Efficacy and mechanisms of action of EMDR as a treatment for PTSD.

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Declaration

This thesis contains no material which has been accepted for the award of any other degree in any other university and, to the best of my knowledge or belief, contains no material previously published or written by another person, except when due reference is made in the text.

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May 2006

Abstract

The first aim of this thesis was to describe the characteristics of Posttraumatic Stress Disorder (PTSD) and to elucidate its place as a symptom disorder that sometimes develops when people are exposed to a traumatic event. The current major theoretical approaches to account for why some people who are exposed to trauma develop PTSD and the mechanisms by which this occurs were described. Three classes of theories were reviewed: conditioning/learning approach; information processing theories with a particular focus on the meaning of the trauma event; and biological models with an emphasis on recent neurocircuitry and neurochemistry models.

Successful treatment approaches were then reviewed which indicated two major contenders for the most efficacious treatment for PTSD: traditional cognitive behaviour therapies (CBT) using either stress inoculation or prolonged exposure; and eye movement desensitisation and processing (EMDR). Prior to the first study (Lee, Gavriel, Drummond, Richards, & Greenwald, 2002), a review of the literature indicated equivalent effects for EMDR and CBT. There had been very few direct comparison studies and each had serious methodological flaws, particularly with respect to random assignment and treatment fidelity. Therefore, the first study ensured adequate attention to these areas and involved a direct comparison between the two procedures using a sample of 24 participants diagnosed with PTSD. EMDR and stress inoculation training with prolonged exposure were found to lead to similar symptom improvement at the end of treatment, apart from a slight advantage for EMDR on intrusion symptoms. Both treatments led to significantly greater symptom reduction than a wait list control condition. At follow-up, EMDR led to greater gains on both

self-report and observer rated measures of PTSD and self-report measures of depression. Overall, the findings were similar to those described in previously published studies, with a suggestion that EMDR was slightly more efficient than the standard CBT approach.

Given that the evidence suggested that EMDR was a more efficient treatment, it became critical to understand the underlying processes. A process study was undertaken that examined the responses of people with PTSD receiving EMDR treatment (Lee, Taylor, and Drummond, 2006). Guided by process studies of other treatments and theories that might account for why EMDR is effective, participants' responses were examined to see which models better accounted for symptom improvement. The main analysis tested whether or not the responses were consistent with processes that occurred during traditional CBT treatment, which prior research had identified as reliving, or whether they were more consistent with Shapiro's proposal that enhanced information processing occurs because there is a dual focus of attention (that is, the person simultaneously focuses on an external stimulus and on the traumatic memory) (Shapiro, 1995). The responses made by 44 participants were coded by an independent rater according to whether they were primarily reliving, distancing, affect or material other than the primary trauma. The coding system was found to have satisfactory inter-rater reliability. Greatest improvement occurred when the participant processed in a more detached or distant manner, whereas reliving responses were not associated with improvement. Cross-lagged panel correlations suggested that processing in a more detached manner was a consequence of the EMDR procedure rather than a measure that co-varied with improvement. The findings underscored a difference in the processes that underlie EMDR and traditional CBT.

The major question left unanswered from this second study was what causes this distancing process? Competing views were that it was facilitated by eye movement; alternatively, the therapist's instructions to participants might have precipitated this distancing phenomenon. The third study tested these ideas by randomly assigning 48 participants to either an eye movement or a no eye movement condition under two types of therapist instructions (reliving or distancing). Participants recalled personal distressing memories, and measures of distress and vividness were taken after treatment and at follow up. Only the eye movements made a significant difference to people's level of distress.

This conclusion appeared at odds with some of the previous literature that had tested the effects of eye movement on levels of distress. A meta-analysis of some of this research had suggested that there was no significant advantage of including eye movement in EMDR treatment unless the person had been diagnosed with PTSD. However, a close examination of this meta-analysis indicated some major methodological flaws in the computation; therefore, this was recalculated. The conclusion from this fourth study was consistent with study three in that EMDR with eye movement was found to lead to significantly greater improvement that EMDR without eye movement.

The results of these four studies were then discussed in terms of their implications for the theoretical models presented in Chapter 1. Aspects of learning theory that might account for EMDR efficiency were discussed as well as the failure of this model to account for treatment gains following EMDR. Information processing models were seen to better account for some of the phenomena observed in

EMDR and for the findings from the four studies. Some suggestions of how eye movements might facilitate improved information processing were presented.

Finally, the relative merits of EMDR and CBT treatments were discussed and suggestions made for when to combine approaches. The conclusions highlight the point that EMDR appears to be the most promising treatment for PTSD.

Refereed Articles

Lee, C., Gavriel, H., Drummond, P., Richards, J., & Greenwald, R. (2002). Treatment of PTSD: Stress inoculation training with prolonged exposure compared to EMDR. *Journal of Clinical Psychology, 58*(9), 1071-1089.

Lee, C. W., Taylor, G., & Drummond, P. (2006). The active ingredient in EMDR; is it traditional exposure or dual focus of attention? *Clinical Psychology & Psychotherapy, 13*, 97-107.

Articles Under Review

Lee, C. W., & Drummond, P. (under review). Does eye movement contribute to EMDR's effect?: a randomized control study and a meta-analysis. Journal of Consulting and Clinical Psychology.

These articles are reproduced in the thesis in their full, original state (Chapters 2, 3 and 4). This accounts for the small degree of repetition and some minor inconsistencies in Anglo/American spelling throughout the thesis.

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CHAPTER 1

INTRODUCTION TO PTSD

1.1 An historical perspective

The effects of a traumatic event on human experience have been noted since the time of Homer (Alford, 1992). In Homer's epic poem The *Odyssey*, he described the psychological and physical difficulties of a Trojan war veteran and included accounts of what we call today 'flashbacks' and 'survivor guilt'. In Shakespeare's *King Henry IV* Lady Percy provides a description of phenomena linked to posttraumatic stress disorder such as the numbing of a person's responsiveness, sleep difficulties, and nightmares.

> "Oh, my good lord, why are you thus alone?
> For what offence have I this fortnight been
> A banish'd woman from my Harry's bed?
> Tell me, sweet lord, what is't that takes from thee
> Thy stomach, pleasure, and thy golden sleep?
> Why dost thou bend thine eyes upon the earth,
> And start so often when thou si'st alone?
> Why hast thou lost the fresh blood in thy cheeks,
> And given my treasures and my rights of thee
> To thick musing and cursed melancholy?...
> And heard thee murmur tales of iron wars;
>
> Speak terms of manage to thy bounding steed;
> Cry 'courage' to! to the field!..."

Later during the American Civil War, physicians focused more on the symptoms of palpitations and named the syndrome ‘Soldiers’ Heart’ (Breuer & Freud, 1955). In World War I, (Myers, 1915) labelled the emotional reactions of soldiers’ post battle experience as ‘shell shock’ but recognised that soldiers not under artillery attack could also present with the same symptoms. During World War II, PTSD phenomena was described as ‘war neurosis’ (Myers, 1940).

In the original diagnostic classification system published by the American Psychiatric Association, the authors described a pattern of gross stress reaction, which is very similar to the diagnosis of posttraumatic stress disorder used today in DSM-IV and ICD-10 (American Psychiatric Association, 1952). However, in the DSM-II classification, gross stress reaction was replaced with transient situational disturbance. This was a very weak diagnosis, which suggested that trauma reactions should disappear and the patient recover as soon as the original stressor disappeared. If not, a different diagnosis was seen as appropriate.

The current diagnostic term ‘PTSD’ was first described in DSM-III (American Psychiatric Association, 1980). Contrary to earlier DSM versions, there was a recognition that the effects of trauma could persist for years after the event occurred. In addition, it drew together observations from researchers and clinicians who dealt with people with quite disparate trauma incidents. Similar effects of trauma were observed in the clinical practises of therapists working with women who had been abused as children (Helfer & Kempe, 1968), involved in accidents or burns (Andreasen, 1980), survivors of the Holocaust, Vietnam veterans, and rape survivors (Breuer & Freud, 1955). Thus, for the first time a generic label was given to phenomena that had previously carried a trauma label that was specific to the stressor event.

There were some comparatively minor modifications to this system for DSM-IV (American Psychiatric Association, 1994). This involved removing references to guilt, specifying that helplessness, intense fear, or horror needed to be experienced during the trauma event, and moving the symptom of experiencing distress when having an intrusive memory from the hyperarousal category to the intrusion category.

The DSM-IV classification of PTSD is detailed below :

A. The person has been exposed to a traumatic event in which both of the following were present:

1. the person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others

2. the person's response involved intense fear, helplessness, or horror.

B. The traumatic event is persistently re-experienced in one (or more) of the following ways:

1. recurrent and intrusive distressing recollections of the event, including images, thoughts, or perceptions. **Note:** In young children, repetitive play may occur in which themes or aspects of the trauma are expressed.

2. recurrent distressing dreams of the event. **Note:** In children, there may be frightening dreams without recognizable content.

3. acting or feeling as if the traumatic event were recurring (includes a sense of reliving the experience, illusions, hallucinations, and dissociative flashback episodes, including those that occur on awakening or when intoxicated).

4. intense psychological distress at exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event

5. physiological reactivity on exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event

C. Persistent avoidance of stimuli associated with the trauma and numbing of general responsiveness (not present before the trauma), as indicated by three (or more) of the following:

1. efforts to avoid thoughts, feelings, or conversations associated with the trauma

2. efforts to avoid activities, places, or people that arouse recollections of the trauma

3. inability to recall an important aspect of the trauma

4. markedly diminished interest or participation in significant activities

5. feeling of detachment or estrangement from others

6. restricted range of affect (e.g., unable to have loving feelings)

7. sense of a foreshortened future (e.g., does not expect to have a career, marriage, children, or a normal life span)

D. Persistent symptoms of increased arousal (not present before the trauma), as indicated by two (or more) of the following:

1. difficulty falling or staying asleep

2. irritability or outbursts of anger

3. difficulty concentrating

4. hypervigilance

5. exaggerated startle response

E. Duration of the disturbance (symptoms in Criteria B, C, and D) is more than 1 month.

F. The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.

The diagnostic classification criteria of ICD-10 (World-Health-Organisation, 1997) is more closely aligned with DSM-IIIR than DSM-IV. In ICD-10 there is no requirement that the event be characterised by intense fear, helplessness, or horror. That is, DSM-IV includes a section that requires that the person had a specific immediate reaction to the stressor, whereas ICD-10 does not require this. Another difference is that the symptoms characterised as general numbing of responsiveness are absent in the ICD-10 formal criteria, although mentioned in its clinical descriptions. There are also some minor differences in the timing of the event. Finally, DSM-IV requires that there is clinically significant distress or impairment associated with the symptoms, whereas ICD-10 does not require this impairment. Both systems require an exposure to a stressor, intrusive, avoidance, and hyperarousal symptoms.

1.2 Prevalence

The prevalence of posttraumatic stress disorder depends on the sampling methods used and the diagnostic criteria. In a sample of Australian community volunteers the twelve month prevalence for PTSD using DSM-IV criteria was 3%, compared with 7% using ICD-10 diagnostic criteria (Peters, Slade, & Andrews, 1999). Investigations of the individuals who received a diagnosis of PTSD for ICD-10, but not DSM-IV, indicated that 56% had insufficient symptom severity because of

the requirements to meet DSM-IV Category C, which is more demanding than the ICD-10 counterpart. A similar point prevalence rate for PTSD using DSM-IV criteria (2.7% for women and 1.2% for men) was found in a Canadian sample (Stein, Walker, Hazen, & Forde, 1997).

In the largest prevalence study in the US (5877 participants) the lifetime prevalence of PTSD was found to be 7.8% using DSM-IIIR criteria (Kessler, Sonnega, Bromet, Hughes, & et al., 1995). The rates were twice as high for women (10.4%) than men (5.0%). This figure is consistent with other US data. In a sample of 1007 young adults using DSM-IIIR criteria, the lifetime prevalence of a diagnosis of PTSD was 9.2% (Breslau, Davis, Andreski, & Peterson, 1991). The same lifetime prevalence rate was reported in a later study with a sample of 2181 participants who were age representative of 18-45 year olds in the general population (Breslau et al., 1998).

Whilst 9% is a common lifetime prevalence of a diagnosis of PTSD, exposure to a traumatic event is much more frequent. Using a broad definition of trauma, Breslau et al. (1998) reported that 89.6% of the sample they studied had been exposed to a traumatic event. In another North American sample using a broad age range and a definition of trauma as a violent event of nature or human origin, the rate of exposure to a traumatic event was 69% (Norris, 1992). The same rate of 69% for traumatic events was found in a study of 4008 American women (Resnick, Kilpatrick, Dansky, Saunders, & Best, 1993). In a general sample of Canadians, the incidence of a traumatic event was 74% for women and 81% for men (Stein, Walker, Hazen, & Forde, 1997).

Given that the lifetime exposure to trauma is around 70% and that the incident lifetime prevalence of a diagnosis of PTSD is 9%, the implication is that most

people exposed to a traumatic event recover. The obvious questions posed from this information is which individuals fail to be able to process a traumatic event, and therefore become symptomatic; and which treatments are most efficient in helping those people recover from their symptoms. This chapter reviews three approaches to understanding how a traumatic experience induces PTSD: learning theory, information processing models, and biological theories.

1.3 PTSD psychopathology: learning theory

Early accounts of the development of PTSD symptoms take into account both classical and operant conditioning models. This approach has been referred to as Mowrer's two factor theory (Mowrer, 1960).

Classical conditioning was used to explain how material present at the time of the traumatic event becomes associated with an aversive response. A previously innocuous item, termed the conditioned stimulus (CS), is present at the time of an aversive stimulus or unconditioned stimulus (UCS). The conditioned stimulus then becomes associated with the unconditioned response (UCR) which in trauma is typically high levels of distress or fear (Resick, 2001). For example, the survivor of a life threatening motor vehicle accident observed a red post box and 'Cole Porter' playing on the radio just before impact. She later found that a similar emotional experience to that present at the accident was triggered when she heard that particular Cole Porter song (CS) or saw a red post box, even at a time when she was not in danger. This learnt fear response is the conditioned response (CR). Thus any time the previously innocuous cues are present in the environment they may result in the CR. Through classical conditioning processes such as generalisation and higher order conditioning, other related stimuli become conditioned as well as memories and

thoughts about the event (Foa & Rothbaum, 1998). This explains how the survivor of the accident came to notice that thinking about the event, and eventually any song on the radio, resulted in a fear reaction.

The second part of Mowrer's two factor theory was the use of operant conditioning to explain why the link between the conditioned (CS) and (CR) does not extinguish over time. In particular it was argued that the avoidance of the trauma-related material over time prevents this habituation. So in the above example if the person changes the radio station on hearing a Cole Porter song, the CS is negatively reinforced which prevents the extinction of the link between the CS and CR.

