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**TITLE**

**A wait-list controlled pilot study of Eye Movement Desensitization and Reprocessing (EMDR) for children with Posttraumatic Stress Disorder (PTSD) symptoms from motor vehicle accidents.**

Running Title: EMDR for treating childhood PTSD symptoms

Keywords: childhood, controlled, EMDR, PTSD, trauma

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## **ABSTRACT**

The present study investigated the efficacy of four EMDR sessions in comparison to a six week wait-list control condition in the treatment of 27 children (aged 6 to 12 years) suffering from persistent PTSD symptoms after a motor vehicle accident. An effect for EMDR was identified on primary outcome and process measures including the Child Post Traumatic Stress – Reaction Index, clinician rated diagnostic criteria for PTSD, Subjective Units of Disturbance and Validity of Cognition scales. All participants initially met two or more PTSD criteria. After EMDR treatment, this decreased to 25% in the EMDR group but remained at 100% in the wait-list group. Parent ratings of their child’s PTSD symptoms showed no improvement, nor did a range of non-trauma child self-report and parent-reported symptoms. Treatment gains were maintained at three and 12 month follow up. These findings support the use of EMDR for treating symptoms of PTSD in children, although further replication and comparison studies are required.

## **INTRODUCTION**

Although trauma-focused cognitive behaviour therapy (TF-CBT) is effective for treating PTSD in children and adolescents after physical or sexual abuse (Silverman et al., 2008), treatments for psychological dysfunction after single event paediatric trauma (e.g., motor vehicle accidents) (McDermott & Cvitinovich, 2000; Carrion, Weems, Ray & Reiss, 2002) are yet to be established. However, Eye Movement Desensitisation and Reprocessing (EMDR) holds some promise (Silverman et al., 2008). Of the three controlled studies that support the efficacy of EMDR with children (Ahmad, Larsson, & Sundelin-Wahlsten, 2007; Chemtob, Nakashima, & Carlson 2002; Jaberghaderi, Greenwald, Rubin, Zand & Dolatabadi, 2004), only one involved exposure to a single traumatic event (i.e., hurricane Iniki) (Chemtob et al., 2002). Three uncontrolled group studies (Fernandez, 2007; Oras, De Ezpeleta & Ahmad, 2004; Puffer, Greenwald & Elrod, 1998) and several case reports (Cocco & Sharpe, 1993; Greenwald, 1994; Pellicer, 1993; Tufnell, 2005) have also supported the use of EMDR with child and adolescent populations. Findings suggest that EMDR can significantly reduce post-traumatic stress disorder (PTSD) and non-trauma symptoms such as anxiety and depression.

In the present study, the efficacy of EMDR was investigated against a wait-list control condition for children with PTSD symptoms from motor vehicle accidents. In comparison to the wait-list group, participants in the EMDR group were expected to show significant improvement in PTSD symptoms, process measures and non-trauma symptoms (anxiety, depression and behavioural problems).

## **METHOD**

### **Participants**

Over a four year period, 27 pre-adolescents (15 boys, 12 girls) were entered into the study following their admission to a hospital emergency department after a motor vehicle accident. Participants ranged from 6.00 to 12.65 years of age ( $M = 8.93$ ,  $SD = 1.78$ ), and between 3.33 and 19.82 months ( $M = 8.35$ ,  $SD = 3.48$ ) had elapsed since their accident. Participants were recruited from 404 motor vehicle accident victims who were first contacted by phone; 154 (38.4%) potential participants were sent information about the study and 56 (36.4%) of these attended an initial assessment. Of 38 eligible participants, five dropped out before the commencement of the study and six were screened out due to co-morbid conditions. Three participants dropped out of the study from pre- to post-treatment (EMDR = 1; wait-list = 2; participation rate 88.9%), and two dropped out from post-treatment to three-month follow-up (participation rate 81%). A further seven participants were lost at 12 month follow-up (participation rate 55%).

For inclusion in the study participants needed to be 6 to 12 years of age and to score at least 12 on the Child Post-Traumatic Stress - Reaction Index (Frederick & Pynoos, 1988; Frederick, Pynoos & Nader, 1992) or meet at least two DSM-IV criteria (including exposure) for PTSD. Participants were excluded if they; were taking psychotropic medication, had concurrent psychological conditions (e.g., major depressive disorder or attention deficit disorder), a past history of sexual and physical abuse or neglect, or had suffered a serious head injury with persistent associated neurological dysfunction or scores in Accident and Emergency less than 12 on the Glasgow Coma Scale (Teasdale & Jennett, 1974, 1976).

## Measures

To determine the efficacy of the EMDR intervention, outcome measures were taken at pre- and post-treatment, and three and 12 month follow-up.

### *Primary Outcome Measures:*

#### *i) PTSD (DSM-IV) Diagnostic Criteria*

A systematic clinical assessment was used to confirm exposure to trauma, re-experiencing, avoidance and arousal criteria (McDermott & Cvitanovich, 2000).

#### *ii) Child Post-Traumatic Stress - Reaction Index (Child PTS-RI)*

The Child PTS-RI (Pynoos & Nader, 1988; Frederick, Pynoos & Nader, 1992) has been widely used in child trauma research and has very good psychometric properties (McNally, 1996; Steinberg, Brymer, Kelly, Decker & Pynoos, 2004).

### *Secondary Outcome Measures:*

Various secondary and process measures (*Subjective Units of Disturbance*; Wolpe, 1982; and *Validity of Cognition scales*; Shapiro, 1989) were taken to corroborate any improvements in trauma-specific symptoms and to determine whether such improvements generalised to non-trauma symptoms such as anxiety (*State Trait Anxiety Inventory for Children*; Spielberger, 1973; Hedl & Papay, 1982; Papay & Spielberger, 1986), depression (*Children's Depression Scale*; Lang & Tisher, 1983; Tisher, Lang-Takac & Lang 1992; Tisher, 1995) and behavioural problems (*Child Behaviour Checklist*; Achenbach, 1991; Saxe et al., 2003; Vila et al., 2001). Parent measures included known correlates of childhood PTSD that were likely to impact upon recovery (Langeland & Olf, 2008) (the *Child Post-Traumatic Stress - Reaction Index: Parent Questionnaire* (henceforth referred to as the Parent PTS-RI), Nader, 1994; *General Health Questionnaire – 12*, Goldberg,

1978; the *Impact of Events Scale*, Horowitz, Wilner, & Alvarez, 1979; the *General Functioning Scale* derived from the Family Assessment Device; Epstein, Baldwin & Bishop, 1983; and a checklist of social stressors).

### **Procedure**

Participants were randomly assigned to either the wait-list control (N = 14) or EMDR group (N = 13). EMDR treatment consisted of four 60-minute sessions delivered by the lead author (M.K.), a doctoral level psychologist with advanced EMDR training, every 7-10 days over a six week period. The six-week wait-list period was similar to the average waiting time for treatment at a local community child and adolescent mental health clinic. To ensure that the wait-list participants had the opportunity to benefit from active treatment, they received EMDR treatment (using the same protocol) after the wait-list period. Modifications were made to the standard EMDR protocol (Shapiro, 1995, 2001) to suit the age and developmental level of participants (see Appendix 1).

### **Treatment Fidelity**

An experienced Child Clinical Psychologist who had completed advanced EMDR training viewed 11 video-taped treatment sessions and rated them for adherence to the EMDR treatment protocol. Ratings were made on a 0 to 5 scale of acceptability similar to that used by Pitman et al. (1996) and Rothbaum (1997). The fidelity rater also provided feedback to the therapist so that any deficits in the treatment could be addressed. The mean treatment fidelity rating was 4.27, SD (0.61) which falls between “acceptable” and “highly acceptable”.

