychological trauma & PTSD*. New York, NY: Guilford Press.
- Kar, N., & Bastia, B. K. (2006). Post-traumatic stress disorder, depression and generalised anxiety disorder in adolescents after a natural disaster: A study of comorbidity. *Clinical Practice and Epidemiology in Mental Health, 2*, 1–7. <http://dx.doi.org/10.1186/1745-0179-2>
- Katz, C. L., Pellegrino, L., Pandya, A., Ng, A., & DeLisi, L. E. (2002). Research on psychiatric outcomes and interventions subsequent to disasters: A review of the literature. *Psychiatry Research, 110*, 201–217. [http://dx.doi.org/10.1016/S0165-1781\(02\)00110-5](http://dx.doi.org/10.1016/S0165-1781(02)00110-5)
- Kendler, K. S., Karkowski, L. M., & Prescott, C. A. (1998). Stressful life events and major depression: Risk period, long-term contextual threat, and diagnostic specificity. *Journal of Nervous and Mental Disease, 186*, 661–669. <http://dx.doi.org/10.1097/00005053-199811000-00001>
- Kirmayer, L. J., Lemelson, R., & Barad, M. (2007). *Understanding trauma. Integrating biological, clinical, and cultural perspectives*. New York, NY: Cambridge University Press. Retrieved from <http://books.google.co.uk/books?id=DXvpbu0tusMC&printsec=frontcover#v=onepage&q&f=false>
- Konuk, E., Knipe, J., Eke, I., Yuksek, H., Yurtsever, A., & Ostep, S. (2006). The effects of eye movement desensitization and reprocessing (EMDR) therapy on posttraumatic stress disorder in survivors of the 1999 Marmara, Turkey, earthquake. *International Journal of Stress Management, 13*, 291–308. <http://dx.doi.org/10.1037/1072-5245.13.3.291>
- La Greca, A. M., Silverman, W. K., & Wasserstein, S. B. (1998). Children's predisaster functioning as a predictor of posttraumatic stress following Hurricane Andrew. *Journal of Consulting and Clinical Psychology, 66*, 883–892. <http://dx.doi.org/10.1037/0022-006X.66.6.883>
- Lo, H. W. A., Su, C., & Chou, F. H. (2012). Disaster psychiatry in Taiwan: A comprehensive review. *Journal of Experimental and Clinical Medicine, 4*, 77–81. <http://dx.doi.org/10.1016./j.jecm.2012.01.005>
- Maxfield, L., & Hyer, L. (2002). The relationship between efficacy and methodology in studies investigating EMDR treatment of PTSD. *Journal of Clinical Psychology, 58*, 23–41. <http://dx.doi.org/10.1002/jclp.1127>
- National Institute for Clinical Excellence. (2005). *Posttraumatic stress disorder (PTSD): The management of PTSD in adults and children in primary and secondary care*. London, United Kingdom: Author.
- Neria, Y., Nandi, A., & Galea, S. (2007). Post-traumatic stress disorder following disasters: A systematic review. *Psychological Medicine, 38*, 467–480. <http://dx.doi.org/10.1017/S0033291707001353>
- North, C. S. (2007). Epidemiology of disaster mental health. In R. J. Ursano, C. S. Fullerton, L. Weisaeth, & B. Raphael (Eds.), *Textbook of disaster psychiatry* (pp. 29–47). Cambridge, United Kingdom: Cambridge University Press. <http://dx.doi.org/10.1017/CBO9780511544415>
- North, C. S., Smith, E. M., & Spitznagel, E. L. (1994). Post-traumatic stress disorder in survivors of a mass shooting. *American Journal of Psychiatry, 151*, 82–88. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/8267140>
- Norris, F. H., & Wind, L. H. (2009). The experience of disaster: Trauma, loss, adversities, and community ef-

- fects. In Y. Neria, S. Galea, & F. H. Norris (Eds.), *Mental health and disasters* (pp. 29–45). New York, NY: Cambridge University Press. <http://dx.doi.org/10.1017/CBO9780511730030.003>
- Pollice, R., Bianchini, V., Roncone, R., & Casacchia, M. (2011). Marked increase in substance use among young people after L'Aquila earthquake. *European Child and Adolescent Psychiatry, 20*, 429–430. <http://dx.doi.org/10.1007/s00787-011-0192-2>
- Pynoos, R. S., Frederick, C., Nader, K., Arroyo, W., Steinberg, A., & Eth, S., et al. (1987). Life threat and posttraumatic stress in school-age children. *Archives of General Psychiatry, 44*, 1057–1063.