There has been empirical support for the notion that avoidance is important for the development of PTSD. A personality measure of the extent to which people avoid a novel stimulus was found in a prospective study to be positively associated with the risk of developing PTSD (Gil, 2005). In addition there is evidence that people with PTSD are likely to engage in suppression of their traumatic memories and trauma-related thoughts (Ehlers & Clark, 2000; Harvey & Bryant, 1998b). Finally, prospective studies that have looked at predicting future PTSD based on current symptoms generally find that both dissociative and avoidance symptoms have stronger predictive power than other symptoms such as those belonging to the re-experiencing cluster (Brewin, Andrews, Rose, & Kirk, 1999; Harvey & Bryant, 1998a, 1998c).

1.4 PTSD psychopathology: information processing models

Although there has been considerable support for a learning theory approach to understand symptoms of PTSD, there are also considerable problems in its ability to account for the development of fear in many situations (Eysenck, 1976; Rachman,

1976; Rackman, 1980). The two factor approach also failed to adequately explain why in some circumstances the conditioned response failed to habituate despite the activation of physiological arousal (Foa & Kozac, 1986). These failures led researchers to propose that cognitive processes are critical in PTSD, and led to treatment programmes that focused on cognitive change and on the meaning of the event to the individual (Epstein, 1991; Janoff-Bulman, 1992) rather than habituation through exposure (Resick & Schnicke, 1993).

One of the earliest models to put meaning at the centre of recovery from PTSD was proposed by Foa and Kozac (1986). They argued that in order to reduce the fear associated with an emotional memory, two conditions are required; firstly activation of the memory network and secondly presenting information that is incompatible with that contained in the memory structure.

According to Foa and Kozac (1986) the fear-relevant information must be activated as completely as possible. This is optimised when the individual is presented with information that matches the structure of the event in their memory system (Lang, 1977). This information includes sensory details about the event, the meaning that the person associates with the event and the person's affect or behavioural response to the event. According to Lang (1977), a critical number of information units must be activated, and some information elements may be especially important in evoking the fear structure.

A number of studies have provided support for Lang's hypothesis. Participants being treated for phobia who have higher heart rates appear to gain more from treatment with systematic desensitisation than those who experience lower levels of physiological arousal (Borkovec & Sides, 1979; Lang, Melamed, & Hart, 1970). In

contrast, conditioning theory would predict that responses associated with low levels of arousal should habituate quickly.

In another study that supported the model, participants with snake or social phobia subjects were trained to focus either on their physiological responses to the stimulus or the stimulus itself (Lang, Levin, Miller, & Kozak, 1983). Later when presented with the fear images, those who had been trained to focus on their responses demonstrated greater physiological arousal. Thus it appears that by focusing on physiological responses, the match between the information presented and that stored in memory evoked the fear structure more fully. Similarly, greater physiological arousal and greater fear was reported by participants trained to form fearful fantasies through scripts that had descriptions of just a stimulus (e.g. a green snake on a rock) compared with those trained to be aware of both a stimulus and a physiological response (e.g. a green snake on a rock and my heart is pounding) (Lang, Kozac, Miller, Levin, & McLean, 1980).

The second aspect of the Foa and Kozac (1986) model was that a necessary condition for fear reduction is that the individual is presented with information incompatible with that which exists in the fear structure. These cognitive and emotional components of new information have to be integrated into the existing emotional memory for a change to occur. They argued that an essential aspect of therapy for fear reduction is exposure not only to the stimulus and response information but also to the meaning the individual makes of the fear situation. Supporting this idea are studies that found that participants receiving therapy that focuses only on changing meaning associated with a traumatic event do better than those who are given pure exposure (Resick, Nishith, Weaver, Astin, & Feuer, 2002;

Tarrier et al., 1999; Tarrier & Sommerfield, 2004), or at least show about the same level of improvement (Marks, Lovell, Noshirvani, Livanou, & Thrasher, 1998).

According to Epstein (1991), PTSD results when an event invalidates at a deep emotional level the fundamental beliefs that a person has about reality. He reduced these beliefs to three primary categories: that the world is benevolent; that the world is predictable/controllable; and that the self is competent, lovable and capable. After a traumatic event, the person may be confronted by an event that seems to indicate the opposite of one of these beliefs: the world is malevolent; the world is chaotic; or I'm incapable, unlovable, unattractive. If one of these negative primary beliefs develops, then a person is likely to replay the event to look at all possible adaptive reactions. In this way, the individual may learn that although the event was dangerous, life itself or the world is not.

Support for Epstein's theory comes from a review of studies examining the thematic themes of survivors' narratives of their trauma, which found the belief structures detailed above (Roth, Lebowitz, & DeRosa, 1997). The importance of meaning is highlighted by research showing that disasters that are perceived to be the result of human factors produce more psychopathology than events considered natural disasters (Galea & Resnick, 2005; Smith et al., 1993). PTSD symptom severity has been found to correlate with ratings of mistrust, helplessness, meaninglessness, and unjustness (Livanou et al., 2002). Degree of disturbance of core beliefs was also found to distinguish individuals with complex PTSD, from those with PTSD, and from those with no diagnosis (Newman, Riggs, & Roth, 1997). However, in one study beliefs appeared to change after rather than before symptom improvement (Livanou et al., 2002). Unlike the two-factor theory, an approach that focuses on meaning can account for reaction formation responses occasionally observed with PTSD where the

person after an experience that threatens safety increases risk-taking behaviour (Epstein, 1991) or self-injures (Connors, 1996). According to Epstein's theory, this is an attempt to develop or have new experiences to counter the underlying theme; e.g., if I'm in dangerous situations and I survive then basically the world is safe.

Similarly, Janoff-Bullman and colleagues have argued that experiences such as rape, life threatening illness or death of a loved one, shatter the sense of our world as being a meaningful one (Janoff-Bulman, 1979, 1992; Janoff-Bulman & Frantz, 1997). They argued that people innately have a sense of justice about the world and a sense of personal control, and that traumatic events become incomprehensible because they often provide evidence that invalidates this belief. Consistent with this idea are studies that found that humans appear to have a tendency to minimise randomness and overestimate the degree of control perceived over events (Gilovich, 1991; Langer, 1975). Janoff-Bullman and colleagues also argued that to counter the sense of meaningless associated with an event, the therapist needs to help a person with PTSD to find meaning in life related to the experience. This might frequently occur by seeing a positive value in the experience. Some evidence supports the view that positive meaning associated with traumatic events decreases the severity of PTSD symptoms. In a prospective study that investigated the responses of participants to three different types of trauma - tornadoes, mass murder and involvement in a plane crash - perceived benefit from the event four weeks after the disaster significantly predicted the absence of PTSD three years later (McMillen, Fisher, & Smith, 1997). Also, the more severe the traumatic event, the more the variance of recovery was explained by the amount of perceived positive benefit from the event. In another prospective study, participants were assessed at two weeks, two months, six months and twelve months after an assault for both positive and negative changes to do with

the self, relationships, spirituality and beliefs about the world. Positive experiences were reported two weeks after the assault, and participants generally continued to report increasingly positive associations to the event as time progressed (Frazier, Conlon, & Glaser, 2001). The positive life changes reported at two weeks were found to predict absence of PTSD symptom levels twelve months after the assault. However, negative associations in general were a stronger predictor of distress. Although these findings provide support for the need to focus on positive meaning, the data of positive associations or perceived benefits being linked to outcome may simply be the result of an effective coping style or a better adjustment.

1.5 PTSD psychopathology: biological perspectives

Biological approaches to understanding PTSD have been influenced by data suggesting apparent changes in certain brain structures and chemical processes associated with arousal. Higher arousal levels are generally linked with PTSD. Participants with PTSD who are asked to recall or are exposed to trauma memories consistently show evidence of greater physiological arousal when compared with people who have anxiety disorders or other psychological problems (Blanchard et al., 1996; Keane et al., 1998; Orr, Meyerhoff, Edwards, & Pitman, 1998; Pitman, Orr, Forgue, Altman, & deJong, 1990).

There appears to be differences in the resting baseline of physiological arousal in people with PTSD compared to healthy controls, but these sometimes disappear when compared to other anxiety disorders (Pitman et al., 1990). Evidence for higher baseline levels of arousal is mixed. Methodological problems associated with past studies such as failing to control for situational effects and differences in recording apparatus/modality make unambiguous interpretations difficult (Prins,

Kaloupek, & Keane, 1995). One way to control for transient situational effects is to study physiological arousal for people diagnosed with PTSD over an extended time period. Two recent studies have looked at 12 and 24 hour periods (Beckham et al., 2000; Muraoka, Carlson, & Chemtob, 1998). However, the findings of these studies appear to be contradictory. In the study by Muraoka et al., 24 hour ambulatory blood pressure and heart rate data were significantly higher in veterans with PTSD than in veterans without PTSD, and heart rate during sleep was also significantly higher among veterans with PTSD. However, Beckham et al. failed to find significant differences in mean heart rate. The contradictory findings may be accounted for by different recording intervals. Heart rate was recorded over a 12 hour period (sampled every 30 minutes) in the Beckham et al. study, whereas in the Muraoka et al. study it was recorded over a 24 hour period (sampled every 20 minutes). The difference in the severity of the cases included in the studies may also have contributed to the inconsistent findings. In the PTSD group in the Muraoka et al. study, only 27% were in a relationship and only 9% were employed. In contrast, in the Beckham et al. study, 80% of the PTSD group were married and 50% were employed, suggesting a better level of psychosocial functioning than for the subjects in the Muraoka et al. study. The mean heart rate of the PTSD group in the Marauoka et al. study was 80.8 beat per minute, whereas the mean for the Beckham et al. study was 68.6 beats per minute, also suggesting that the Marauoka et al. subjects exhibited more severe pathology.

Another reason to account for some of the occasional inconsistent findings in arousal levels may be due to different symptom levels of dissociation in the PTSD samples. Individuals with high levels of dissociation show very different arousal levels to people low in dissociation (Griffin, Resick, & Mechanic, 1997). In fact their

responses were found to be the opposite of those who displayed a more phobic response to PTSD. Participants with PTSD, classified as either high or low in dissociative tendencies according to scores on the Peri-traumatic Dissociation Index, were found to have equivalent arousal levels, as measured by heart rate and skin conductance, when discussing neutral topics. However, when talking about their sexual assault, scores on both measures decreased in the high dissociation group but increased in the low scoring group. This effect was still evident when discussing a neutral topic after the assault discussion.

Arousal levels have been linked in prospective studies to the development of PTSD. The resting heart rates of trauma survivors one week after the event were much higher in those who later developed PTSD than those who did not (Shalev et al., 1998). Similarly in survivors of a motor vehicle accident, heart rates obtained on the day of discharge from hospital were significantly higher in those who later developed PTSD than those who did not (Bryant, Harvey, Guthrie, & Moulds, 2000).

A number of specific chemicals have been proposed to be critical in this high arousal associated with PTSD, namely catecholamines, corticosteroids, and serotonin (Resick, 2001; van der Kolk, McFarlane, & Weisaeth, 1996). However, studies have not always resulted in consistent findings. For example, in research into urine levels of norepinephrine and epinephrine in different patient groups, those diagnosed with PTSD had higher mean levels of norepinephrine than those diagnosed with bi-polar disorder, major depressive disorder or undifferentiated schizophrenia. The mean epinephrine levels were also higher for the PTSD group than all the other diagnostic groups apart from bipolar disorder (Kosten, Mason, Giller, Ostroff, & Harkness, 1987). However, in a study of Vietnam combat veterans with post traumatic stress disorder, urinary catecholamine levels did not differentiate between

the patient group and a control group (Pitman & Orr, 1990). In a study of combat veterans diagnosed with PTSD, norepinephrine but not epinephrine levels were found to correlate significantly with severity of PTSD symptoms in the PTSD group. PTSD in-patients were shown to have significantly higher norepinephrine and epinephrine levels compared to PTSD out-patients and normal controls (Yehuda, Southwick, Giller, Ma, & Mason, 1992). Finally, in a study that followed a cohort of 292 young adults over a ten year term and periodically collected urine samples, a subsample of 69 participants who had lifetime PTSD was identified. These participants were found to have higher catecholamine levels than those who had been exposed to trauma but had not developed PTSD or to a control group who had not been exposed to trauma (Young & Breslau, 2004a).

Considerable research has examined corticosteroids and their relationship to PTSD. In acute stress, cortisol helps regulate stress hormone release via a negative feedback loop involving the hippocampus, hypothalamus and pituitary gland (Yehuda, 2002). The role of cortisol is to stem the activities of the hypothalamus and pituitary gland by inhibiting other biological agents triggered by the stress and released by the hypothalamic-pituitary-adrenal (HPA) access. There is some evidence that people diagnosed with PTSD have low cortisol levels, especially in the acute phases after the assault. Resnick, Yehuda, Pitman, and Foy (1995) examined the cortisol levels of women in emergency rooms immediately following sexual assault. Their cortisol levels and PTSD diagnostic status were then assessed three months later. They found that women with sexual abuse histories had lower cortisol levels soon after the sexual assault than women without such histories. In addition, the previously assaulted women were three times more likely to develop PTSD at the three-month mark. Similarly, in a study of motor vehicle accidents survivors, cortisol levels taken shortly

after the accident were negatively correlated with PTSD symptoms at six months, and this was a better predictor of PTSD status than other measures of symptoms taken at the same time (McFarlane, Atchison, & Yehuda, 1997).

Not all studies found significantly lower levels of cortisol to be associated with PTSD. Saliva cortisol levels were examined in a longitudinal epidemiological study of 265 participants exposed to trauma (68 with PTSD), and 183 participants never exposed to trauma (Young & Breslau, 2004b). Those who had received a PTSD diagnosis showed increased saliva cortisol compared to those who were exposed to trauma but did not have a PTSD diagnosis. However, it should be noted that participants who had a diagnosis of PTSD but had never received co-morbid diagnosis for major depressive disorder showed normal saliva cortisol levels, as did participants who had received a diagnosis of major depressive disorder on its own. In other words, only those with co-existing PTSD and a major depressive disorder showed an increased elevation. Similarly, higher urinary cortisol levels were found for participants with a dual diagnosis of major depressive disorder and post traumatic stress disorder than with either disorder on its own (Young & Breslau, 2004a). Participants with PTSD and without another comorbid diagnosis had neither an increase nor a decrease in mean urinary cortisol levels. Yehuda (2002) reviewed all the previous studies that had examined cortisol levels and their relationship to PTSD and noted that both increased and decreased cortisol levels have been associated with PTSD. She argued that the discrepant findings can be explained by the extent of previous exposure to trauma (lower cortisol levels associated with having a trauma earlier in life rather than latter), existence of comorbid diagnoses, and changes in circadian pattern of cortisol such that there is more variance associated with PTSD.

She concluded that lower cortisol levels are likely to be a factor at least in a sub sample of people with PTSD.

The third chemical compound frequently associated with PTSD is serotonin. In a review of this literature van der Kolk (1997) concluded that there was some evidence of decreased serotonin activity in traumatised animals. Although less attention has been paid to the relationship between serotonin and PTSD than corticosteroids and catecholamines, it is worth noting that treatment using selective serotonin reuptake inhibitors (SSRIs) appears to be the most successful of all known pharmacological agents in treating PTSD (van Etten & Taylor, 1998).