### **Statistical analysis**

Chi square and independent t-tests were conducted to investigate pre-treatment differences between the EMDR and wait-list groups. Experimental effects were investigated using

three MANOVA's with time (pre- vs post-treatment) as the within-subject factor and group (EMDR vs wait-list) as the between-subject factor. The variable groupings for the MANOVA's consisted of: i) the primary outcome measures (PTSD diagnosis, Child PTS-RI scores), ii) process measures, iii) child self-report measures (state and trait anxiety, and total depression and total positive scores on the *Children's Depression Scale*), iv) parent ratings of children, and v) parent self-report and other measures. Where overall (group x time) treatment effects were identified, univariate ANOVA's were conducted with *a priori* planned contrasts to delineate treatment effects. Where appropriate, the Greenhouse-Geisser adjustment was applied to the degrees of freedom to correct for violations of the sphericity assumption.

Since there were no significant changes across measures from before to after the wait-list period in the wait-list group, the EMDR and delayed treatment data were combined for further statistical analysis. Due to the loss of participants at 12 month follow up, separate MANOVA's were used to investigate effects at post-treatment and three- and 12-month follow up.

## **RESULTS**

### **Case Vignettes**

#### *Jack*

Jack, aged 6, was riding a skateboard (lying on his back) on the road when he lost control and a car ran over his leg resulting in a tibia and fibula fracture. Nine months after his accident, his initial Child PTS-RI score was 25 (moderate) and he met DSM-IV PTSD criteria for exposure and re-experiencing.

Early in the first treatment session a safe place was established by asking Jack to complete a few sets of eye movements whilst vividly recalling, in terms of images, emotions and

body sensations, a time when he felt really happy and was having fun (e.g., visiting a local play area called “the fun factory”). Jack also practiced using the stop signal, by holding his hand up or turning his head, or saying “stop”, a few times to promote his sense of control.

Jack was then asked to look at his drawing of the accident, to “imagine or remember the worse part of it” and to say to himself “I’m going to die” (his negative cognition). Jack’s extreme level of discomfort (i.e., SUDS rating of 10), concordant non-verbal behaviour (holding his breath, widened eyes and restlessness) and limited initial responsiveness, led the therapist to acknowledge his obvious fear (the therapist noted “you’re doing fine, it can be really hard to think about frightening memories like accidents and to do eye movements at the same time”). The therapist then asked if it would help Jack to imagine looking at the accident from further away; “perhaps you could imagine looking through a window at your accident or watching your accident on TV; would that help make it easier?” Desensitisation resumed after Jack replied “I want to imagine looking through the window of a car”. Providing Jack with options in how he recalled his accident was intended to promote his sense of control.

Sometimes children were encouraged to bring their favourite toy to the therapy session to incorporate into the therapy. Jack brought his toy Kangaroo named “Joey” to the second session. The session commenced with the safe place exercise and Joey (instead of the therapist’s hand) became the visual stimulus. The therapist gave Joey a voice (and jumping sound effects) during the eye movements (i.e., Joey asked Jack, “can I come to the fun factory too?”) and in response Jack laughed and smiled. In line with the initial treatment session, Jack was given a choice of how he recalled his accident (i.e., looking at his drawing and remembering the worst part of the accident, looking at his accident through a car window or watching it on TV). He chose to look at his drawing. To promote engagement and to enhance Jack’s sense of safety and security, Jack was asked if Joey

could help with the eye movements. Desensitisation proceeded and Jack disclosed new and distressing material relating to his medical treatment (e.g., the painful experience of having his plaster cast removed). Throughout the session Jack stopped the eye movements on several occasions. After he complained of some eye soreness, the finger flicking technique was instigated. That is, instead of watching Joey move back and forth, the therapist held both fists approximately 1200mm apart and Jack was asked to track the alternate raising of the therapist's fingers. Desensitisation proceeded and after successive sets of eye movements Jack reported several accident-related memories (e.g., being under the car and screaming "get it off me!"; intense fear, and his father's anger). To further reinforce Jack's engagement and sense of control over the therapy process, he was given the option of completing one, three or five more sets of eye movements as the session drew to a close; he chose just one.

Towards the end of the third treatment session, Jack reported several accident-related memories (e.g., screaming under the car and going down the hill on the skateboard) and after recalling his father swearing, he moved his chair a little further away from the therapist. He crouched behind the backrest of the chair and gradually peaked over the top of it. Despite this overt behaviour, the desensitisation procedure continued and, after successive sets of eye movements, Jack reported numerous further trauma-related images or memories (e.g., images of the hospital, having the plaster taken off and the associated pain). His SUDS rating at the end of the third session was 8.5.

Surprisingly, Jack said that he felt "safe" at the start of the fourth session. As the session progressed and his SUDS continued to be rated as zero, Jack completed sets of eye movements whilst he imagined his accident memory and repeated the phrase "I'm OK now" (his positive cognition) to himself. He then repeated the same words to himself as he completed further sets of eye movements and imagined himself successfully skateboarding

in the future. He smiled as he pictured himself riding his skateboard in a standing position and saving Joey from a motor vehicle accident. At post treatment, Jack's SUDS remained at 0 and his VOC increased from 3 to 4.5 out of 7. He no longer met DSM-IV PTSD criteria for re-experiencing and his Child PTS-RI scores at post-treatment, three- and 12-month follow-up were 14 (mild), 7 (doubtful) and 10 (doubtful) respectively.

### *Steve*

Steve, aged 12, was crossing a busy highway when he was hit by a car and sustained a fractured tibia and fibula. He was transported to hospital by ambulance and was admitted to hospital for surgery. Four months after his accident Steve met DSM-IV PTSD criteria for exposure, re-experiencing and arousal, and even though his initial SUDS rating was seven, he acknowledged only mild symptoms levels on the Child PTS-RI.

Treatment commenced with the usual safe place exercise and practice using the stop signal. Desensitisation progressed into the later half of the session, at which point Steve reported strong accident-related feelings and a new negative cognition ("I'm useless"). He stated "my brain is reluctant to think and it wants to go home". To promote Steve's sense of control over the therapy process, he was subsequently given the option of completing three, five or 10 more sets of eye movements. Despite his obvious distress, he chose to complete 10 further sets of eye movements. When cognitive responses persisted during subsequent sets of eye movements (e.g., "I feel sorry for my brain"), he was directed to any associated body sensations (i.e., the therapist asked, "where do you feel that in your body?"). His subsequent responses included numerous images of his favourite video game and the various characters representing monsters and heroes.

During further desensitisation in session two, cognitive interweave (Shapiro, 1995) was employed to combat Steve's extreme level of fear after he stated "I don't ever want to

cross roads” and “I’m never going to be safe for the rest of my life”. This involved ‘Socratic’ questioning followed by sets of eye movements. For example, Steve was asked how many accidents he had had whilst crossing a road (“one”), and how many times he had crossed a road in his life (“thousands”). The therapist then said, “so you have had one serious accident in thousands of road crossings, which means the chance of you having an accident is....?” (“one in a billion” replied Steve).

During the third session, Steve’s memory of his pet being killed on the road was targeted using EMDR and Steve’s associated SUDS decreased from 5 to 2. Unexpectedly, Steve then mimed crossing the road and being hit by car. He completed sets of eye movements as he repeated this and he seemed amused by his own actions.

With continued desensitisation during the final treatment session, Steve’s SUDS rating reached zero. The installation of his two positive cognitions was then completed (“I’m in control now” and “It’s over and I’m safe now”). At the end of treatment his VOC ratings had increased from 2 to 7, and he no longer met DSM-IV PTSD criteria for re-experiencing or arousal. His Child PTS-RI scores improved from 16 (mild) at pre-treatment to 8 (doubtful) or below at post-treatment, three- and 12-month follow-up.