- Roos, R., Benjamin, A., de Roos, C., Meijer, A. M., & Stams, G. J. (2009). Efficacy of EMDR in children: A meta-analysis. *Clinical Psychology Review, 2*, 1–8. <http://dx.doi.org/10.1016/j.cpr.2009.06.008>
- Rubonis, A. V., & Bickman, L. (1991). Psychological impairment in the wake of disaster: The disaster-psychopathology relationship. *Psychological Bulletin, 3*, 384–399. <http://dx.doi.org/10.1037//0033-2909.109.3.384>
- Seidler, G. H., & Wagner, F. E. (2006). Comparing the efficacy of EMDR and trauma-focused cognitive-behavioral therapy in the treatment of PTSD: A meta-analytic study. *Psychological Medicine, 36*(11), 1515–1522. <http://dx.doi.org/10.1017/S0033291706007963>
- Shapiro, F. (1995). *Eye Movement Desensitization and Reprocessing: Basic Principles, Protocols, and Procedures*. New York: Guilford Press.
- Shapiro, F. (2001). *Eye Movement Desensitization and Reprocessing, Basic Principles, Protocols and Procedures*. (2nd ed.). New York: The Guilford Press.
- Shapiro, F., & Maxfield, L. (2002). Eye movement desensitization and reprocessing (EMDR): Information processing in the treatment of trauma. *Psychotherapy in Practice, 58*, 933–946. <http://dx.doi.org/10.1002/jclp.10068>
- Solomon, R. M., & Shapiro, F. (2008). EMDR and the adaptive information processing Model: Potential mechanisms of change. *Journal of EMDR Practice and Research, 2*, 315–325. <http://dx.doi.org/10.1891/1933-3196.2.4.315>
- Terranova, A. M., Boxer, P., & Morris, A. S. (2009). Factors influencing the course of posttraumatic stress following a natural disaster: Children's reactions to Hurricane Katrina. *Journal of Applied Developmental Psychology, 30*, 3440355. <http://dx.doi.org/10.1016/j.appdev.2008.12.017>
- Ursano, R. J., Fullerton, C. S., Weisaeth, L., & Raphael, B. (2007). Individual and community responses to disasters. In R. J. Ursano, C. S. Fullerton, L. Weisaeth, & B. Raphael (Eds.), *Textbook of disaster psychiatry* (pp. 3–26). New York, NY: Cambridge University Press. <http://dx.doi.org/10.1017/CBO9780511544415>
- Van Rood, Y. R., & de Roos, C. (2009). EMDR in the treatment of medically unexplained symptoms: A systematic review. *Journal of EMDR Practice and Research, 3*, 248–263. <http://dx.doi.org/10.1891/1933-3196.3.4.248>
- Vernberg, E. M., La Greca, A. M., Silverman, W. K., & Prinstein, M. J. (1996). Prediction of post-traumatic stress symptoms in children after Hurricane Andrew. *Journal of Abnormal Psychology, 105*, 237–248.
- Watson, P. J. (2007). Early intervention for trauma-related problems following mass trauma. In R. J. Ursano, C. S. Fullerton, L. Weisaeth, & B. Raphael (Eds.), *Textbook of disaster psychiatry* (pp. 121–139). New York, NY: Cambridge University Press. <http://dx.doi.org/10.1017/CBO9780511544415>

Correspondence regarding this article should be directed to Fehmida Natha, Doctorate in Clinical Psychology, Lancaster University, Furness College, Faculty of Health and Medicine, Lancaster, LA1 4YG, United Kingdom. E-mail: f.patel@lancaster.ac.uk