In a recent review of brain structures found to be associated with PTSD, three areas seem to have the most support: the amygdala; the hippocampus; and the medial prefrontal cortex (Shin, Rauch, & Pitman, 2005). A number of different studies have suggested that the amygdala is involved in PTSD. For example, increased cerebral blood flow in the amygdale region was detected using positron emission tomography when participants with PTSD were read back scripts related to their trauma than scripts related to non trauma imagery (Rauch, van der Kolk, Fisler, & Alpert, 1996; Shin et al., 2004). Also, combat veterans without PTSD did not show amygdala activation for combat scripts (Shin et al., 2004). Interestingly, in addition to amygdala activation, when participants who had PTSD were exposed to their traumatic script, Broca's area showed decreased activity (Rauch, van der Kolk, Fisler, & Alpert, 1996). This is consistent with clinical observations that people with PTSD often find difficulty using words to describe their traumatic experience.

Functional magnetic resonance imagery technology was used to study the amygdala response to trauma-related and non-trauma-related words for survivors of sexual and physical abuse who had been diagnosed with PTSD (Protopopescu et al.,

2005). The PTSD participants were found to have an increased amygdala response to the trauma-related stimuli compared to other negative and neutral words. In addition, in comparison to a control group where negative stimuli, were presented, the PTSD patients failed to show normal patterns of sensitisation and habituation to the negative stimuli and the extent of this delayed habituation correlated with PTSD symptoms severity.

Not all studies have found amygdala activation followed attempted provocation with PTSD relevant stimuli. In a review Shin, Rauch, and Pitman (2005) stated that the precise reasons for these replication failures are not known. Likely factors include small samples, poor resolution of investigating equipment, stimuli that were inadequate to produce an arousal response, and inadequate control groups.

Several studies using MRI technology and PET technology have found deficits in hippocampal structure associated with PTSD and trauma experiences (Bremmer et al., 1995; Bremner et al., 2003; Vythilingam et al., 2002). However, these populations all involve chronic PTSD. Deficits in hippocampal functioning have not been found following recent trauma (6 months) and not always in studies of children exposed to trauma (Bonne et al., 2001; De Bellis et al., 2002). There is also a question of causality; that is, do individuals with PTSD have a smaller hippocampus to begin with or does the experience of a trauma event lead to hippocampus reduction? In animal studies, corticosteroids have been linked to hippocampal cell death [for a review see (van der Kolk, 1996)], suggesting a neurotoxic effect of trauma experiences. However in a twin study that investigated this effect, monozygotic twins with exposure to combat but without PTSD were compared to non exposed combat co-twins and a set of twins in which a co-twin had PTSD and the other had no exposure to combat or a PTSD diagnosis (Gilbertson et al., 2002).

Smaller hippocampuses were found in the PTSD group and their non exposed co-twins. Furthermore, there was a significant negative correlation between the PTSD symptom severity of the exposed twin and the hippocampal volume of their non-exposed co-twin. This is not consistent with the idea that the trauma causes neurotoxic effects and more consistent with the notion that a smaller a hippocampus predisposes a person to PTSD. However in one study on the plasticity of the hippocampal reduction, sustained treatment with paroxetine was found to result in an increase in hippocampal volume (Vermetten, Vythilingam, Southwick, Charney, & Bremner, 2003).

The third region of the brain involved in PTSD appears to be a prefrontal cortex-amygdala interaction. Combat veterans with PTSD were found to have decreases in activity in the medial prefrontal cortex when confronted with personal recollections of their combat experiences (Shin et al., 2004). Furthermore this decrease was inversely correlated with activity in the amygdale. PTSD symptom severity was positively correlated with the increase in the right amygdala and negatively with a reduction in the medial frontal gyrus. In another study using SPECT technology, reduced cerebral blood flow in the inferior and medial frontal gyrus areas was associated with trauma scripts as opposed to neutral scripts in police officers with PTSD (Lindauer et al., 2004). A study using SPECT technology found that patients diagnosed with PTSD who were undergoing treatment had increases in left frontal lobe functioning and decreases in amygdala activation (Levin, Lazrove, & van der Kolk, 1999). Finally on MRI investigation, children with PTSD were found to have a smaller prefrontal cortex than a control group (De Bellis et al., 2002).

These alterations in brain structure and function found to be associated with PTSD have implications for alterations in processing associated with PTSD. It is not

surprising that the amygdala has a role to play in PTSD because it has been clearly implicated in autonomic arousal and emotional and behavioural processing of material related to fear (LeDoux, 2000; Sotres-Bayon, Bush, & LeDoux, 2004). A neurocircuitry model of PTSD emphasises the role of an overactive amygdala with a combination of insufficient top down governance of the amygdala by the medial prefrontal cortex and the hippocampus (Shin, Rauch, & Pitman, 2005). The hippocampus has been linked to the processing of episodic memory. Thus a hippocampal deficit may interfere with being able to identify safe contexts surrounding incoming stimuli. This failure to process episodic memory causes traumatic events to remain stored with rich sensory detail and is consistent with the reports of people with PTSD reporting that when they recall a traumatic events, the memory has a reliving quality (Stickgold, 2002). Similarly, dysfunction of medial prefrontal cortex has been linked to deficits in the extinction of memories that have an associated emotional charge (LeDoux, 2000; Sotres-Bayon, Bush, & LeDoux, 2004).

1.6 Psychological treatments of PTSD: review of the evidence

Whilst there are psychological theories and psychobiological theories to account for some of the phenomena of PTSD, no theory is predominant or provides a satisfactory understanding of all of the phenomena. Similar to the lack of a dominant theory to explain the phenomenon of PTSD, no specific treatment has universal acceptance. Prior to the first study (Lee, Gavriel, Drummond, Richards, & Greenwald, 2002), according to the APA task force on promotion and dissemination of psychological procedures, no methods were considered well-established treatments for PTSD (Chambless et al., 1998). Nevertheless, this task force considered that three methods were “probably efficacious”, that is, Exposure, Stress-inoculation, and Eye Movement Desensitization and Re-processing (EMDR). The next section

reviews the outcome studies for each of these three treatments prior to study 1. In chapter 2, study 1 is presented in its entirety. An update of outcome studies following the publication of study 1is presented in chapter 2.3.

1.6.1 Comparison of Stress Inoculation and Exposure Treatments with other therapies

Freuh, Turner, and Beidel (1995) noted that there has been confusion over what constitutes an exposure procedure. In this review I have described any procedure that involves continuous presentation of in vivo or imaginal trauma-related cues as exposure. What constitutes a stress inoculation procedure has also varied from study to study. For example Foa, Rothbaum, Riggs, and Murdock (1991) had sessions devoted to covert modeling, thought stopping, and self instructional training which are not part of the stress inoculation treatment described by Resick, Jordan, Girellis, Hutter, Marhoefer-Dvorak (1988). In this review I have described the procedure as stress inoculation if that is the label given by the authors.

In general, early studies with sexual assault survivors failed to demonstrate a clear superiority of stress inoculation or exposure therapy over other treatments. For example, although Kilpatrick and Veronen (1984) found that a brief behavioural intervention resulted in symptom reduction, it was not found to be superior to a condition merely involving repeated assessment on the psychopathology measures. Similarly, Frank, Anderson, Stewart, Dancu, Hughes, and West (1988) failed to find significant differences between an exposure-based treatment and cognitive therapy. Resick et al. (1988) found that Stress Inoculation was as effective as assertion training and supportive psychotherapy, and that each of these conditions was more effective than a wait-list control group as measured by self-report.

Similar findings were reported in early studies of survivors of traumas other than sexual assaults. Although Brom, Kleber and DeFares (1989) found a

desensitization treatment to be more effective than a wait-list control, there were no differences between this behavioral treatment and hypnotherapy or short-term psychotherapy. Boudewyns and Heyer (1990) compared exposure to conventional individual counseling and found no significant differences at the end of treatment. However, those who received exposure had reduced physiological responding to traumatic stimuli at 3 month follow-up compared to a control group. Cooper and Clum (1989) examined the incremental effectiveness of imaginal flooding over standard psychotherapeutic and pharmacological measures. Whilst they demonstrated that adding imaginal flooding to a standard treatment resulted in significant improvements on some self-report trauma measures, it had little effect on other anxiety and depression measurements.

Many of the above studies failed to include a formal measure of PTSD, and comparative treatments often overlapped in important components. An exception was a study conducted by Foa et al. (1991) which demonstrated a clear superiority for cognitive behavioral interventions with rape victims. They compared the effects of prolonged exposure, stress inoculation training and supportive counseling with a wait-list control. The diagnosis of PTSD was made on the basis of DSM-III-R criteria obtained from information through structured interviews and self report measures. Prolonged exposure and stress inoculation training were found to be superior to supportive counseling and the wait-list control. Although these latter two conditions were associated with some reduction in arousal symptoms, there were few changes on the measures of avoidance and intrusion. At post treatment assessment, the stress inoculation intervention led to significantly lower scores on measures of PTSD than prolonged exposure, whereas at the 3.5 month follow-up, prolonged exposure was the superior treatment. Foa and her colleagues concluded that an optimal program should

combine both stress inoculation and prolonged exposure. Combining these approaches into a four session treatment package and comparing this to a repeat assessment no-treatment control produced promising results (Foa, Hearts-Ikeda, & Perry, 1995). Ten female assault survivors were found to have less severe re-experiencing and arousal symptoms than the control group. In the treated group one out of the ten people met symptom criteria for PTSD compared to seven out of ten in the repeated assessment group. Five and half months after the assault those in the treatment group were still significantly less depressed than those in the repeated assessment group and had less severe re-experiencing of trauma symptoms.

More recently, Marks, Lovell, Noshirvani, Livanou, & Thrasher (1998) examined whether cognitive restructuring alone or in combination with prolonged exposure was more effective in reducing posttraumatic symptomatology. Participants with PTSD, of at least 6 months duration, were assigned to one of four treatments: prolonged exposure alone; cognitive restructuring alone; combined prolonged exposure with cognitive restructuring; or relaxation. The diagnosis of PTSD was made using a formal structured interview (the Clinician-Administered PTSD Scale) and self report inventories were also used to examine treatment efficacy. Exposure and cognitive restructuring, individually or in combination, reduced posttraumatic stress symptomatology. These gains were maintained at six-month follow-up and were significantly greater than the moderate improvement from relaxation.

In summary, studies on the effectiveness of exposure and stress inoculation have had considerable methodological difficulties and have produced equivocal findings. Those studies that have been more methodologically rigorous have found stress inoculation and exposure interventions to be more effective than alternatives.

1.6.2 EMDR Outcome Studies

A more recent development in the treatment of PTSD is the method called Eye Movement Desensitization (Shapiro, 1989). This procedure was later reconceptualised and renamed Eye Movement Desensitization and Reprocessing (EMDR) by Shapiro (1991). EMDR requires the client to (a) focus on an image of a traumatic incident that evokes distress, (b) concentrate on a cognitive statement that best matches the traumatic image, (c) identify a preferred cognition and rate its validity, (d) describe the type of emotional distress and rate its severity using a Subjective Units of Disturbance Scale (SUDS), and (e) locate any physical sensations that accompany the distress. Components (a), (b), (d), and (e) become the initial target on which the client is instructed to focus. The client is then assisted to develop rhythmic saccadic eye movements by following the therapist's fingers across his or her field of vision. Subsequent targets are chosen depending on the client's responses to each set of eye movements (Shapiro, 1989, 1991, 1995).

Similar to the literature on exposure-based treatments, early attempts to evaluate the effectiveness of EMDR against a wait-list control also found few significant differences (Jensen, 1994). In contrast, more recent studies have found EMDR significantly superior to wait-list controls both at post-treatment and at follow-up (Rothblaum, 1997; Wilson, Becker & Tinker, 1997). Perhaps the discrepancy in the findings can be attributed to Jensen's acknowledgement that the treatment provided in his study was not judged to be a good match to the EMDR procedure described by Shapiro (1989). Secondly, Jensen (1994) delivered only two treatment sessions to a chronic PTSD group with the result that the treatment may not have been sufficiently powerful to effect change.

Prior to study 1, there were six published studies on the effectiveness of EMDR in comparison to other treatment modalities. Boudewyn and Hyer (1996) found EMDR to be more effective than a supportive counselling procedure in Vietnam veteran subjects. The standard EMDR intervention was also compared with a variant that did not involve any eye movements. There were no significant differences between these two groups. This finding that the eye movement component failed to add to treatment effects was also reported by Dunn, Schwartz, Hatfield, and Wiegele (1996) but is at odds with other studies (Shapiro, 1989; Wilson et al., 1996; Feske & Goldstein, 1997).

Two other studies involving Vietnam veterans also found that EMDR was superior to an active treatment alternative (Carlson, Chemtob, Rusnak, Hedlaund, & Muraoka, 1998; Rogers, et al., 1999). In the latter study compared to imaginal exposure, EMDR was found to lead to significantly larger reductions on an intrusive measure and a measure of distress. However the sample size was small (n=12).

Similar findings of the superiority of EMDR to active treatments have been reported in non-veteran populations (Marcus, Marcus, & Sakai, 1997; Scheck, Schaeffer & Gillette, 1998). In both studies, appropriate formal diagnostic assessment and standardized instruments were used. In the former study, EMDR was compared to "treatment as usual" which was whatever treatment was most preferred by therapists who received the referral. This included procedures such as psychodynamic psychotherapy, medication, behavioural techniques or hypnosis. Outcome measures included self-report inventories and an independent rater who conducted a diagnostic assessment. Significantly greater gains for EMDR at post-treatment were found on all trauma measures. In addition, at post-treatment 77% of EMDR subjects compared to only 50% of standard care patients no longer met the

diagnosis for PTSD. This result was found in spite of the EMDR participants having fewer treatment sessions. Scheck et al. (1998) compared an active listening treatment to EMDR where participants receiving the latter showed significantly greater improvement on all self-report measures. Superior treatment gains were also evident by blind independent ratings of PTSD. Careful attention was paid to treatment integrity, and therapists in each condition had considerable experience in and allegiance to their treating paradigm.

1.6.3 Conclusions from Review of Treatments for PTSD

In studies with more methodological rigor, EMDR is not only more effective than a wait-list control condition but also more effective than minimal intervention approaches. However, the same appears true for stress inoculation and prolonged exposure as described by Foa et al. (1991). This conclusion is consistent with Van Etten and Taylor's (1998) meta-analysis of PTSD. They reported that EMDR and prolonged exposure and stress inoculation were superior to all other psychological therapies on observer-rated and self-report measures at follow-up. Unlike pharmacotherapy, these psychological treatments were shown to maintain their effectiveness at follow-up. Although generally equally effective, there were trends for differences to be observed between EMDR and the other two procedures. Stress inoculation training and prolonged exposure were found to be more effective than EMDR on observer-rated total PTSD symptomatology at post-treatment but not on self-report measures. The apparent superiority of prolonged exposure and stress inoculation disappeared at follow-up with no differences between any of the total PTSD measures. Van Etten and Taylor (1998) also noted that EMDR improvement occurred after fewer sessions than prolonged exposure or stress inoculation. The only

other difference reported between the treatments was superiority for EMDR in intrusion symptoms. Whilst prolonged exposure and stress inoculation had comparable effect sizes to other psychological treatments on both observer and self-report measures of intrusive symptoms, EMDR demonstrated significantly superior effect sizes to other psychological treatments.