### **Pre Treatment Sample Characteristics**

Despite random allocation to group, wait-list parents reported higher self-reported health problems on the GHQ – 12 [ $t(23) = -2.14, p < .05$ ] and IES avoidance subscale [ $t(23) = -2.06, p < .05$ ] (see Table 1). There were also significantly more girls in the wait-list group than in the EMDR group ( $n = 9$  versus 3) [ $\chi^2(1, n=27) = 4.64, p < .05$ ]. An ANCOVA showed no significant covariation between these three variables and outcome measures. The groups were otherwise equivalent at pre-treatment on all outcome measures, demographic and trauma related variables.

### **Primary outcome measures**

A MANOVA of the primary outcome measures revealed a significant main effect for time [ $F(2,21) = 8.78, p < .01$ ] and an interaction between group and time [ $F(2,21) = 10.08, p = .001$ ]. Univariate ANOVA confirmed significant main effects for time (Child PTS-RI scores [ $F(1,22) = 15.69, p = .001$ ]; number of DSM-IV PTSD criteria [ $F(1,22) = 6.96, p < .05$ ]), and interaction effects for group and time (Child PTS-RI scores [ $F(1,22) = 8.23, p < .01$ ]; number of DSM-IV PTSD criteria [ $F(1,22) = 17.82, p < .001$ ]). In a secondary statistical analysis (MANCOVA) that controlled for group differences at baseline, the group and time interaction remained significant [ $F(2,17) = 9.32, p < .01$ ].

*A priori* contrasts identified a significant pre to post reduction in the number of DSM-IV PTSD criteria [ $t(11) = 4.17, p < .01$ ] and Child PTS-RI scores [ $t(11) = 4.26, p = .001$ ] for the EMDR group but not for the wait-list group (Figures 1A & 1B). There was also a significant difference between groups at post treatment, but not at pre-treatment, in the number of DSM-IV PTSD criteria [ $t(22) = 4.00, p = .001$ ] and Child PTS-RI scores [ $t(22) = 2.38, p < .05$ ].

Differences between groups in the rate of clinically significant improvement were determined by using Chi Square analysis to compare the number of participants in each group meeting two or more, and three or more PTSD criteria. Pre to post treatment, the proportion of participants in the EMDR group meeting two or more criteria decreased from 100% to 25% in the EMDR group, but did not change in the wait-list group [ $\chi^2(1, n=24) = 14.40, p < .001$ ].

A MANOVA of the primary outcome measures for the combined data confirmed multivariate effects for time from pre- to post-treatment and three-month follow-up [ $F(4,18) = 15.86, p < .001$ ] [ $F(1,18) = 9.77, p < .001$ ] and from post-treatment to 12-month follow-up [ $F(2,13) = 6.56, p < .05$ ]. Univariate ANOVA's with planned contrasts confirmed pre- to post-treatment improvement for both the number of DSM-IV PTSD criteria [ $F(1,21) = 32.09, p < .001$ ] and Child PTS-RI scores [ $F(1,21) = 46.14, p < .001$ ] (Figures 1C & 1D). Child PTS-RI scores, but not the number of DSM-IV PTSD criteria, significantly improved from post-treatment to three-month follow-up [ $F(1,21) = 4.78, p < .05$ ] and both the number of DSM-IV PTSD criteria [ $F(2,13) = 9.33, p < .01$ ] and Child PTS-RI scores [ $F(2,13) = 13.38, p < .01$ ] improved from post-treatment to 12-month follow-up (Figures 1C & 1D).

From post-treatment to three-month follow-up, the number of participants meeting two or more criteria improved from eight (34.8%) to five (22.7%), and at 12-month follow-up only two participants (13.3%) met two or more criteria.

## **Secondary outcome measures**

### *Process measures*

A MANOVA revealed significant main effects for group [ $F(2, 20) = 5.41, p < .05$ ] and time [ $F(2, 20) = 14.99, p < .001$ ] and an interaction between group and time [ $F(2, 20) = 7.55, p < .01$ ]. Univariate ANOVA confirmed a significant main effect for time for SUDS [ $F(1,21) = 31.22, p < .001$ ], but not for VOC ratings. There were interaction effects for group and time for both SUDS [ $F(1,21) = 11.22, p < .01$ ] and VOC ratings [ $F(1,21) = 10.80, p < .01$ ]. As expected, *a priori* contrasts identified a significant pre- to post-treatment reduction in SUDS ratings [ $t(12) = -6.34, p < .001$ ], and a significant increase in VOC ratings [ $t(12) = 3.41, p < .01$ ] for the EMDR group but not for the wait-list group (Figures

2A & 2B). There was also a significant difference between the EMDR and wait-list groups for SUDS [ $t(23) = -5.69, p < .001$ ] and VOC ratings [ $t(23) = 3.87, p < .001$ ] at post-treatment but not at pre-treatment. A repeated measures MANOVA of the process measures for the combined data confirmed multivariate main effects for time from pre- to post-treatment and three-month follow-up [ $F(4,18) = 14.78, p < .001$ ], but not from post-treatment to 12-month follow-up. Univariate ANOVA's with planned contrasts confirmed pre- to post-treatment improvement for SUDS [ $F(1,21) = 50.85, p < .001$ ] and VOC ratings [ $F(1,21) = 21.50, p < .001$ ] (Figures 2C & 2D).

#### *Secondary child and parent measures*

Separate MANOVA's investigating treatment effects for child self-report measures, parent ratings of children and other parent measures were all non-significant (see Figure 2 and Table 2).

MANOVA's of the combined data from pre- to post-treatment and three-month follow-up revealed a significant main effect for time for parent ratings of children [ $F(12,9) = 4.24, p < .05$ ] whilst child self-report and other parent measures were all non-significant (see Table 3). Similar MANOVA's of the combined data from post-treatment to 12-month follow-up were all non-significant. Univariate investigation of the main effects for time for parent ratings of children, with repeated contrasts, confirmed pre- to post-treatment improvement in Parent PTS-RI scores [ $F(1,20) = 19.68, p < .001$ ], CDS scores [ $F(1,20) = 5.85, p < .05$ ], and CBCL internalising [ $F(1,20) = 8.45, p < .01$ ] and externalising [ $F(1,20) = 7.54, p < .05$ ] (see Figure 2 and Table 3).

## **DISCUSSION**

The present investigation is only the second controlled study of EMDR for children afflicted by single event trauma, and the first study to examine the efficacy of the technique for the treatment of PTSD symptoms resulting from motor vehicle accidents. Independent ratings indicated that the EMDR treatment was delivered with a moderate to high level of fidelity. Four one-hour sessions of EMDR treatment proved more effective than a six-week wait-list control condition in alleviating PTSD symptoms as measured by Child PTS-RI scores and clinician rated PTSD diagnostic criteria. EMDR treatment also resulted in significant improvement on standard EMDR process measures.

Pre- to post-treatment effect sizes (Cohen's *d*; Cohen, 1988) for the EMDR group ranged from 1.16 for Child PTS-RI scores to 1.92 for SUDS scores. The former was comparable with the effect size of 1.55 obtained by Chemtob et al. (2002) and although non-trauma measures (self-reported anxiety and depression, and parent ratings of behaviour and depressive symptoms) did not show significant improvement, the significant improvement in PTSD symptoms in just four treatment sessions indicates that brief and focused treatments are of value for those afflicted by single-event trauma. These improvements were clinically significant. All participants initially met two or more PTSD (DSM-IV) criteria, whereas after EMDR treatment this decreased to 25% in the EMDR group. In addition, improvements in PTSD symptoms were maintained at three-month follow-up with some further improvement over the longer term in participants who could be contacted at 12-month follow-up.