1.7 Conclusions from chapter 1

PTSD has been reported throughout history. Depending on the criteria used to define its symptoms, the lifetime of prevalence is about 9% whereas the presence of the exposure to traumatic symptoms is about 69%. Theories to account for why people develop PTSD included learning theory, theories based on information processing and biological theories, each of which explains some of the phenomena of PTSD although anomalies appear to exist for each. Reviews of the psychological treatment of trauma indicate that EMDR and exposure-based treatments are promising, but further study is needed for each before any of these can be considered a well established treatment for PTSD. Given that exposure and stress inoculation has considerable support as does EMDR, the most important question following the literature review is to compare the effectiveness of these two treatments. The result of this experiment is presented as a published paper in chapter 2. The introduction to the paper begins by stating the above position and reviewing two studies published prior to Lee et al (2002) that directly compared traditional exposure and EMDR treatments. In the thesis it was thought important to establish whether or not EMDR is an effective treatment before attempting to understand its processes.

CHAPTER 2

TREATMENT OF PTSD: STRESS INOCULATION TRAINING WITH PROLONGED EXPOSURE COMPARED TO EMDR

2.1 Preamble to study one

The paper reprinted in the next section has multiple authors. In keeping with doctorate research regulations below is a clear statement of my part in this work.

Helen Gavriel's contribution was the provision of a third of the treatment, and she helped refine the treatment manuals used in the study. She also helped recruit participants from the Royal Australian Navy and Sexual Assault Referral Centre to bring the numbers up to a sufficient level to ensure adequate power. Peter Drummond was my PhD supervisor at the time of the project and assisted in consultation throughout the period. Geoff Richards had particular expertise in behavioural approaches to PTSD and was used as a consultant to ensure treatment fidelity to this approach would be satisfied. Ricky Greenwald performed a similar function for the EMDR aspects of the treatment. I wrote the paper, designed the study and conducted all the analyses, thus was assigned first author of the paper.

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SITPE & EMDR FOR PTSD

Treatment of PTSD:

Stress Inoculation Training with Prolonged Exposure compared to EMDR

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Abstract

The effectiveness of Stress Inoculation Training with Prolonged Exposure (SITPE) was compared to Eye Movement Desensitisation and Reprocessing (EMDR). Twenty four participants who had a diagnosis of Post Traumatic Stress Disorder (PTSD) were randomly assigned to one of the treatment conditions. Participants were also their own wait list control. Outcome measures included self-report and observer-rated measures of PTSD, and self-report measures of depression. On global PTSD measures, there were no significant differences between the treatments at the end of therapy. However on the subscale measures of the degree of intrusion symptoms, EMDR did significantly better than SITPE. At follow-up EMDR was found to lead to greater gains on all measures.

The recent review commissioned by the APA task force on empirically validated psychological procedures stated that there are no well-established treatments for PTSD (Chambless et al., 1998). Nevertheless, this review found that three methods were "probably efficacious" for civilian populations, these being Exposure, Stress-inoculation, and EMDR.

Similarly in a recent meta-analysis of PTSD, Van Etten and Taylor (1998) concluded that EMDR and traditional behavior therapy (including exposure and cognitive interventions) were superior to all other psychological therapies immediately after treatment. They found that EMDR and traditional behavior therapy were equivalent in effect size to the most potent of the drug treatments which was found to be serotonin specific reuptake inhibitors (SSRI's). However the SSRI's had significantly higher drop-out rates than the psychological treatments. Unlike all other treatments, adequate follow up data was only available on the effectiveness of EMDR and traditional behaviour therapy. Both these therapies demonstrated maintenance of treatment effects at follow-up. Although generally equally effective, there were trends for some differences between Behavior Therapy and EMDR. Behavior Therapy was found to be more effective than EMDR on observer-rated total PTSD symptomatology at posttreatment but not on self-report measures. The apparent superiority of behavior therapy disappeared at follow-up with no differences between any of the total PTSD measures. Van Etten and Taylor (1998) also suggested that EMDR was more effective in reducing intrusion symptoms. Although Behavior Therapy and EMDR had comparable effect sizes for observer-rated intrusive symptoms, only EMDR was significantly more effective than all controls. A final

observation was that although the effect sizes for EMDR and Behavior Therapy were equivalent, this treatment effect was achieved after an average of 4.6 sessions for EMDR compared to 14.8 sessions for Behavior Therapy.

The findings from this meta-analysis were congruent with the first study to directly compare EMDR with a behavioral procedure (Vaughan et al., 1994). Four sessions of EMDR were compared with imaginal exposure treatment and Applied Muscle Relaxation. There were significant improvements in all three treatment conditions compared with a waitlist control on both observer-rated symptomatology and self-report measures. There were few significant differences between the three treatments. An exception was the assessments by a blind independent observer which indicated that only participants treated with EMDR had more improvement in intrusive symptoms. However the small sample size in this study limited power in detecting significant differences between groups. Notably, equivalent treatment effects were reported even though EMDR involved less treatment time due to reduced homework requirements.

To assess the strengths and weaknesses of the Vaughan et al. (1994) study, we compared it against the standards proposed by Foa and Meadows (1997) for a methodologically sound outcome study in PTSD. These standards involve: clearly defined target symptoms, reliable and valid measures, use of blind evaluators, adequate assessor training, replicable/manualized treatments, unbiased assignment to treatment (which includes multiple therapists for each condition), and ratings of treatment adherence.

The Vaughan et al. (1994) study satisfied many of the criteria suggested by Foa and Meadows (1997). For example improvement was assessed using standardized measures of PTSD and other symptoms. A structured clinical interview was used to

determine PTSD diagnostic status and the symptom severity of the population was clearly defined. The assessor was blind to treatment assignment. There was random assignment to all conditions and multiple therapists were used to deliver each of the treatments. The major problem with the study is that treatment integrity was unknown. There was no reference to detailed treatment manuals and there was no independent rater to assess the degree to which the treatments were conducted in the manner with which they were devised.

In a contrast to Vaughan et al. (1994), Devilly and Spence (1999) found EMDR to be less effective than an exposure based treatment both at the end of treatment and at three-month follow-up. The exposure based procedure (called TTP by the authors) combined Stress Inoculation Training and Prolonged Exposure. It was based on the work of Edna Foa and colleagues (Foa, Rothbaum, Riggs, and Murdock, 1991) but included additional cognitive components. Devilly and Spence stated that the subjects in the exposure based condition improved further during a three-month follow-up period while those in the EMDR condition returned to baseline. This result runs counter to the trend reported in the meta-analysis by Van Etten & Taylor (1998) of EMDR recipients improving further during follow-up.

The methodological rigour of the Devilly and Spence study was variable. Assessing it against the Foa and Meadows standards, it is clear that Devilly and Spence defined the target symptoms in the population being treated, utilised valid and reliable measures, and used blind symptom evaluators at post treatment (but not at follow-up).

However the procedure of assigning participants to treatment has been criticised (Chemtob, Tolin, van der Kolk, & Pitman, 2000; Maxfield & Hyer, in press). In addition the EMDR treatment delivered departed from the standard protocol

in a number of ways (Maxfield & Hyer, in press). These included rating the negative cognition, repeating the negative cognition during treatment, and omitting to target future and anticipated distressing material. The study also failed to meet the Foa et al. standard because multiple therapists were not used in both conditions making it difficult to separate treatment effects from therapist effects.

The primary purpose of the present study was to further investigate the relative effectiveness of the leading treatments for PTSD by comparing SITPE with EMDR. Particular attention was paid to treatment fidelity because comparative outcome studies to date have had weaknesses in this area. Furthermore, to more directly compare the efficiency of these two approaches, each participant was given the same number of treatment sessions and homework compliance was monitored. The effects of these treatments on global PTSD symptoms and intrusion symptoms were evaluated at post treatment and follow-up.

Method

Design

All participants were referred for treatment of PTSD. Following initial assessment each participant was entered onto a wait list. After six weeks, participants whose diagnosis of PTSD was confirmed by structured interview were then randomly assigned to either SITPE or EMDR. Therapeutic outcome was assessed via self-report measures of PTSD that are free from experimenter bias, observer-rated measures of PTSD, and self-report measures of depression. These were collected immediately after treatment and at a three-month follow up.

Measures

Davidson's Structured Interview for PTSD (SI-PTSD; Davidson, Smith, & Kudler, 1989). This required the clinician to assess the severity and frequency of particular symptoms associated with the diagnostic criteria for PTSD using DSM-III-R. Davidson et al. (1989) reported excellent diagnostic sensitivity and good specificity in comparison to other diagnostic interviews. Further construct validity was demonstrated by correlation analysis with the PTSD self-rating scale (Keane, Wolfe, & Taylor, 1987), the Hamilton Depression Scale (Hamilton, 1967), and the Hamilton Anxiety Scale (Hamilton, 1959). Although independent raters were initially used to score participant's responses this was not always possible and so most of *these* data *were* collected by the treating practitioner. Regular reviews *every two weeks* of these assessments of client symptoms were held to ensure consensus. These subjective measures were supplemented by a set of standardised objective measures.

Keane's Post-Traumatic Stress Disorder Scale from the Minnesota Multiphasic Personality Inventory (MMPI-K; Keane, Malloy, & Fairbank, 1984). This contains 49 MMPI items that have been shown to empirically differentiate between PTSD and non-PTSD veteran patients. According to Newman, Kaloupek, and Keane (1996), sensitivity and specificity varies from study to study but it appears to have moderate or strong psychometric qualities in most studies.

Impact of Event Scale (IES; Horowitz, Wilner, & Alvarez, 1979). This is one of the most widely used self-report measures of post-trauma symptomatology. The IES assesses the extent of avoidance, numbing and intrusion symptoms. Its advantages are that it has been widely used across a number of different trauma samples and that it is very easy to administer (Newman et al., 1996). However the measure does not assess hyper-arousal symptoms.

Beck Depression Inventory (BDI; Beck, Rush, Shaw, & Emery, 1979). This was included both as a measure of subjective distress to supplement scores on the IES and also because depression is thought to often accompany PTSD symptoms (Davidson & Foa, 1991).

Participant Selection and Description

All prospective participants were recruited either from the Clinical Psychology section of a large general hospital, the Psychology Department of a Government Defence service or a sexual assault referral centre. Practitioners were asked to refer people who appeared to have been traumatised by a recent event. All participants were interviewed about the nature of the trauma to ensure that it satisfied category "A" for PTSD using DSM-IV criteria. They were then given the IES and the BDI. Forty participants were referred with a range of traumas including sexual and physical assault, severe motor vehicle accidents, combat experience, and witnessing a murder.

At initial interview four people who met the criteria for Alcohol and Drug Dependency, Psychosis or a cluster B Personality Disorder as defined by DSM-IV (as assessed by the interviewing clinician) were excluded from the study. Another four people were excluded because of insufficient symptom severity (defined by a score of less than 32 on the IES) and one was excluded because of prior treatment with one of the procedures currently under investigation. Two failed to attend for reassessment.

The remaining 29 participants were re-interviewed after a 6 week wait list period. At this time all participants received the SI-PTSD and the MMPI-K. Two participants were excluded at this point because they failed to meet all of the diagnostic criteria for PTSD according to the SI-PTSD. The BDI and IES were then repeated.

Three participants dropped out of treatment: one from the SITPE condition,

one from EMDR, and one went to prison. Thus 24 completed treatment, 12 were given EMDR, and 12 given SITPE.

The mean age of the 24 participants who completed the study was 35.3 years. There were 13 males and 11 females. Seventy five percent of the sample had less than 12 years of education, 62.5% had blue-collar occupations, but 62.5% were not currently employed. Roughly half of the participants (54.2%) were involved in litigation proceedings at the time of treatment. Most had significant trauma in the past, 70.8% had experienced a trauma prior to the current episode and 29.2% had experienced multiple previous traumas. In addition 58.3% rated their childhood origin as containing either physical abuse, emotional neglect, or sexual abuse. Many of the participants had a history of psychopathology. For example, 41.7% had received some form of psychological or psychiatric treatment in the past, 50% had family members who had received treatment from a mental health professional, and 20.8% had been hospitalized before with a psychiatric condition.

Procedure

The same instruments administered at session 1 (SI-PTSD, MMPI-K, IES, BDI) were also administered posttreatment and at 3 month follow-up. The IES and BDI were also administered at the beginning of each session to assess intrusion, avoidance, and depression levels.

Participants were informed of the study at the pretreatment assessment and signed a consent form by the start of the first treatment session. Once each participant had been selected for the study he/she was assigned to one of the treatment conditions in alternate order, thus resulting in 12 participants for each treatment. Assignment of the first participant was via a coin toss. Each treatment program involved seven 90-minute sessions delivered on a weekly basis.

Three therapists were involved in treatment and each administered both treatments. Of the participants who completed treatment, 21 (11 SITPE, 10 EMDR) were treated by the first two authors who each had received Level I and Level II EMDR training by the EMDR Institute. Prior to EMDR training both therapists had considerable experience with exposure based strategies, had attended training workshops based on the Foa model and had given training workshops in this method. At about ¾ of the way through the study, one of the therapists also began offering training in EMDR. The third therapist was undergoing post-graduate psychology training. She treated three participants (1 SITPE, 2 EMDR) and received regular supervision from one of the primary therapists.

Independent treatment integrity checks were obtained from either video or audiotapes of the treatment sessions. A person not involved with this study randomly selected five tapes from each condition. Seven of these were videotapes.

The rater of the EMDR tapes was a clinical psychologist and an approved EMDR trainer by this Institute. The tapes were evaluated based on a checklist provided by the EMDR Institute. The checklist contained 27 items referring to aspects of the procedure. Each item was rated on a 1 to 7 scale according to its fidelity, where 1 = Poor and 7 = Excellent.

Rating the fidelity of the SITPE treatment was more difficult because there was no formal fidelity checklist to accompany the Foa manual. In addition there is no accreditation body for SITPE training. To improve the reliability of the assessment of SITPE fidelity, two raters assessed these sessions. They were asked to rate each tape on how well the procedures were employed, and the degree to which the therapist matched the instructions provided in the treatment manual. Fidelity was assessed on the same 1-7 scale used in the EMDR condition. Both raters were Clinical

Psychologists with more than 10 years experience. Each had been trained at Universities that specialised in behavioral treatments. Both worked in accredited War Veteran programs and had attended workshops on SITPE methods. One rater trained staff in his unit and at universities in behavioral treatments for PTSD. Neither rater had EMDR training.

Treatment Conditions

SITPE This treatment was based on a 22 page manual developed and supplied by Edna Foa. Foa et al (1991) stated that this combination of treatments was likely to be the most efficacious in treating PTSD. Each therapist maintained adherence to the treatment manual apart from adapting the client handouts and interventions from rape/sexual assault content to more general PTSD issues. Secondly the procedure was reduced from 9 sessions to 7 by excluding the session containing thought stopping and condensing the content of the first 3 sessions into 2 by providing the participants with more extensive homework exercises that included relaxation tapes and notes. Foa has also excluded the session containing thought stopping from a briefer version of her 9-session treatment (Foa et al., 1995).

The first session was devoted to assessment as well as briefly introducing the client to controlled breathing. This was an attempt to counter-condition any anxiety that may have evolved from discussion of the trauma. Session 2 began with an educational phase in which the treatment and rationale were described. A handout was introduced into this section to help explain how fear and anxiety become conditioned during traumatic events and how avoidance is often used as a coping mechanism. Trauma-related information was gathered in order to generate imaginal and in vivo exposures for treatment and homework. Brief training in progressive muscular

relaxation was given and participants were then provided with the full version on a tape that they were required to use for daily practise in the next week.

Session 3 involved a prolonged exposure in which the participant was invited to recall a trauma memory. Participants were instructed to close their eyes and give a detailed present-tense account of this memory for more than an hour. If the narrative ended, the participant was asked to start at the beginning again. The therapist reinforced continued recall of the trauma material and discouraged avoidance behaviours. Anxiety levels were monitored every five minutes. The session was audiotaped and following exposure the client's reaction was discussed. The homework assignment was to listen daily for the next week to the taped scenario from the session.

Instruction on coping skills began in the fourth session. The format for teaching coping skills for sessions 4,5,6 and 7 was: definition of the coping skills; rationale and mechanism; demonstration; application 1 (practise with problem unrelated to trauma); review; and application 2 (practise on trauma-related problem). The skills training occupied the first 45 minutes of the session. The next 45 minutes consisted of imaginal exposure using the same format as that described in session 3. The homework assignment was to carry out an in-vivo exposure from the hierarchy constructed in session two and to remain in that session at least 45 minutes or until the anxiety decreased. They were also required to complete a monitoring form of this homework activity. Additional coping skills practise was also set for homework.

Coping skills were taught in the order described in Foa's manual. These were based on other treatment approaches and included cognitive restructuring (Ellis and Harper, 1975; Beck, Rush, Shaw, and Emery, 1979), guided self dialogue

(Meichenbaum, 1977), and the use of covert modelling and role play (Vernon and Kilpatrick, 1983).

EMDR The full standard 8-phase EMDR procedure was used as described by Shapiro (1995). Following assessment each client was given relaxation-breathing strategies which he/she was encouraged to practise. In the second session the Preparation Phase was administered including the establishment of appropriate expectations. The second session also included the establishment of the target memory and Desensitization was begun. This involved having the client focus on the most distressing portion of the selected trauma memory while simultaneously moving his/her eyes from side to side by following the therapist's fingers across the line of his or her visual field. The speed and number of movements depended on the client's responses.

In general the therapist asked the client to voice any associations to the trauma material at the end of each set of eye movements and for the next set of eye movements the person was then encouraged to stay focussed on whatever had emerged. However, if there seemed to be a failure in the progression of material, as defined by two consecutive eye movement sets occurring without any change, then one of the unblocking procedures was used (as described in Shapiro, 1995). When distress dissipated following this procedure, the participant was asked to refocus on the memory and the procedure was repeated until the participant was unable to identify any portion of the memory that was still associated with distress.

At this point, the therapist checked the participant's degree of arousal to the trauma selected for treatment. This was done using an 11-point (0 = no discomfort; 10 = highest possible discomfort) Subjective Units of Distress Scale (SUDS; Wolpe, 1982). When the SUDS score reached 0 or 1, the Installation Phase began which

involved having the client pair a positive cognition with the original trauma information while doing eye movements. At the end of each set the participant was asked to hold the current memory of the trauma and rate the believability of the positive cognition on a 7-point scale (1 = completely untrue; 7 = completely true). Once this rating had reached a stable 6 or 7 the Body Scan Phase was implemented. The participant was asked to focus on any residual physical distress and eye movements were continued, usually until the distress was eliminated. The session concluded with a debriefing. If any distress remained, an imagery technique was used to facilitate relaxation.

Subsequent sessions began with the Re-evaluation Phase of the EMDR protocol. Past trauma material was assessed for the most disturbing aspects, and if disturbing material remained then this was further targeted with EMDR. Once this had been processed towards resolution, any present stimuli that either elicited a trauma response or any potential future situation that the therapist or client identified as likely to elicit disturbing trauma-related emotions or problematic behaviors was then targeted.

Results

Preliminary analysis- sample characteristics

A Chi-Square test for independence indicated no significant differences between the two treatment groups in amount of prior therapy, current involvement in litigation, drug use, education level, employment status, family psychiatric history, prior traumas, or past incidents of abuse in the person's family background (see Table 1). An independent t-test analysis also found no significant differences between the groups on age or time between the trauma and participation in the study (see Table 2).

Although 5 males participated in the EMDR treatment and 8 males in the SITPE, this difference was not significant (Pearson Chi-Square = 1.51, p=.22). Independent t-tests were used to investigate differences between the treatment groups on pretreatment measures. No differences were found for the IES (t (22) = .11, p = .91), BDI (t (22) = 1.05, p = .31), SI-PTSD (t (22) = 1.63, p = .12), or MMPI-K (t (22) = 1.31, p = .21). Therefore the groups appeared to be equivalent on major variables.

Insert Table I here

The length of time between the trauma and initial assessment for the study ranged from 2 to 71 months with a mean of 14.92 and a standard deviation of 15.71. One participant at the lowest end of the range was allowed onto the waiting list at one month post-trauma, thus potentially satisfying criteria for PTSD, and treatment was begun at 10 weeks post-trauma, 2 weeks before the 3-month mark which, by convention, defines PTSD as chronic.

Insert Table 2 here

At pretreatment the mean score for all participants on the IES was in the severe range (55.3) and in the moderately severe range on the BDI (21.4). Scores were also high on the SI-PTSD (39.7). On the MMPI-K scale, 70.8% of the sample scored above the T score cut-off point of 65. The mean MMPI-K T-score was 76.83. Therefore this group was significantly traumatised.

Waitlist effects

Decreases in mean scores during the 6-week waitlist period and during treatment on two self-report measures were investigated using a paired t-test (see Table 3). Scores on the BDI decreased more over the treatment phase than over the pretreatment phase, t (23) = 2.60, p < .05, as did scores on the IES, t (23) = 5.63, p < .001. Thus improvements during the treatment period were not due to spontaneous

remission.

Insert Table 3 here

Comparison of interventions

Means and standard deviations for all the dependent variables on each assessment occasion are presented in Table 4. A decrease in symptom severity is signified by a decrease in outcome scores for all measures. There appeared to be a greater improvement in outcome scores across all measures for participants receiving EMDR (see Figure 1). A multivariate analysis of co-variance (MANCOVA) was used to test whether or not following treatment the scores on SI-PTSD, IES, BDI and MMPI-K differed significantly between the two treatments. Pretreatment scores were used as covariates. The assumption of homogeneity of regression was tested by assessing the degree of interaction between the independent variable and the covariates. The results showed that there was sufficient homogeneity to use MANCOVA Wilks $\Lambda(8,20)= .33$ ($F=1.87$, $\eta^2=.43$, $p=.122$)[1]. MANCOVA is also based on the assumption that the dependent variables are intercorrelated. An examination of these correlations shows that this is true for the measures used in this study (Table 5).

Insert Table 4 here

Insert Table 5 here

A MANCOVA was conducted using scores at posttreatment as the dependent variable. There was no significant difference between conditions immediately after treatment Wilks $\Lambda(4,15)= .73$ ($F=1.37$, $\eta^2=.27$, $p=.29$).

Differences between the two treatments at follow-up on the outcome variables of SI-PTSD, IES, BDI and MMPI were then tested for significance using a

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[1] Eta squared=η^2

MANCOVA. The scores at follow-up were used as the dependent variable and the scores prior to treatment were used as covariates. There was a significant main effect for condition favoring EMDR Wilks $\Lambda(4,15)= .55$ ($F=3.08$, $\eta^2=.45$, $p<.05$). Univariate tests of between-subjects effects showed significant differences on the IES, $F(1,18)=8.04$, $\eta^2=.31$, $p<.05$; BDI, $F(1,18)=12.15$, $\eta^2=.40$, $p<.001$; SI-PTSD, $F(1,18)=6.74$, $\eta^2=.27$, $p<.05$; MMPI-K, $F(1,18)=6.32$, $\eta^2=.26$, $p<.05$.

Given the finding of significant differences in treatment effects over the pretreatment to follow-up period but not during the pretreatment to posttreatment period, the significance of changes that occurred between posttreatment and follow-up was investigated. A MANCOVA was conducted using scores at follow-up as the dependent variable and posttreatment scores as covariates. There was no significant difference between conditions Wilks $\Lambda(4,15)= .73$ ($F=1.42$, $\eta^2=.28$, $p=.28$). Thus the finding of differences at follow-up probably reflects a cumulative differential treatment effect rather than any particular dramatic change during the follow-up period (see Figure 1)

Insert Figure 1 here

Differences in improvement on the two intrusion measures between the two treatments were tested with MANCOVA (see Table 6). Scores on the variables at posttreatment were used as dependent variables and the pretreatment scores on these measures as covariates. There was a significant main effect for condition favouring EMDR, Wilks $\Lambda(2,19)= .66$ ($F=4.91$, $\eta^2=.34$, $p<.05$). Univariate tests showed that only intrusion scores on the IES differed significantly between the conditions at posttreatment, $F(1,20)= 9.74$, $\eta^2=.33$, $p<.005$.

Insert Table 6 here

Differences between the two treatments on the intrusion measures were also tested at follow-up with MANCOVA. Scores on both the structured interview and self-report measures at follow-up were used as dependent variables and the initial scores on these measures were used as covariates. There was a significant main effect for condition in the expected direction, Wilks $\Lambda(2,19)= .58$ ($F=6.99$, $\eta^2=.42$, $p<.005$). Univariate tests of between subjects effects showed significant differences on both the IES scores, $F(1,20)=11.80$, $\eta^2=.37$, $p<.005$, and the SI-PTSD, $F(1,20) = 11.71$, $\eta^2=.37$, $p < .005$. There were no significant differences between the treatments on avoidance measures either at posttreatment Wilks $\Lambda(2,19)= .99$ ($F=.09$, $\eta^2=.01$, $p=.92$) or at follow-up Wilks $\Lambda(2,19)= .80$ ($F=2.41$, $\eta^2=.20$, $p=.12$).

To compare the effect sizes in the current study with those obtained in earlier studies, a Cohen's d statistic was calculated by determining the difference between the two means and dividing by the pooled variance. These within groups effect sizes are presented in Table 7.

Insert Table 7 here

Clinically significant change

Both treatments proved to be highly effective with negligible outcome differences on diagnostic status. At posttreatment, 83% of the participants in the EMDR condition and 75% of those in SITPE no longer met the criteria for PTSD as measured by the SI-PTSD. At follow-up 83% from each condition no longer met these criteria.

Another means of considering clinically significant change is by using a cut-off score of the pretreatment mean less two standard deviations, as recommended by Jacobson and Truax (1991). In the present study those participants scoring below 37 on the IES would be regarded as having clinically significant improvement. Using this

criterion, each of the treatments produced clinically significant improvement in 66.7% (8) of the participants at posttreatment. Using the same criterion, at follow-up 91.7% (11) of EMDR participants compared to 50% (6) of the SITPE participants had achieved clinically significant improvement. This difference was statistically significant (Pearson Chi-Square = 5.04, $p < .05$).

Treatment Integrity

Fidelity ratings were satisfactory. Using the EMDR checklist, the rater's mean fidelity score was 5.2 and the median was 6.0 on the 1-7 scale.

Similar high scores were obtained in the integrity ratings of the SITPE treatment. Agreement between the two SITPE raters was substantial (r=.87). The median rating was 6.0 and the mean rating was 6.33.

A t-test for independent samples indicated that the difference between the mean ratings obtained for the 10 EMDR and SITPE tapes was not significant $t(8) = 2.130$, $p = .07$.

Discussion

Both the EMDR and SITPE procedures produced significant improvement on self-report measures of depression and trauma in comparison to a waiting period. The effects of treatment were large to very large according to criteria suggested by Cohen (1977) and both treatments required only a small number of sessions. Although all participants met the criteria for PTSD at the start of treatment, 83% no longer met these criteria at follow-up.

The study excluded participants on the basis of possible psychosis, personality disorder, or active substance abuse; however, most participants had a significant history of trauma in addition to the index event, as well as a significant history of prior mental health problems. About half of the participants were involved in

litigation at the time of treatment, and well over half were unemployed. This was a relatively complex and challenging population such as is found in actual clinical practice; thus, the findings are directly relevant to clinical practice with this type of client.

There were no significant differences between groups on any of the global measures immediately after treatment. However, small but statistically significant differences were found at treatment follow-up on measures of trauma symptomatology and distress. The comparatively greater improvement over the follow-up period after EMDR treatment is consistent with the results of Van Etten and Taylor (1998). In one of the few earlier studies to directly compare traditional behavioral procedures to EMDR, there were also larger reductions in trauma measures in the EMDR group, although those improvements did not reach statistical significance (Vaughan et al., 1994).

There was no significant difference between the two treatments according to the number of people meeting PTSD diagnosis at posttreatment or follow-up. Using the criterion of clinically significant improvement defined as symptom reduction of at least two standard deviations below the pretreatment score, there was no difference between the treatments at posttreatment but at follow-up almost twice as many EMDR participants had reached this criterion than participants in SITPE.

These findings appear at odds with the follow-up data reported in another study comparing similar behavioral procedures used in the current study to EMDR (Devilly & Spence, 1999). In that study, participants in the behavioral treatment improved further during the follow-up period while those in the EMDR condition appeared to return to baseline.

Treatment integrity issues

The conflicting findings lead to questions about the nature of the treatment delivered in each study. In the present study, extensive procedures were followed to ensure treatment fidelity. Therapy administered by the first two authors was reviewed by a fidelity rater in a pilot project to ensure fidelity with the treatment under investigation. Subsequently, separate raters who had training in, and were identified with each treatment were used to assess the fidelity of the therapy in each condition. All raters were experienced clinicians in treating PTSD. Two raters also had more than 5 years experience as a trainer in their respective models. Not only were high fidelity ratings obtained for each treatment by raters with impeccable credentials; the minimal dropout and improved outcomes were at levels consistent with those achieved in previous research.