The lack of pre- to post-treatment improvement on parent ratings of their children may reflect the subclinical characteristics of this population, or the lack of statistical power

resulting from the small sample size. In relation to the former, PTSD diagnostic rates, Child PTS-RI scores, and levels of co-morbid psychopathology were lower in this study than in other treatment samples (e.g., Chemtob et al., 2002; Farrell, Hains & Davies, 1998; Field, Seligman, Scafedo & Schanberg, 1996; Goenjian et al., 1997). Furthermore, child-rated anxiety and depression levels were in the normal range or only moderately elevated, and parent-rated Child Behaviour Checklist scores were notably lower than those associated with functional impairment (Carrion et al., 2002). Nevertheless, the failure of child and parent non-trauma measures to show significant improvement may indicate a specific treatment effect for EMDR on PTSD symptoms.

The main methodological limitation of this study is that a single therapist also completed the treatment and outcome assessments. Although the positive outcomes might be explained by the demand characteristics of EMDR, they could equally be explained by real treatment effects. In particular, it would be surprising for such demand effects to impact only on trauma measures at the exclusion of all non-trauma measures. However, the relatively small sample size and use of a subclinical population limit the degree to which the findings can be generalised to other traumatised child populations.

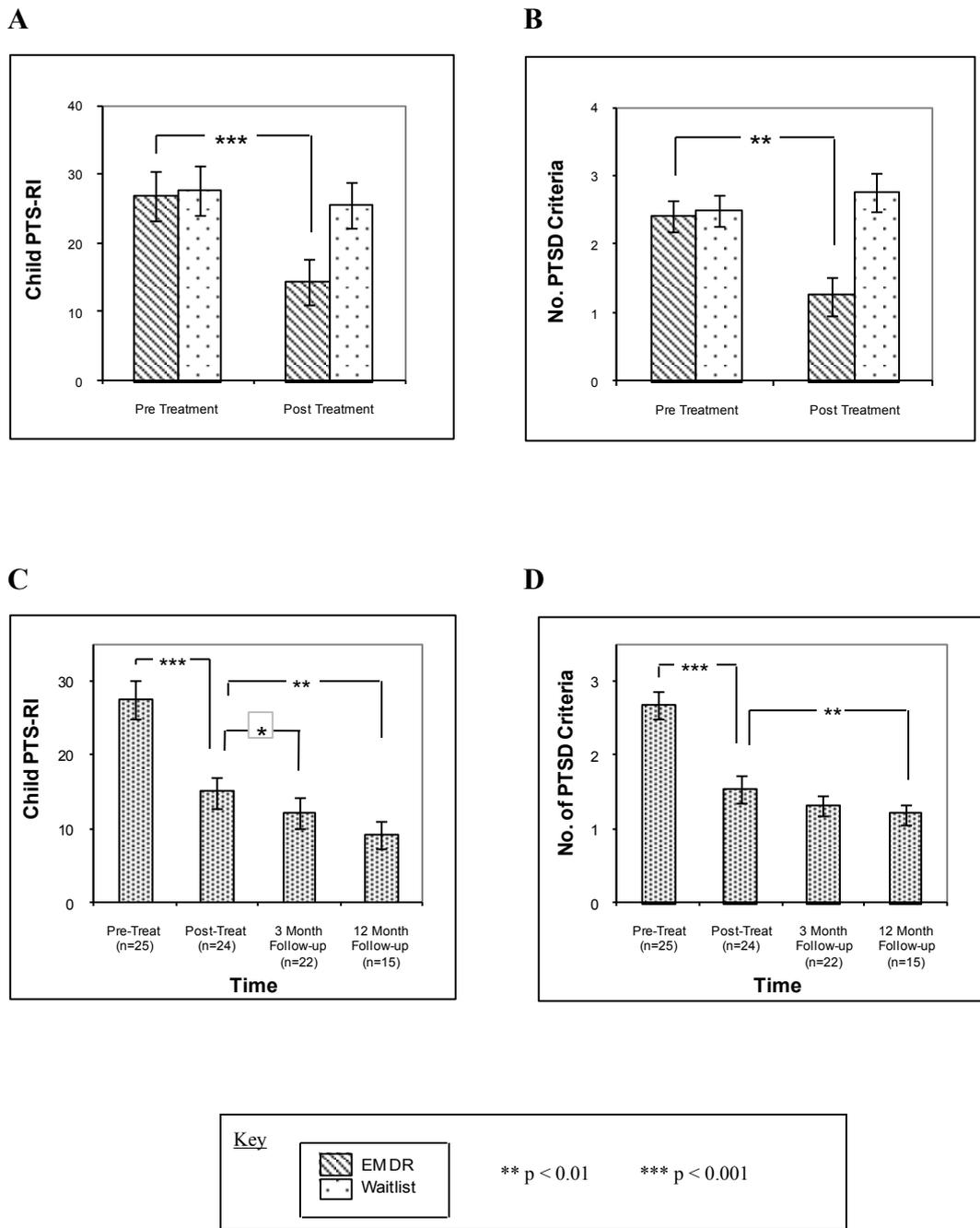
### **Future Research**

The immediate research priority should be to replicate the present findings with paediatric populations suffering PTSD symptoms (clinical and subclinical) following common single traumatic events (e.g., serious playground accidents, burns, anaphylaxis or falls). Obviously, larger sample sizes would increase statistical power and enable the investigation of any subtle treatment effects and predictors of treatment outcome. Comparison of EMDR with short versions of trauma-focused CBT would determine whether EMDR offers greater efficiency.