In contrast, Devilly and Spence (1999) used the same fidelity rater for both treatments, with no indication that the rater had any special qualifications beyond being a certified mental health practitioner with some training in each of the methods. The standard training in EMDR has not always been sufficient to ensure treatment fidelity (see Greenwald, 1996), and according to the EMDR International Association (1999), an additional period of supervised practice is required for a basic level of competence. Much more supervised experience is required to qualify as a supervisor (trainers have additional requirements), presumably the level one would want for a fidelity rater. Although equivalent credentialing may not exist for behavior therapists, a fidelity rater should have advanced qualifications as may be available. Since the credibility of the Devilly and Spence rater is questionable, it is unclear how his or her view of fidelity correlates with actual practice.

The quality of the EMDR treatment delivered in the Devilly and Spence study may be called into question on other grounds. In the present study, the EMDR group

showed an effect size of 1.97 for self-report measures and 2.48 for observer-rated measures which although larger than the mean reported in the Van Etten and Taylor meta-analysis were within the 90% confidence intervals for EMDR. One possible reason for our slightly larger than average effect size could be that there were seven treatment sessions compared to an average of 4.6 in the studies that were reviewed in the meta-analysis. In contrast the effect size of .32 reported by Devilly and Spence for EMDR at follow-up is well outside of those intervals, suggesting that the treatment was less potent than usual. In particular, Devilly and Spence do not mention the use of Re-evaluation phase of the EMDR procedure. One of the crucial aspects of this phase is to have the person focus on possible difficult situations in the future and to process associated anticipated distress with accompanying eye movements. The exclusion of this phase may account for the relatively low effect size at follow-up given that aversive events that may have occurred in the follow-up period were not targeted during treatment. In contrast, it is reasonable to surmise that the cognitive-behavioral treatment in the Devilly and Spence study was delivered properly, in that the principal investigators were presumably well versed in the CBT protocol they devised and named.

Whereas the EMDR treatment conducted by Devilly and Spence may not have adequately replicated the standard protocol, the same does not appear applicable to the SITPE treatment in our study. We obtained a mean effect size for this treatment procedure on self-report measures of 1.01 (7 sessions) which is similar to the 1.10 (9 sessions) reported by Devilly and Spence – although both are lower than the 1.63 (14.8 sessions) reported by Van Etten and Taylor. Similarly, our attrition rates (14%) were equivalent for each treatment and to other EMDR and traditional Behavior Therapy studies (Van Etten and Taylor, 1998). This contrasts with the unusually high

attrition rate of 35% for EMDR reported by Devilly and Spence, much of which occurred prior to the first session involving eye movement.

Intrusion and avoidance symptoms

EMDR resulted in greater reduction in intrusive symptoms than SITPE. At follow-up there were large and significant differences on both observer-rated and self-reported intrusion measures. However, immediately after treatment only the self-report intrusion measure showed significantly greater changes for the EMDR treatment. This finding is similar to Vaughan et al. (1994) who reported greater reduction in symptoms of intrusion for the EMDR condition.

The superiority of EMDR over SITPE for intrusion symptoms may be due to the unique aspects of the EMDR intervention that focuses more on treating intrusions. In EMDR sessions, participants are frequently asked in the session "What do you get now?" - a question which would elicit any intrusive phenomena. When such material is reported, it is targeted for desensitization. In contrast, SITPE appears to more directly target avoidance behavior. The SITPE condition included a substantial homework component where, from the third session, participants were given tasks that encouraged them to face stimuli that they had previously avoided. These tasks occupied seven hours of the participant's week and thus represent a very intensive aspect of the intervention. However, there were no significant differences between the two treatments on any of the avoidance measures at posttreatment or follow-up.

Other considerations in treatment choice

EMDR appears to be a more efficient treatment than SITPE. In the current SITPE protocol each person was set approximately 7 hours of homework between each treatment session (totalling 42 hours). Although compliance was less than optimal, therapists administering SITPE estimated from the participants' homework

diaries that the average person completed 28 hours of homework. This was a similar compliance rate to that reported in other studies that formally assessed the degree to which homework tasks were completed with this type of intervention (Marks et al., 1998; Scott and Stradling, 1997). This compares to an estimated 3 hours homework for EMDR.

A possible further advantage for EMDR is that participants may prefer it to SITPE. In EMDR the person does not have to recount details of their trauma experiences to the therapist whereas this is a necessary aspect of SITPE. Other investigators examining participants' perceptions of the treatment have all reported that EMDR is preferred to other modalities. For example, Vaughan et al. (1994) found that participants rated their EMDR therapist as more warm and supportive than their behavioral therapist despite the same therapist being used in both treatment conditions. In one study (Ironson, Freund, Strauss, & Williams, in press), the level of distress post-session was lower for EMDR than for the traditional exposure treatment. Other authors have also suggested that EMDR is preferred by participants over other treatment methods (Boudewyns & Hyer, 1996; Pitman et al., 1996), and one study reported a lower dropout rate for EMDR (0/10) compared to prolonged exposure (3/10) (Ironson et al, in press). However, participant preference was not assessed in the current study and any differences were not substantial enough to affect the retention rates.

Limitations

A possible limitation of the present study was the rather small size of the sample. However, the number of participants at follow-up compares favorably with other studies in this area. For example, Foa et al. (1991) maintained only 9 subjects per condition and Vaughan et al. (1994) averaged 12. As well, the effect sizes for the

differences in intrusion measures were substantial. However, the present study clearly requires replication with more participants.

Another limitation of the present study was that the assessor administering the structured interview posttreatment and at follow-up was not blind to treatment assignment or in all cases independent to the therapist. However, because the standardized self-report trauma measures were generally consistent with the interview data, this probably did not influence the results. Indeed, in nearly all the analysis, the mean effect sizes for the observer-rated measures were less than the self-report measures.

It is unclear to what extent conclusions based on the SITPE treatment used in this study may be generalized to other exposure and cognitive treatment packages. A recent study found that combining stress inoculation training and prolonged exposure was less effective than prolonged exposure on its own, although not significantly different from stress inoculation training on its own (Foa et al., 1999). It was argued that perhaps the inclusion of exposure and the stress inoculation training into the one condition might lead to information overload for participants, thus making it less effective than prolonged exposure. However, in that particular study the PE had a lower dropout rate. This may have confounded the interpretation as the difference between the treatments was only found when treatment non-completers were included in the analysis. In contrast, another study that compared exposure only with cognitive therapy only and with the combination found no significant differences between the 3 treatments (Marks et al., 1998). Consideration of these findings is complicated by the fact that Foa and colleagues were treating only female assault victims, whereas Marks and colleagues were treating a general adult PTSD sample. Thus the optimal combination of skills training, cognitive therapy and exposure in a traditional

behavioral treatment programme of PTSD remains uncertain.

Finally, it is possible that designating a treatment duration of seven sessions may have put the SITPE condition at a disadvantage in that a larger number of sessions may have increased its effectiveness. Indeed, Foa et al (1999) speculated that, in a combined approach, even more sessions might be needed for each treatment component to be optimally effective. On the other hand, the effect size obtained in the current study for SITPE compares quite favorably with those obtained in other studies of traditional Behavior Therapy approaches, so it is unlikely that SITPE was unfairly represented here. Still, it is possible that SITPE might be improved with additional sessions. The decision to use seven sessions across treatment conditions was meant to give each treatment a fair chance while allowing a comparison of treatments over the same number of sessions.

Conclusion

It is encouraging that both treatments were highly effective with a challenging PTSD population in relatively few sessions and with low dropout rates. Although there was considerable clinically significant improvement in symptomatology, after the 7-session course of treatment participants were still indicating some distress. In clinical practice the option of continuing treatment might rectify this.

Considering the controversy and confusion that has surrounded EMDR, a particular strength of this study was the emphasis on ensuring adherence to the treatment protocols as specified by the respective treatment manuals. A number of reviewers who analyzed the contradictory findings regarding EMDR have concluded that it is highly effective for trauma treatment, but only when done properly (Greenwald, 1996; Lee et al, 1996; Shapiro, 1999). This view is supported by a recent meta-analysis that found that good fidelity in EMDR studies was the best predictor of

positive outcome (Maxfield & Hyer, in press). The present findings are consistent with that understanding. Furthermore, EMDR may be particularly difficult to master (Shapiro, 1991), resulting in potentially inadequate practice even by those with some formal training in the method (Greenwald, 1996). Further study of EMDR should emphasize treatment fidelity to ensure that results are meaningful and can be interpreted.

This study compared the two major treatments for PTSD by the same clinicians who were competent in both methods, and featured nearly all of the components of optimal controlled research called for by Foa and Meadows (1997). The sample consisted of a PTSD population which can be considered to be representative, within the limits imposed by the selection criteria, of those presenting with PTSD in clinical practice. These findings extend the previous research support for both SITPE and EMDR, and indicate that these approaches should be considered as first line treatments for PTSD.

In this study EMDR was somewhat more effective in terms of treatment outcome, particularly in regard to intrusive symptoms at least in the intermediate term. It was also more efficient, in that it required much less homework. This result awaits replication.

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Appendixes

Table 1. Comparison of Background Variables in each Treatment Condition.

	EMDR	**SITPE**	**Pearson Chi-squared (a)**
Currently seeking compensation for trauma	5 (42%)	8 (67%)	1.51
Regular or binge user of drugs	5 (42%)	5 (42%)	0.00
History of psychiatric treatment in family	8 (67%)	4 (33%)	2.67
History of abuse in family of origin	8 (67%)	8 (67%)	0.00
Sought prior assistance for this incident	4 (33%)	6 (50%)	.41
Unemployed	8 (67%)	7 (58%)	.18
Prior trauma	7 (58%)	10 (83%)	1.82
Less than 12 years education	9 (75%)	9 (75%)	0.00

(a) None of the differences were statistically significant $p > .05$

Table 2
Mean Age and Time Between Trauma and Entering Treatment for Each Treatment Condition

	EMDR	SITPE	*t* value	*p* value
Duration (months)	17.67 (19.66)	12.17 (10.62)	.85	.40
Age (years)	34.00 (17.16)	36.58 (13.58)	.41	.69

Note: Standard deviations in brackets.

Table 3. Comparison of Changes in Scores During Waitlist and Treatment.

	Preliminary assessment	**Prior to Session 1**	**Posttreatment**	**Improvement during waitlist**	**Improvement during treatment**
IES	55.33 (8.49)	50.50 (10.70)	26.71 (19.51)	4.83	23.89
BDI	21.33 (9.67)	18.67 (8.99)	10.73 (9.55)	2.67	7.94

Standard deviations in brackets.

Table 4. Means and Standard Deviations for the Outcome Measures by Treatment Group.

	EMDR			SITPE		
	Pre	**Post**	**Follow-up**	**Pre**	**Post**	**Follow-up**
BDI						
Mean	16.75	8.21	7.75	20.58	13.25	15.92
Adjusted Means (a)		7.30	7.38		14.16	16.28
SD	7.81	5.71	4.63	10	12.01	12.09
IES (Total)						
Mean	55.75	23.17	19	54.92	30.25	32.92
Adjusted Means		21.15	17.22		32.27	34.69
SD	8.21	18.99	18.73	9.08	20.21	19.98
MMPI-K						
Mean	72.58	54.86	54.33	81.08	65.75	70.75
Adjusted Means		56.12	56.48		64.49	68.60
SD	16	15.65	9.36	15.96	17.43	18.89
SI-PTSD (Total)						
Mean	37.58	17	14.17	42.25	25.08	24.33
Adjusted Means		17.03	14.40		25.06	24.10
SD	5.47	12.92	12.15	8.25	13.27	12.03

(a) Adjusted means based on MANCOVA

Table 5. Pearson correlations between measures.

	Beck IES	**Beck MMPI-K**	**Beck SI-PTSD**	**IES MMPI-K**	**IES SI-PTSD**	**MMPI-K SI-PTSD**
Pre	.38*	.71*	.41*	.33	.44*	.53*
Post	.51*	.71*	.67*	.64*	.79*	.82*
Follow-up	.66*	.84*	.64*	.59*	.78*	.70*

*****significant at $p<.05$

Table 6. Means and Standard Deviations for the Intrusion and Avoidance Measures of PTSD by Treatment Group.

	EMDR			SITPE		
	Pre	**Post**	**Follow-up**	**Pre**	**Post**	**Follow-up**
IES (intrusion)						
Mean	26.58	10.08	8.92	24.17	15,58	16.67
SD	7.01	7.56	8.25	6.95	11.35	10.79
SI-PTSD (intrusion)						
Mean	11.25	5.17	3.42	10.83	6.75	6.42
SD	1.96	4.76	3.73	2.48	4.54	3.99
IES (avoidance)						
Mean	25.00	13.08	10.08	26.58	14.67	16.25
SD	6.59	11.72	11.20	7.49	9.78	9.60
SI-PTSD (avoidance)						
Mean	14.58	6.92	4.75	15.75	8.58	9.33
SD	3.09	5.71	3.93	4.90	5.55	5.07

Table 7. Mean within group effect sizes (Cohen's d) of treatment for the pretreatment to follow-up period across different studies.

	EMDR			**Traditional Behavior Therapy**[1]		
	Meta-Analysis	Current study	Devilly & Spence	Meta-Analysis	Current study	Devilly & Spence
Self-report	1.33	1.97	.32	1.63	1.01	1.10
Observer-rated changes	2.27	2.48	Not Available	1.93	1.74	Not Available

[1] The values in the columns labeled Traditional Behavior Therapy refers to the average effect size across all studies identified as Behavior Therapy in the Meta-analysis (Van Etten & Taylor, 1998), to SITPE in the current study, and to TTP in the study by Devilly and Spence (1999).