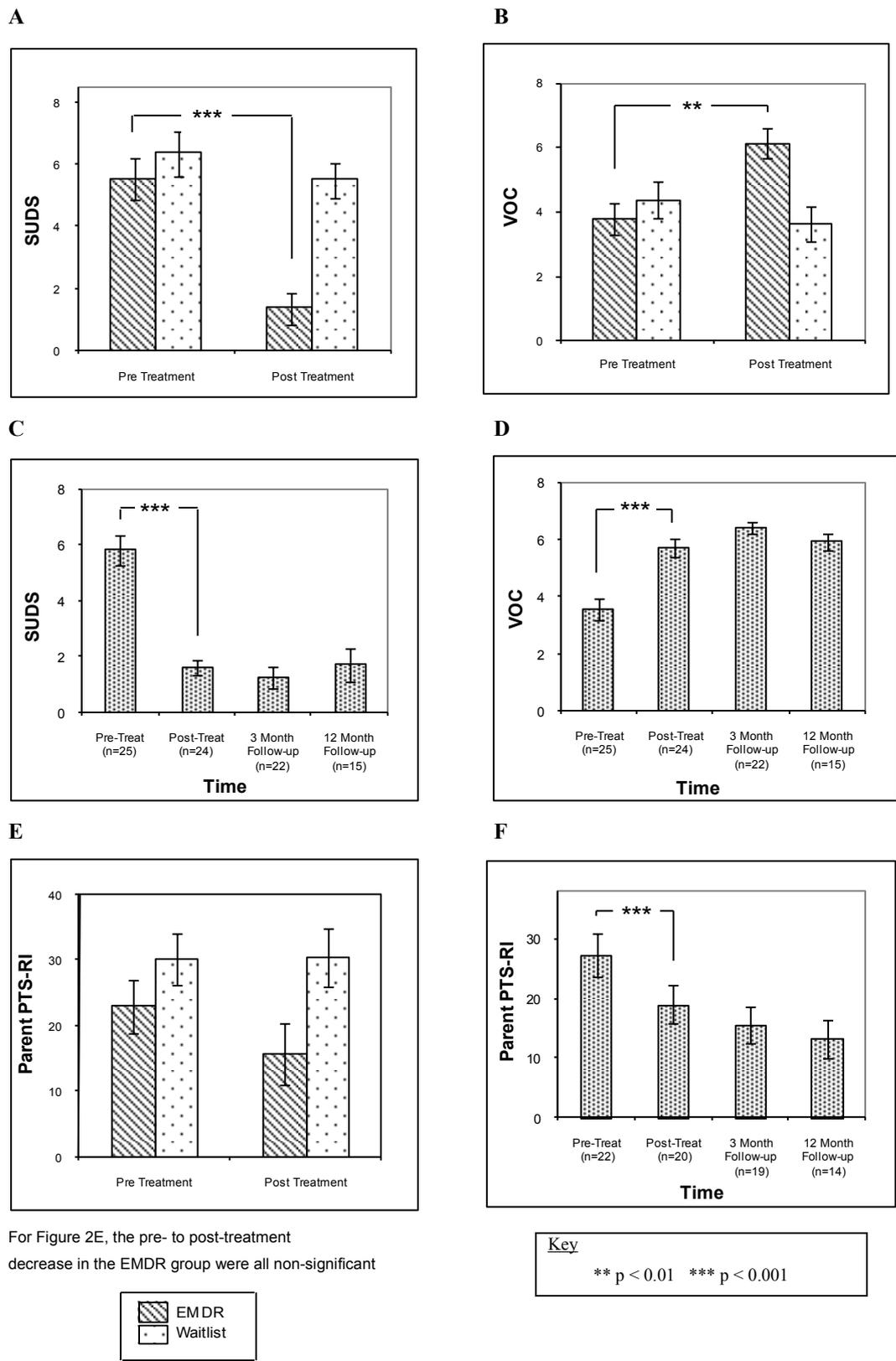
**Table 1 – Pre-treatment comparison of all measures**

Variable	EMDR		Wait-List		t	sig
	M	+ SD	M	+ SD		
<b><u>Primary Outcome Measures</u></b>						
Total No. of PTSD Criteria	2.46	± 0.66	2.64	± 0.63	0.73	n.s.
Child PTS-RI Total	25.92	± 12.18	27.29	± 12.58	0.29	n.s.
<b><u>Secondary Outcome Measures</u></b>						
<i>Process Measures</i>						
SUDS	5.54	± 2.90	6.00	± 2.04	0.46	n.s.
VOC	3.77	± 1.92	4.35	± 1.53	0.78	n.s.
<i>Child Self-Report Measures</i>						
STAIC - State Anxiety	28.69	± 4.53	32.21	± 8.40	1.34	n.s.
STAIC - Trait Anxiety	35.54	± 7.21	40.21	± 7.02	1.71	n.s.
CDS - Total Depression	135.69	± 25.63	140.69	± 29.06	0.46	n.s.
Total Positive	72.23	± 9.16	67.92	± 7.32	1.32	n.s.
<i>Parent Ratings of Child</i>						
Parent PTS-RI Total	21.73	± 12.14	30.0	± 15.43	1.42	n.s.
CBCL Total Score	34.67	± 22.60	45.77	± 33.45	0.96	n.s.
CDS Total Depression	107.42	± 21.62	114.23	± 31.48	0.62	n.s.
Total Positive	68.00	± 6.48	69.38	± 6.33	0.54	n.s.
<i>Parent Self-Report and Other Measures</i>						
IES Total	22.33	± 15.03	34.64	± 22.48	1.61	n.s.
IES - Intrusions	14.83	± 18.29	18.29	± 12.68	0.82	n.s.
IES - Avoidance	7.50	± 10.14	16.36	± 11.53	2.06	*p<.05
GHQ-12	1.25	± 1.91	3.93	± 3.95	2.14	*p<.05
GFS	20.92	± 4.19	19.42	± 4.42	0.51	n.s.
No stressors in past 12 months	1.25	± 1.91	1.62	± 1.33	0.56	n.s.

**Note:** 1. Table shows results of independent t tests. SUDS: Subjective Units of Disturbance; VOC: Validity of Cognition; STAIC: State Trait Anxiety Inventory for Children; CDS: Children's Depression Scale; PTS-RI: Children's Post Traumatic Stress - Reaction Index; CBCL: Child Behaviour Checklist.



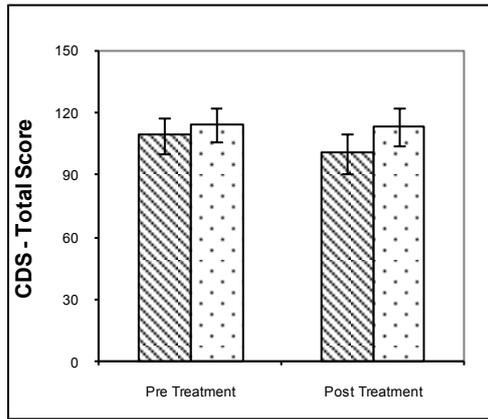
**Figure 1** – Change ( $\pm$ SE) in primary outcome measures from pre to post treatment and combined group data at three and 12 month follow-up



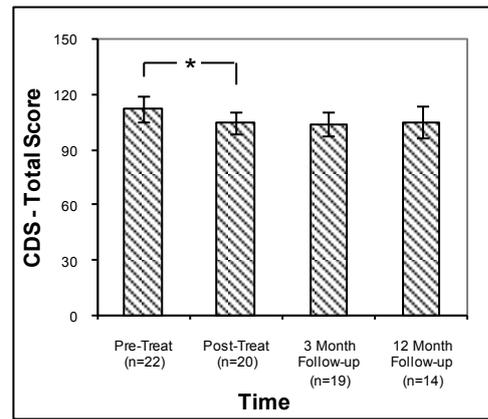
For Figure 2E, the pre- to post-treatment decrease in the EMDR group were all non-significant

**Figure 2** – Change ( $\pm$ SE) in secondary outcome measures from pre to post treatment and combined group data at three and 12 month follow-up