Figure 1. Effects of treatment condition on the outcome variables

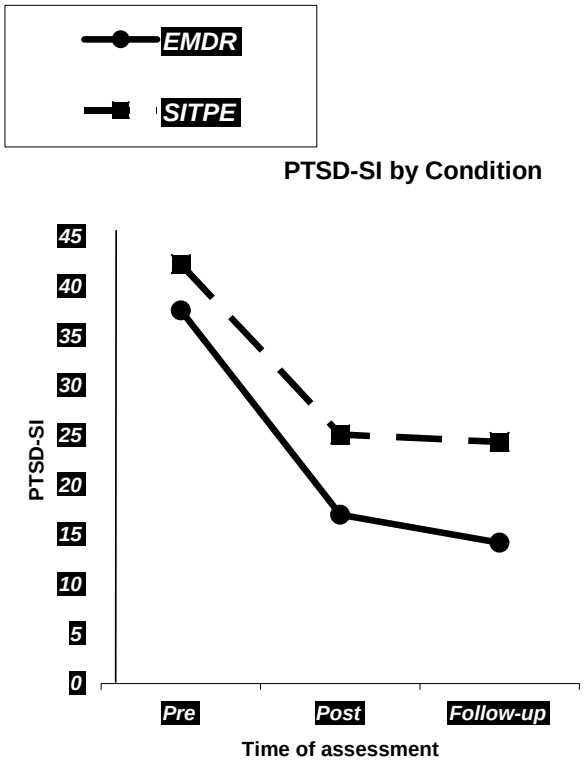
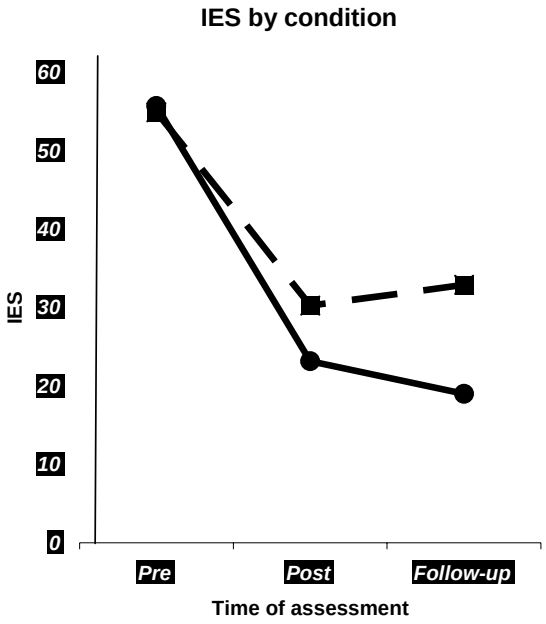


Figure 1. Continued



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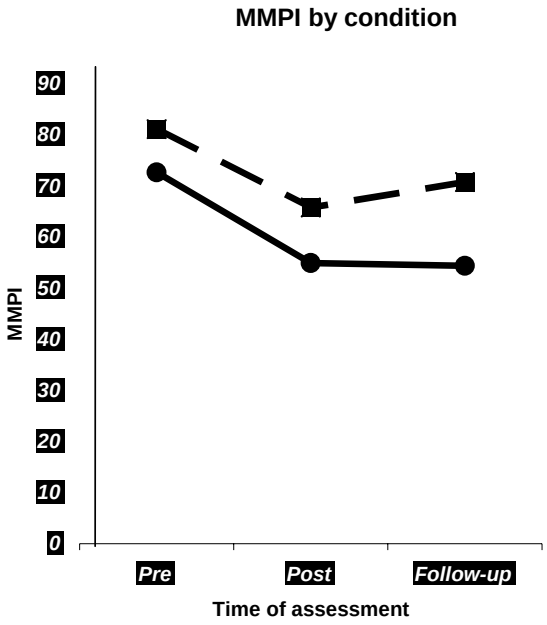

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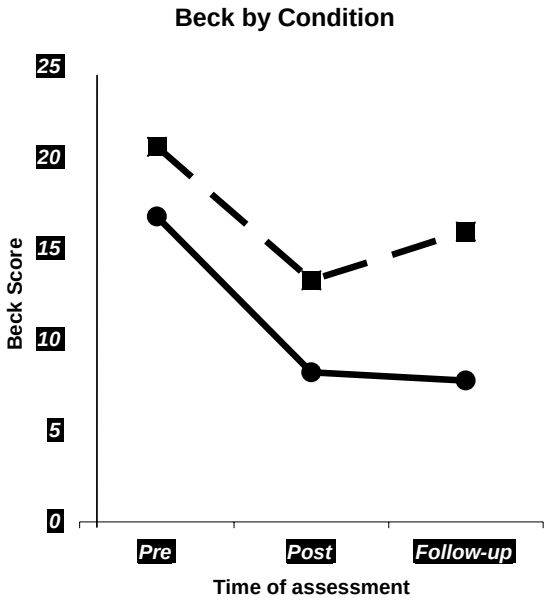

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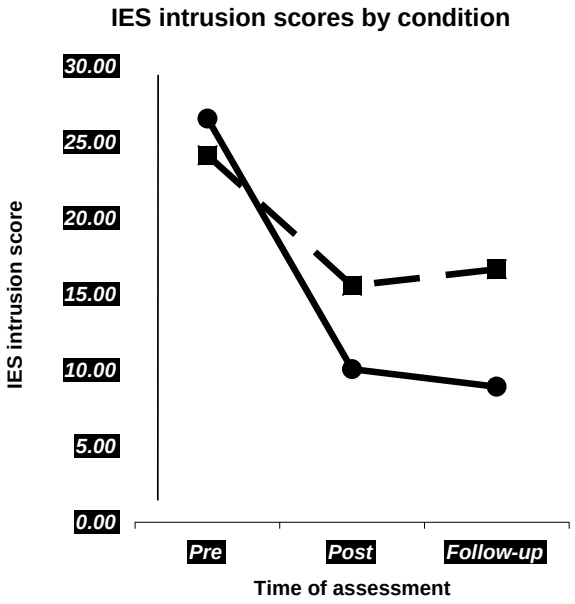

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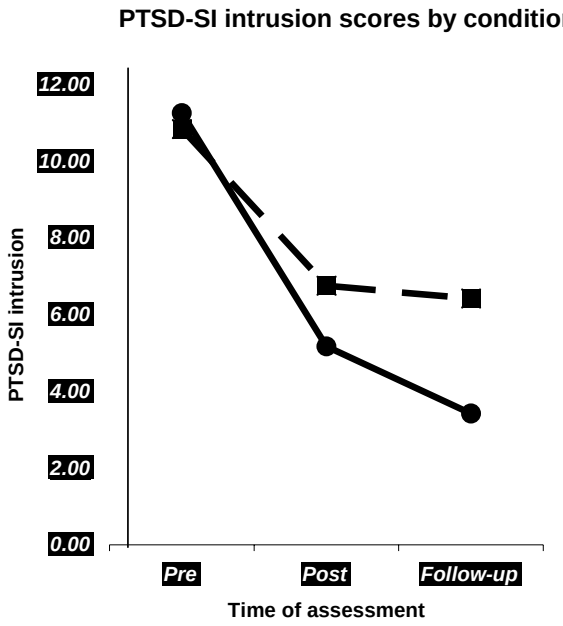

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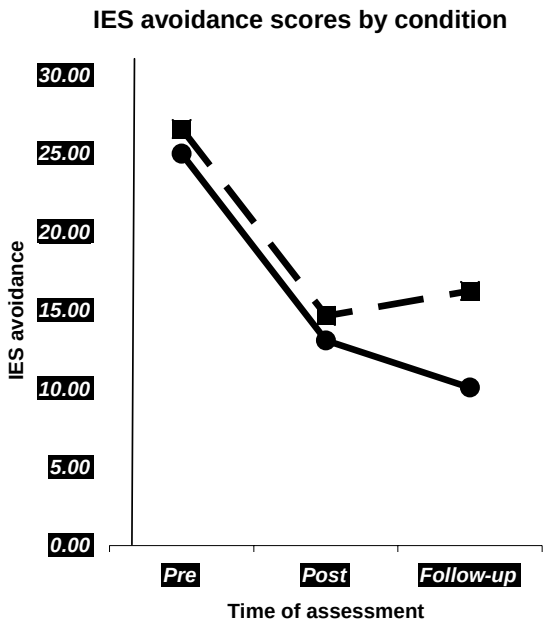

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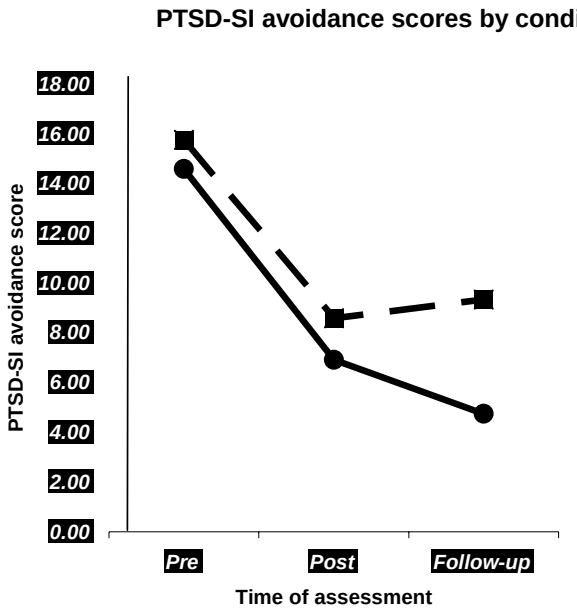

2.3 Update on outcome studies post publication

This literature update following study 1 has been divided into 3 sections. The first looks at randomised outcome studies on CBT vs EMDR. The second compares EMDR with treatment as usual. The third looks at recommendations either by committees formed to examine evidence based practise guidelines or by researchers pondering the same question using meta-analysis techniques.

2.3.1 Randomised outcome studies: CBT vs EMDR

There were four subsequent publications that directly assessed the effectiveness of EMDR compared to a traditional exposure-based treatment. One study published in 2002 with 22 participants also found that EMDR and prolonged exposure were equally effective post-treatment (Ironson, Freud, Strauss, & Williams, 2002). Participants receiving EMDR appeared to improve quicker in that 70% had reached a level of clinically significant improvement in PTSD after three EMDR sessions compared to only 17% in the prolonged exposure condition. A limitation of the study was that only 12 of the 22 participants could be contacted at follow-up. The data indicated that both groups maintained their treatment gains with no difference between the two treatments.

EMDR was also found to work more quickly than exposure-based treatments in a larger trial with 105 participants (Power et al., 2002). EMDR was compared with exposure plus cognitive restructuring on a number of observer-rated and self-reported measures of PTSD. Both treatments were found to lead to substantial improvements and were more effective than a wait-list control. Although the exposure plus cognitive restructuring and EMDR treatments were equivalent on most measures, the

EMDR treatment was achieved with significantly fewer treatment sessions (4.2 versus 6.4). At a fifteen-month follow-up, gains for both treatments were generally maintained. The only significant difference at follow-up was an improvement in depression (according to an independent observer) in favour of EMDR.

EMDR and Prolonged Exposure (PE) were found to be equivalently efficacious and both superior to a waitlist control in a controlled trial of 74 female rape victims (Rothbam, Astin, & Marsteller, 2005). Outcome measures assessed the severity PTSD, depression, dissociation and state anxiety. These measures were administered by assessors blind to treatment condition. Unlike other studies noted above, there was no difference between the active treatments in rate of improvement. The study met the highest criteria for methodological rigour proposed by Foa and Meadows (1997).

The improvements in EMDR over CBT are not limited to English speaking cultures. In a study involving Iranian girls who had been sexually abused, EMDR was found to be significantly more efficient than CBT (Jaberghaderi, Greenwald, Rubin, Zand, & Dolatabadi, 2004). Efficiency was determined by calculating the change scores on each measure and dividing this by the number of sessions. However, the study was limited by the lack of a long term follow-up and the sample size was small.

The trends from the above studies are that compared to traditional exposure treatments, EMDR was found to be superior on at least one of the dependent measures. Most indicated a greater efficiency in that either fewer sessions were needed for an equivalent treatment effect or there was an advantage at follow-up when the number of treatment sessions was the same. Finally, the better efficiency of EMDR is further underscored in that many of the above studies (Jaberghaderi,

Greenwald, Rubin, Zand, & Dolatabadi, 2004; C. Lee, Gavriel, Drummond, Richards, & Greenwald, 2002; Power et al., 2002; Rothbam, Astin, & Marsteller, 2005) required participants in the exposure treatments to do up to seven hours homework per week whereas EMDR participants had none.

Although most studies have found advantages of EMDR over CBT since study 1 was published, one study reported an opposite effect (Taylor et al., 2003). In the study 15 participants completed each treatment and two therapists were involved. For treatment completers there were greater reductions on symptom measures of avoidance and re-experiencing for imaginal exposure treatment over EMDR but equivalent reductions on hyperarousal. However the differences between the two treatments were not that great given that an examination of the intent to treat participants showed no differences between the EMDR and traditional exposure. In addition seven people dropped out of the imaginal exposure treatment and only four from EMDR. Although the difference in drop out rate was not statistically significant, it seems that conclusions based on the completer sample only is a narrow interpretation of the data as such a larger number of participants did not tolerate the treatment. There were no significant differences between the two treatments on the percentage of people with PTSD diagnosis at follow-up. The participants doing imaginal exposure spent on average 42 more hours doing homework.

2.3.2 EMDR versus treatment as usual

EMDR has been demonstrated to have significant advantages over usual treatment for PTSD in a Health Maintenance Organisation (HMO) setting (Marcus, Marquis, & Sakai, 2004). Furthermore, these gains on measures were conducted by

an independent assessor for PTSD, and gains in depression and anxiety were maintained at a six month follow-up.

In a comparative outcome study that had one of the longest follow-up evaluations of PTSD treatment, Edmond, Sloan, and McCarty (2004) investigated the effects of EMDR and treatment as usual on women who had been sexually abused as children. In fact during the 18 month follow-up, the EMDR group was found to improve on every standardised measure which included the Beck Depression Inventory, the Impact of Events Scale, and the State Trait Anxiety Inventory. Data suggested that the resolution achieved with the participants in the EMDR condition may have been a more complete resolution, in that a smaller percentage of EMDR treatment completers obtained additional therapy during the follow-up period. These results were consistent with an earlier follow-up evaluation at three months which showed that EMDR resulted in significantly lower scores on two of the four symptom outcome measures (Edmond, Rubin, & Wambach, 1999).

2.3.3 Analysing the research trends: meta-analysis and expert consensus guidelines

Prior to study 1 there had been two meta-analyses of PTSD treatment both of which had not included this paper. In a meta-analysis published since then (Bradley, Greene, Russ, Dutra, & Westen, 2005), all of the other studies cited in this chapter were included apart from Rothbam, Astin, and Marsteller (2005). Overall the effect sizes for EMDR were equivalent for both EMDR and traditional CBT. However the point made in a previous meta-analysis applies in that the mean number of sessions to achieve this equivalence of outcome was less for EMDR treatment trials than for traditional exposure therapy (van Etten & Taylor, 1998).

More recent guidelines by various international societies looking at the scientific merit of treatments have now endorsed EMDR. In 2004, the American Psychiatric Association endorsed EMDR as an effective treatment for ameliorating symptoms of both acute and chronic PTSD (American Psychiatric Association, 2004). In the same year the United States Department of Veteran Affairs and Department of Defence (2004) examined the effectiveness of various treatments for PTSD and gave EMDR its highest level of recommendation. Other organisations have also examined EMDR and found that the evidence supporting its efficacy in treating PTSD is at the highest level, including the Israeli Council for Mental Health (Bleich, Kotler, Kutz, & Shalev, 2002), the Dutch National Steering Committee for Guidelines for Mental Health Care (2003), the Northern Ireland Department of Health (2003), and the United Kingdom Department of Health (2001). The evidence that EMDR may work more quickly and may be less distressing to patients was mentioned in the reviews of the Dutch National Steering Committee for Guidelines for Mental Health Care (2003) and United States Department of Veteran Affairs and Department of Defence (2004).

CHAPTER 3

THE ACTIVE INGREDIENT IN EMDR; IS IT TRADITIONAL EXPOSURE OR DUAL FOCUS OF ATTENTION?