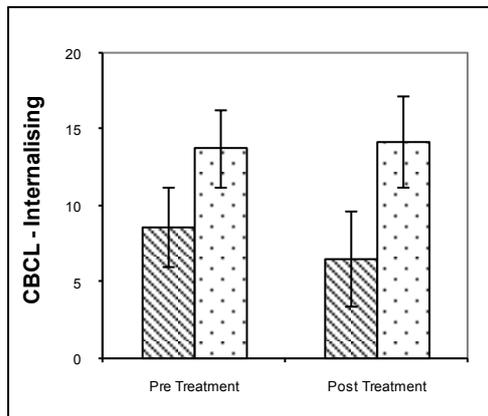
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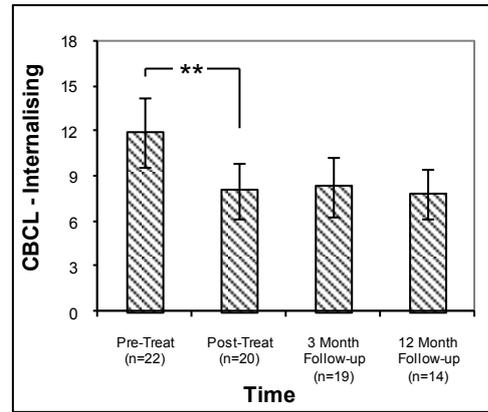
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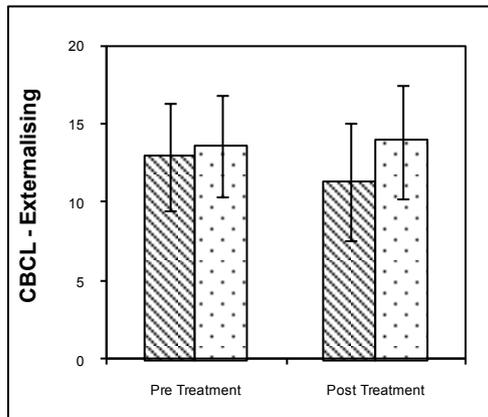
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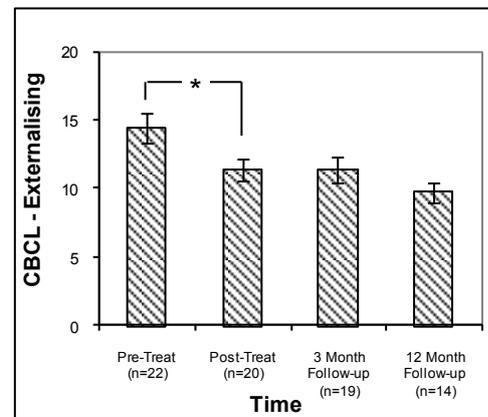
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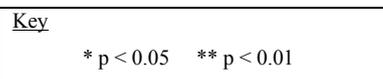
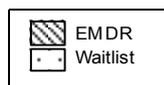
K



L



For Figures 2G, 2I & 2K, the pre- to post-treatment decreases in the EMDR group were all non-significant



**Figure 2 cont.. – Change ( $\pm$ SE) in secondary outcome measures from pre to post treatment and combined group data at three and 12 month follow-up. CDS: Children's Depression Scale; CBCL: Child Behaviour Checklist.**

**Table 2 – Pre- to post-treatment comparisons for non-trauma measures**

Variable	EMDR				Wait-List			
	Pre Treatment		Post Treatment		Pre Treatment		Post Treatment	
	M	+ SD	M	+ SD	M	+ SD	M	+ SD
<b><u>Secondary Outcome Measures</u></b>								
<i>Child Self-Report Measures</i>								
STAIC - State	28.50	± 4.68	28.83	± 3.35	32.33	± 8.37	31.67	± 6.83
STAIC - Trait	35.42	± 7.51	33.50	± 8.72	39.58	± 7.23	36.17	± 8.83
CDS Total	138.42	± 24.72	135.75	± 26.98	137.50	± 27.87	131.25	± 26.46
Total Positive	71.67	± 9.33	70.00	± 11.12	67.50	± 7.48	67.92	± 8.35
<i>Parent Ratings of Child</i>								
CBCL Total	36.73	± 22.49	28.45	± 22.34	30.10	± 34.16	43.17	± 40.16
CDS Total	109.09	± 21.85	100.00	± 19.76	116.36	± 33.62	113.45	± 40.77
Total Positive	68.18	± 6.76	71.45	± 5.41	69.50	± 6.60	70.33	± 9.06
<i>Parent Self-Report and Other Measures</i>								
IES Total	23.45	±15.23	12.64	±14.60	37.08	±23.47	27.83	±23.79
Intrusions	15.27	± 8.09	7.18	± 7.88	19.25	±13.48	13.33	±12.09
Avoidance	8.18	±10.34	5.45	± 8.13	17.83	±11.69	14.50	±13.83
GHQ	1.09	± 1.92	1.91	± 2.63	4.25	± 4.11	3.83	± 4.15
GFS	21.00	± 4.38	19.73	± 5.39	19.21	± 4.55	19.08	± 4.60
No. of stressors in past 12 months	0.88	± 0.64	0.88	± 0.83	1.63	± 1.06	2.13	± 1.55

Note: 1. There were no significant differences between the EMDR and Wait-list group from pre to post-treatment. STAIC: State Trait Anxiety Inventory for Children; CDS: Children's Depression Scale; CBCL: Child Behaviour Checklist; IES: Impact of Events Scale; GHQ: General Health Questionnaire; GFS: General Functioning Scale.

**Table 3 – Comparison of all measures from pre-treatment to 12-month follow-up**

Variable	Pre Treatment		Post Treatment		3 Month Follow-up		12 Month Follow-up	
	M	+ SD	M	+ SD	M	+ SD	M	+ SD
<b>Primary Outcome Measures</b>								
	N=25		N=23		N=21		N=15	
Total No. of PTSD Criteria Met	2.70 ± 0.82***		1.52 ± 0.85		1.33 ± 0.62		1.20 ± 0.56*	
Child PTS-RI Total	27.09 ± 12.22***		14.74 ± 9.73		12.14 ± 10.06		9.07 ± 7.19**	
<b>Secondary Outcome Measures</b>								
<i>Process Measures</i>								
SUDS	5.60 ± 2.60***		1.56 ± 1.28		1.25 ± 1.89		1.80 ± 2.33	
VOC	3.54 ± 1.97***		5.71 ± 1.59		6.40 ± 0.88		5.90 ± 1.10	
<i>Child Self-Report Measures</i>								
STAIC - State	30.13 ± 6.08		29.22 ± 4.98		28.29 ± 3.51		25.80 ± 3.90	
STAIC - Trait	36.00 ± 8.14		34.09 ± 8.85		32.38 ± 8.85		32.40 ± 8.10	
CDS Total	136.39 ± 24.67		128.83 ± 31.22		119.52 ± 32.99		117.20 ± 36.25	
Total Positive	69.57 ± 8.99		70.70 ± 9.54		71.62 ± 8.10		69.80 ± 10.40	
<i>Parent Ratings of Child</i>								
	N=22		N=20		N=19		N=14	
Parent PTS-RI Total	27.45 ± 17.25***		18.55 ± 15.00		15.37 ± 14.70		13.67 ± 12.45	
CBCL Total	40.91 ± 32.88		29.68 ± 30.12		31.80 ± 30.79		27.57 ± 20.85	
Internalising	11.55 ± 10.62**		7.73 ± 8.39		8.30 ± 9.30		7.86 ± 6.30	
Externalising	13.86 ± 11.93*		10.82 ± 12.27		11.40 ± 11.83		9.71 ± 8.43	
Total Comp.	15.88 ± 3.26		16.22 ± 2.90		16.34 ± 3.78		16.81 ± 3.80	
CDS Total	111.27 ± 31.99*		104.23 ± 26.24		104.10 ± 31.01		105.21 ± 31.25	
Total Positive	68.77 ± 7.70		70.18 ± 6.47		68.95 ± 6.91		70.00 ± 7.01	
<i>Parent Self-Report and Other Measures</i>								
IES Total	24.77 ± 19.74		14.59 ± 15.51		12.52 ± 15.15		14.00 ± 18.88	
Intrusions	14.09 ± 10.39		7.64 ± 8.67		6.00 ± 7.42		7.93 ± 10.19	
Avoidance	10.68 ± 12.12		6.95 ± 9.18		6.52 ± 8.58		6.07 ± 9.33	
GHQ	2.59 ± 3.57		2.00 ± 2.98		1.38 ± 2.82		1.07 ± 2.20	
GFS	20.18 ± 4.52		18.89 ± 5.07		19.78 ± 5.48		21.68 ± 4.73	
No. of stressors in past 12 months	1.53 ± 1.36		1.27 ± 0.88		1.43 ± 1.16		1.00 ± 0.82	

**Note:** 1. Asterisks denote values significantly different to post treatment (\* p<.05; \*\*p<.01; \*\*\*p<.001). PTS-RI: Children's Post Traumatic Stress - Reaction Index; SUDS: Subjective Units of Disturbance; VOC: validity of cognition; STAIC: State Trait Anxiety Inventory for Children; CDS: Children's Depression Scale; CBCL: Child Behaviour Checklist; IES: Impact of Events Scale; GHQ: General Health Questionnaire; GFS: General Functioning Scale.

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## **APPENDIX 1**

### **EMDR Protocol for Children**

Having reviewed the case studies and available child EMDR literature, the present protocol draws on other relevant literature and takes into account the age and developmental range of the present population. As with the adult protocol, a degree of flexibility was accepted in applying the protocol to suit the needs of particular children. The following section describes the nature of modifications in each of the eight phases of treatment.

#### **Phase 1 - Client History and Assessment**

A detailed assessment interview is recommended for traumatised children (Yule, 1994) and in terms of procedure, Shapiro (1995) has recommended that therapists initially see the child and parent together. In this way the general details of the child's trauma-related problems can be identified with the parent present, and then the child can be interviewed alone for their account of their trauma-related problems. According to Shapiro (1995), this two part process transfers the authority of the parent to the therapist and helps the child to feel special. It also allows both parent and child to overcome any initial anxiety and to establish some rapport with the therapist which obviously facilitates the assessment. Nader and Pynoos (1993) have found it useful to elicit the parents' worries and concerns regarding the trauma in order to screen for parents who need therapy for their own trauma-related difficulties, and to help parents understand their child's trauma reaction. Seeing the child alone decreases the chance that children will try to protect their parents by underreporting their symptoms. The use of drawing as part of the child's assessment is also recognised as a useful way to facilitate free discussion and gather information (eg. Pynoos & Eth, 1986).

Important aetiological factors in the development of child PTSD need to be assessed such as the severity of trauma exposure, parental trauma-related distress, and time since the trauma. Severity of trauma exposure can be assessed by proximity to the traumatic event, injury severity, suddenness of the event, the number of lives lost, the perception that one is going to die and observation of dead or mutilated bodies. Parental trauma-related distress can be assessed using standard adult assessments of PTSD, general health assessments and a clinical interview.

For research purposes it is obviously advantageous to employ multiple measures from various sources such as parents, child self-report and clinician ratings which include trauma-specific, process (eg., SUDs and VOC), and general behavioural measures. Measures of anxiety and depression are particularly important because of the well established comorbidity between anxiety and depressive disorders.

## **Phase 2 - Preparation**

Shapiro (1995) has explained that during this phase the therapist needs to adopt a client centred approach which is flexible, conveys unconditional positive regard, and supports the client's need for safety and reassurance. The primary task in this phase is to establish a safe place for the child so that if necessary the child could be guided to relax in order to contain a severe abreaction. The child was asked to recall a time when they felt in control, good, happy, confident or strong.

Whilst imagining themselves at this time (i.e. where they were, how it looked and felt in their body) they completed at least two sets of EM's until they reported or displayed (e.g. smiling) positive feelings congruent with their imagined scene. Apart from dealing with abreactions, the safe place was used to end sessions following incomplete processing, and it ensured that the EMDR procedure, particularly the EM's, were initially associated with positive, or at least neutral affects. Furthermore, commencing in this way allowed the therapist to test the child's level of comfort with EM's, and to determine the most suitable direction, distance and speed for the initial EM's. To reinforce the child's sense of safety and control, the child practised the use

of the stop signal (i.e. holding their hand up or turning their head, or saying “stop”). They were advised that if they needed to, they could stop the EM’s at any time (in phase 4 they were encouraged to keep engaging in EM’s as much as possible, but to stop the therapist if they really needed to).

Importantly, Shapiro (1995) has advised that EMDR should not be attempted unless the client has sufficient trust in the therapist and understands the importance of giving honest feedback about their progress. As for adults, the theory of EMDR was explained in appropriate language.

### **Phase 3: Assessment of Target Memory**

The two aims of this phase were to first help the child identify their traumatic image and associated negative cognition, positive cognition, emotions and body sensations, and second, to elicit their associated VOC and SUDs ratings. During phase 1, children completed a drawing of the “worse part of their accident” which was then used as the target or trigger for imaging their trauma. Although not utilised in this study, Shapiro (1995) has noted that images could also be encapsulated in children's drawings, play or games and these can be used as imaginal representations of trauma during EMDR if they are linked to trauma relevant feelings or cognitions. There has been one anecdotal report of a child drawing their problem (a black cloud) and holding this in mind as the target for EMDR (Shapiro, 1995).

The child’s negative cognitions were elicited by asking “when you look at your picture and think about the worst part of the accident, what words go with that? What thoughts do you have about it?” or “what do you think about in the picture?” Similarly, desired positive cognitions were elicited in the same way. For example, “when you look at your picture and think about the worst part of the accident, what words or thoughts would you like to have or prefer to have?”

Consistent with the recommendations of Shapiro (1995), if the child could not identify cognitions, or their cognitions were unsuitable, several approximations of self-referent cognitions were offered to the child and they were asked which of these they would like to be able to think and believe instead of their negative cognition. Alternatively, the child's own cognitions were used, even if they were not ideal.

To assist children with making VOC ratings, the VOC scale was presented as a 700mm visual analogue scale ranging from “0 - completely false” to “7 - completely true”. To orient children to the meaning of this scale and to ensure they understood it, three examples were used to demonstrate how it worked. For example, they were asked, “if you said to yourself, “I love my mum and dad”, how true does that feel right now? “. Several other examples were used until it was clear they understood the meaning of the scale (e.g. they rated statements such as “I love school”, “ I love my brother or sister”, “I love eating vegetables”).

Given that children can have difficulty identifying emotions and their intensity, time was also spent helping them clarify their feelings if necessary. For example, if they said they felt “bad” they would be asked “are there any other feelings?” or “do you mean bad like angry, like if someone steals your things at school? or sad, like when you lose your favourite toy? or scared or worried etc ?”.

The VOC scale, the SUD scale was presented as a 1000mm visual analogue scale ranging from “0 - calm” to “10 - most”. Again, to orient children to the meaning of this scale and to ensure they understood it, a few examples were used to demonstrate how it worked. For example, “if you imagine being at home watching TV on the couch, how uncomfortable do you feel?” and “if you imagine giving a speech or singing in front of the school, how uncomfortable do you feel?”. As per the recommendations of Shapiro (1995), arm actions were also used if necessary to demonstrate how the scale worked so that the child understood that SUDs ranged from “feeling

OK or fine” (hands together) to “really, really, really uncomfortable, bad or yucky” (hands wide apart).

Given the number of elements involved in questions about body sensations, it was not surprising that some younger children required help understanding the question pertaining to the identification of body sensations. That is, just like the adult protocol, children were asked to look at their picture and to remember or imagine the worst part of their accident, to think about their negative cognition and feelings and to tell the therapist “where they felt it in their body”. If they didn’t understand or seemed confused, they were simply asked “when you think about you accident like that, do you feel anything in your body at all”? Alternatively, an example was given such as, “sometimes when you have strong feelings, you can feel it in your body, like when you’re worried and you feel a knot in your tummy or it feels churned”.

#### **Phase 4 -7: Desensitisation, Installation, Body Scan and Closure**

##### **Desensitisation**

Shapiro (1995) has encouraged the use of age appropriate explanations of physiology checks which basically ask the child “what is happening now?” or “what do you get now?” after each set of EM’s. An initial explanation in age appropriate language may go as follows:

*“sometimes you might feel or think differently about the accident after you've watched my hand. I will ask you what you are thinking or feeling. If you do not think or feel anything that's OK - you can't do this stuff wrong, just tell me what ever is happening whether it's nothing, something or anything”.*

Shapiro (1989) states that such instructions serve to reduce performance anxiety, confusion, and demand effects, especially since clients can have difficulty with the changes that occur. She has also suggested that “clinicians should gently reinforce the client’s effort by softly saying “good” during the set (*of EM’s*). This often reassures clients who are not sure they are doing it right” (Shapiro, 1995, p143).

### **Low Demand Levels with Reassurance**

To help the child feel as comfortable as possible and to understand the low demand level of the technique, almost any response to the initial set of EM's (e.g. shrugging of the shoulders) was followed by the instruction to "think about that" during a subsequent set of EM's. If there seemed to be any confusion about what was required, further explanation and reassurance was offered. For example, some children seemed to think that if they couldn't maintain their accident image during the initial sets of EM's they were doing something wrong. In this case they would be offered reassurance such as,

*"that's fine, it's impossible to do this wrong, whatever happens is OK. You might have thoughts about the accident, then they might go away, you might have thoughts about what you had for lunch or other memories, you might think of nothing, or even something that is silly or funny, whatever happens is OK".*

### **General Approach, Flexibility and EM Variations**

The general approach was that of being child focused because, after all, the child was coming along to engage with the therapist about something quite distressing; hence, the sessions needed to be at least tolerable, preferably interesting and most of all useful. The latter of course necessitated the child attending enough sessions to receive adequate treatment. Hence, positive reinforcement was offered to participants for engaging in the difficult task of thinking and talking about their accident. Lighter moments were also encouraged during the treatment where the child or therapist would be playful or silly.

In terms of flexibility, if children wanted to spontaneously draw or act out some part of the accident this was allowed. For example, after a set of EM's, one child demonstrated how he was thrown back and forward in his chair during the accident. Another child added to the picture of his accident to show where other people were positioned and where bystanders came from after the accident. These disclosures were naturally the focus of sets of EM's.

Due to the fact that some children find eye movements difficult, Shapiro (1995) has recommended the two handed method, the use of puppets, coloured spots on the wall, cartoon figures or comic book heroes. She has also suggested concurrent methods of maintaining the child's attention/processing such as humming a tune during EM's, making rhythmical movements with the upper body or acting congruent with the child's imagery. In the present protocol, the two handed EM method was used for children who complained of eye discomfort or had difficulty tracking. This consisted of the therapist placing their closed fists approximately 500mm to 1400 mm apart and asking the child to focus on the therapist's alternate flicking of a finger or hand. Some children brought along their favourite toy to the treatment session which at times was incorporated in the EM's. For example, a few children brought a doll, teddy or stuffed toy, hence the instruction for EM's would be to look at "name of toy" moving from side to side. This would facilitate a more comfortable atmosphere and help the child engage in the treatment.

### **Dealing with Blocks**

If younger children (e.g. 6 or 7 years) seemed to be having difficulty holding all the elements of their accident memory in their imagination (picture, thoughts, feelings etc), the instructions were initially simplified. For example, "when you look at your picture and think about your accident "what thoughts do you have?" or "what do you think about in the picture?". For older children, the procedure was more like that for adults.

In addition to the procedures for dealing with blocks, such as changing the speed or direction of the EM's, the flexibility of the protocol allowed for intermittent periods of drawing, play or breaks either in the therapy room or the child could visit their parent in the waiting room.

Alternatively, the parent was allowed in the therapy room whilst the treatment continued (e.g. the child could sit on their parent's lap). The only exception to this was where the parent had significant levels of trauma symptoms which could be exacerbated and compromise the child's treatment. The aim of this was to create a low demand environment where the child felt they had

much of the control (often in contrast to their experience during their accident). This theme of giving the child a sense of control was the hallmark of dealing with blocks or abreactions. For example, if after successive sets of EM's, the child continued to experience no change in their experience, or displayed discomfort that could not be labelled, even after asking, "what's happening in your body?", they would be asked if it was difficult to think of the accident. If they indicated that this was the case, the therapist made a suggestion such as,

*"perhaps we could make it easier for you to think about the accident. What if I asked you to imagine that we were watching your accident through the window or on TV, or we could imagine your accident happening to tiny little people, like ants that we are looking at on the ground? We could even imagine it like a cartoon. Which one of these would help you most?"*

Invariably, after the child chose a form of distancing and the desensitising phase continued, they would progress from talking about the accident in the third person (e.g. on TV) to talking in the first person. If after trialling the distancing technique, the child still had some difficulty with the material, the image would be manipulated. For example, the therapist might refer to the child's original account of the accident and say,

*"if we imagine the accident on TV, we would be watching you get into the car after arguing with your brother, then playing your computer game on the way to nana's, stopping at nana's place to pick up the cake, getting back in the car, going through the lights just before the other car hit you, the car hitting you, the man asking if you are OK, mum crying, then the ambulance coming. That's a lot to think about! How about we pretend you have a remote control and you can fast forward the picture to where you're comfortable to start with, which part would you go to first?"*

For some children eye movement compliance was facilitated by using the two handed method, puppets, coloured spots on the wall, cartoon figures, comic book heroes, humming a tune, making rhythmical movements with the upper body or acting congruent with the child's imagery. Variations included corrective imagery such as having the child imagine blowing their traumatic

picture to bits (EM's need to be repeated with new images and blown up repeatedly).

As with the standard protocol, sets of EM's (approximately 12-24 back and forth movements, at 2 per second) continued for as long as the child's response material continued to indicate desensitisation. Any time that there was repeatedly no change in response material, the child was directed to return to the original target memory. If a positive cognition emerged during desensitisation, EM's continued until nothing further was being added (in terms of insight, understanding or emotional adjustment). The child was subsequently returned to their target memory.

### **Installation, Body Scan & Closure**

When children reported SUDS of 0 or 1, attention switched to the validity of the desired cognition (PC). "How do you feel about the statement ...". Usually there was an increase in the child's VOC rating concurrent with their reduced SUDs ratings. In any case, the child was then asked to recall their trauma memory along with desired PC. Although positive cognitions were sometimes offered to children during phase 3, as per the recommendations of Shapiro (1995), there were no other variations to the standard installation procedure. Hence when children could evoke the original trauma and achieve a VOC of 6 or 7 for their desired cognition (with no other trauma or competing cognition emerging), at least three sets of saccades were completed to engrain the new cognitions. The standard body scan and closure procedure followed with the latter involving the safe place exercise if necessary.

It was standard practice to debrief the child after the session and to give them the opportunity to comment or ask questions. They were then asked if it was OK to tell their parent how they went, and if they consented, there was a brief debriefing with the parent whilst the child was present. The parent was usually given an overview of the material covered and the plan for subsequent sessions. The parent was given an opportunity to make any comments or ask questions.

Both child and parent were told that there might be further thoughts, feelings or memories which come up about the accident between sessions and they were assured that this was normal. At the commencement of the next session, the therapist routinely asked the child and parent about any associations to their accident, or changes in behaviour which emerged after the previous session. If necessary, this material became the focus of the session.

### **Phase 8: Re-evaluation, Planning Generalisation & Maintenance**

In order to encourage the optimal level of generalisation and maintenance of treatment gains, Shapiro (1995) insists that four factors be addressed, and these apply to children as much as adults. The therapist ensured that: i) the treatment target or targets were resolved, ii) any associated material activated by the primary target/s was resolved, iii) any additional material from the past or present that could impede generalisation and maintenance was targeted, and iv) the treatment was conducted in the context of adequate social or family supports. The evaluation of these four factors was considered at post treatment and at three and 12 month follow up.