3.1 Preamble to study two

As discussed in chapter 1.0, data supporting underlying theories of PTSD are mixed such that no theory accounts for the entire phenomenon. Whilst Lee et al., (2002) found that EMDR is more efficient than traditional exposure in treating PTSD, and subsequent research seems to support this view (chapter 2.3), a satisfactory explanation of the underlying mechanism in EMDR remains elusive. In fact recent reviews have highlighted the point that a lack of understanding of the important processes is a reason to be cautious about providing this treatment (Devilly, 2005).

Prior to the second study (Lee, Taylor, & Drummond, 2006)**,** no one had attempted to study the processes in EMDR by analysing the participants' responses during treatment. Several reviewers had highlighted key differences between traditional exposure and EMDR at a theoretical level (Rogers & Silver, 2002; Smyth & Poole, 2002) but there had not been any formal data analysis on what takes place in session. It was thought that such an analysis would help elucidate likely factors to account for EMDR effects. The decision as to which processes to focus on was made with the aid of past process studies of exposure-based treatments and theories proposed to account for EMDR effects. The introduction of the next published paper details these ideas.

Once again there were multiple contributors to the paper. Peter Drummond continued to provide consultation on this study in his role as supervisor of my PhD. Graham Taylor provided half the data for the study, assisted in the development of the rater classification system, and rated half the sessions of the study. Since I wrote the paper, designed the study and conducted all the analyses, I was first author.

The active ingredient in EMDR; is it traditional exposure or dual focus of attention?

Short title: Active mechanisms in EMDR

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Abstract

Very little is known about the mechanisms that underlie the therapeutic effectiveness of Eye Movement Desensitisation and Reprocessing (EMDR). This study tested whether the content of participants' responses during EMDR is similar to that thought to be effective for traditional exposure treatments (reliving), or is more consistent with distancing which would be expected given Shapiro's proposal of dual process of attention. The responses made by 44 participants with Posttraumatic Stress Disorder (PTSD) were examined during their first EMDR treatment session. An independent rater coded these responses according to whether they were consistent with reliving, distancing or focusing on material other than the primary trauma. The coding system was found to have satisfactory inter-rater reliability. Greatest improvement on a measure of PTSD symptoms occurred when the participant processed the trauma in a more detached manner. Cross-lagged panel correlations suggest that processing in a more detached manner was a consequence of the EMDR procedure rather than a measure that covaried with improvement.

In 2000, Guidelines from the International Society for Traumatic Stress concluded that Eye Movement Reprocessing and Desensitisation was efficacious in the treatment of civilian PTSD populations (Chemtob, Tolin, van der Kolk, & Pitman, 2000). Since then, further studies have found that efficacy of EMDR is equivalent to or slightly better than traditional exposure-based treatments (Ironson, Freud, Strauss, & Williams, 2002; Lee, Gavriel, Drummond, Richards, & Greenwald, 2002; Power, McGoldrick, Brown, Buchanan, Sharp, Swanson, & Karatzias, 2002), although contrary findings have also been reported (Taylor, Thordarson, Maxfield, Fedoroff, Lovell, & Ogrodniczuk, 2003).

The mechanism that underlies the effectiveness of the EMDR procedure remains controversial (Cahill, Carrigan, & Frueh, 1999). Some researchers have argued that the procedure works through mechanisms identical to that of imaginal flooding (Sanderson & Carpenter, 1992). In contrast, Smyth and Poole (2002) argued that whilst imaginal flooding and EMDR are similar, in that both involve exposure to an aversive stimulus, in many ways the exposure conducted within EMDR is the antithesis of what has been considered necessary for habituation. The key differences are that the exposure is delivered in very short time intervals in EMDR instead of being continuous and prolonged, the eye movements are akin to a distraction task, and the client is instructed to simply remain aware of what arises rather than focus on the stimuli targeted for deconditioning. It is this last difference that is the focus of investigation in this paper.

Given its roots in conditioning theory, the essence of the exposure-based approach is on "reliving" the trauma experience (Foa and Rothbaum, 1998). In traditional CBT treatment of PTSD, great care is taken by the therapist to have the client focus on as much detail of the trauma situation as possible. For example, Foa

and Rothbaum (1998) stated, "I will ask you to recall these painful memories as vividly as possible. We call this 'reliving'. I don't want you to tell your story about the assault in the past tense. What I would like you to do is to describe the assault in the present tense, as if it were happening now, right here" (Page 162).

Similarly, Lyons and Keane (1989) emphasised that in the exposure phase of their treatment programme, reliving the trauma material is crucial. They stated that the client needs to be encouraged to continue to revisit the particular components that cause most distress. The therapist redirects the client's thinking through re-telling to those sections.

Support for the importance of the reliving approach in traditional CBT was found in a process study (Jaycox, Foa, & Morral, 1998). They reported that participants who had high levels of emotional engagement and then showed subsequent reduction in SUDS scores improved most on PTSD measures. Participants who were lower on emotional engagement did worse. They concluded that the reliving process during treatment was critical because the client was able to establish that emotional engagement with the trauma memory was not dangerous and that the reliving allowed the person to distinguish better between re-experiencing and remembering.

Rather than reliving, EMDR appears to involve two quite distinct processes, distancing and free association. Instructions given to the client before and during the Desensitisation phase of the treatment encourage the person to take the role of observer of experiences in the session. In the introduction to the Desensitisation phase, Shapiro (1995) recommended to instruct the client to “Imagine you are on the train and the scenery is passing by. Just notice the scenery without trying to grab hold of it or make it significant” (Page 107). Shapiro (1995) stated an emphasis in the

process has always been to “Let whatever happens happen” and “To just notice the trauma” (Page 322). This encouragement of the participant to be an observer of the traumatic event and develop this more distant strategy is similar to other practices of mindfulness and acceptance (Hayes, Strosahl, & Wilson, 1999; Kabat-Zinn, 1990; Linehan, 1993; Segal, Williams, & Teasdale, 2002). These instructions are in sharp contrast to the protocols for prolonged exposure, where the client’s failure to focus on describing the trauma is seen as avoidance and is actively discouraged by the therapist.

When the standard Eye Movement procedure does not result in a client reporting change, particularly when they are experiencing an intense emotional reaction, the therapist is even more directive in the encouragement of distancing. Shapiro (2001) suggested that the therapist direct the client to engage in perceptual manipulations of the trauma memory such as viewing the entire event as if it is projected on a TV screen, or to imagine erecting a bullet-proof glass barrier between the client and the event. Shapiro argued that this can be necessary to maintain what she described as a dual focus of attention. That is, the client is simultaneously aware of the trauma material but also of being in the present. The dual focus of attention concept refers to maintaining an optimal balance between a focus on the traumatic material and a sense of not being part of the trauma.

The second process during EMDR that differs from the reliving emphasis in traditional exposure-based therapies is that the person is permitted to experience associations to the original target image to emerge and be reported. This emerging material is accepted by the therapist, who continues to allow the client to focus on either the old or new material, providing that the client's responses continue to evolve and change. The assumption is that non-target traumatic stimuli are often associated

with the targeted material in the client's memory network and therefore are a legitimate target for attention as this material can facilitate integration of the traumatic material with the client's other life experiences.

Although initially directed to recall emotions and cognitions connected to the target trauma, clients are also told it is very likely that they will not be able to do this and that focusing on auxiliary material is permitted. Shapiro (1995) pointed out that in many ways EMDR can be viewed as free association to the trauma material. EMDR allows the client to either make schematic links to associated material in the memory network or to continue to relive the experience, the latter being more akin to classical habituation (Lee, Gavriel, & Richards, 1996).

This study investigated the extent to which the client is involved in reliving, distancing, or focusing on other material during EMDR treatment. If improvement during EMDR has the same underlying mechanism as traditional exposure-based therapies, then the greatest reduction in the client's traumatic symptoms should follow sessions which contain a greater proportion of specific trauma content. Based on the habituation model of exposure to trauma related material, greatest improvement should occur when the participant is completely involved in retelling the trauma event rather than being distant in the process or when the person is focusing on auxiliary events in life. Alternatively, Shapiro's (2001) description of the EMDR process emphasised a dual focus of attention. Based on this explanation greatest improvement should occur when the participant is focusing on the trauma with some distance.

Method

Design

All participants were treated for PTSD in one of two outpatient private practice settings. All sessions were natural treatment events. The measures used were

part of routine clinical practice and decisions about when to treat and what to do in treatment were made solely on the basis of the treating practitioner's assessment of client needs and EMDR protocols. All participants were administered a structured interview by the treating clinician to establish diagnostic status. Immediately prior to the first EMDR Desensitisation session, an Impact of Event Scale (IES) was administered. This measure was repeated at the beginning of the following session. The dependent variable was the change in the scale scores between sessions. The therapist either recorded in writing the verbatim responses of the participants during the Desensitisation Phase, or tape recorded the session and the responses were later transcribed. These responses were then coded by an independent rater who was blind to the change in IES scores. The rater coded the responses of the participant after each set of eye movements to determine whether the person had described content consistent with reliving the trauma, content involving distancing from the trauma, content not directly involved with the trauma incident, or a negative affective experience.

Participants

Although 56 potential participants were identified as seeking treatment for PTSD who had not previously received EMDR, 5 were found to not have had sufficient symptom severity at some stage since the trauma event to meet DSM-IV criteria. In addition 4 participants were not given EMDR because, in the opinion of the treating private practitioner, their level of emotional stability was not sufficient during the course of therapy for the procedure to be safe. Three of the participants were given EMDR but were excluded from the analysis because during the treatment they were given an 'unblocking' procedure (Shapiro, 2001) that involved redirecting the person to re-experience the target material (one participant) or to refocus on the

trauma with greater sense of distance (two participants). Given the potential to complicate the interpretation of the results their data was excluded.

In the remaining 44 participants, the first EMDR Desensitisation session was analysed. The participants presented with traumas that included industrial accidents (6), motor vehicle accidents (12), sexual abuse (4), sexual assault (3), violent assault (14), and witnessing the death of another (5). There were 25 females and 19 males. The ages ranged from 15 to 67 years with a mean value of 40.07± 11.97 (± standard deviation). The mean number of desensitisation sets in a session was 14.89± 5.40.

Measures

Structured Interview for PTSD (SIP:Davidson, Malik, & Travers, 1997). This required the clinician to assess the severity and frequency of particular symptoms associated with the DSM-IV diagnostic criteria for PTSD (American Psychiatric Association, 1994). Davidson et al. (1997) reported that the SIP has high internal consistency (Cronbach α= .80), good test-retest reliability (r=.89) and satisfactory interrater reliability (r=.90).

Impact of Events Scale (IES:Horowitz, Wilmer, & Alvarez, 1979). This is one of the most widely used self-report measures of post-trauma symptomatology. The IES assesses the extent of avoidance, numbing and intrusion symptoms. Its advantages are that it has been used across a number of different trauma samples and that it is very easy to administer (Newman, Kaloupek, & Keane, 1996). Coefficients of internal consistency across studies range from .79 to .92 and it has proven sensitivity to detecting treatment effects (Weis & Marmar, 1995).

Participant response classification. A rating system for coding the responses that each participant gave during the Desensitisation phase of EMDR treatment was constructed. ‘Reliving’ was defined as any response that suggested that the person

was re-experiencing the trauma with the perceptual or cognitive experiences that occurred at the time of the trauma e.g., “He is trying to hold my hand. I am pulling away”, “I’m waiting for a crash, I know it’s going to happen.” Such responses were typically in the first person and present tense e.g., “I am in the ambulance”, “I see her crawling away from me”.

The second category was ‘Distancing’. This referred to stimuli that were present at the time of the trauma event but the person described the event in a way that suggested that it was not happening now. The essence of this response was that the event was described with a detached quality. Often it consisted of the participant observing himself or herself in the event rather than a description of being in the experience. Alternatively, the material was described with alterations to the perceptual elements. Examples of this category included: “The faces seem all blurred.”, “Its harder to see the knife.”, “It doesn’t seem so real, he (perpetrator of assault) is much smaller now”.

The third category was ‘Associated’, which referred to any stimuli not present during the traumatic event. This included material pertaining to relationships that the person had in the general community, other events in their life including previous traumas, events relating to the participant’s family of origin, difficulties the person had in life subsequent to the target trauma, and even more neutral stimuli such as a sports programme seen on TV.

The fourth category was ‘Affect’, which was given to any response that clearly indicated a negative emotion. This included words describing feelings such as terrified, angry, or scared, and descriptions of physical sensations (e.g., really tight, sick in the stomach, pain in my back). Responses that contained an ‘Affect’ response that was not clearly a negative experience (e.g., “A kind of numb tingling feeling”,

"less tense") were not classified as 'Affect'. Some participant's responses after a set of eye movements could have both an 'Affect' response and a content response ('Distancing', 'Reliving', or 'Associated').

The raters were unable to determine whether 7.7% of the responses could be classed as any of the four primary categories. This occurred when a response contained both 'Reliving' and 'Distancing' content or when there was insufficient information in the response to determine a rating (e.g., in response to the question "What are you aware of now?" the participant replied "Something grey." or "Never again."). Given that the analysis was done on actual treatment sessions, the therapist did not elicit further clarification to assist in the future rating process to maintain fidelity with EMDR treatment protocols.

The raters met for 10 hours to determine a reliable coding system. At the end of this time each rater coded 10 identical records from PTSD clients not included in this study which provided 214 data points. An analysis using Cohen's kappa indicated high inter-rater reliability (Kappa value=.84, $p<.01$). To further assess the validity of the rating system, a third rater who was also blind to the change in IES scores and to the hypotheses of the study, was trained for 4 hours in the derived rating system. Ten participant session transcripts were then chosen at random and the third rater's responses were then compared to the initial rater's responses. An analysis using Cohen's kappa indicated high inter-rater reliability (Kappa value=.81, $p<.01$).

Procedure

The first two authors conducted the treatment provided in the study. Both were accredited with the EMDR International Association as 'approved consultants'. This study involved a natural observation of the therapeutic process. Thus, the therapist always provided the treatment to the client that he judged to be most beneficial, and

the first EMDR session did not occur at the same session number for each participant. Additional therapy time was sometimes needed to develop rapport, discuss normal reactions to trauma, receive education about PTSD symptoms, develop skills to better regulate emotions, or have the therapist meet with the participant's partner to facilitate better understanding. This is in keeping with what Shapiro (2001) described in stages one to three of EMDR treatment. Eye movement occurs in the 4th stage of the procedure which Shapiro labelled Desensitisation.

Every participant was given an IES at the beginning of the first Desensitisation session. The IES was then readministered at the start of the next session. The change in these scores was then compared with the content of the session. The Desensitisation stage began with the therapist instructing the client to recall the targeted trauma image, to repeat the negative self-belief associated with this, and to notice the emotions or somatic sensations present. The client was told to notice where in the body he or she felt distress. The therapist then instructed the client to follow the therapist's fingers with his or her eyes[1]. After a brief period (minimum 24 secs) the clinician stopped the eye movements and said "Rest. Take a break." or "Let it go." or "Take a deep breath." The therapist then asked, "What do you get now?" or "What do you notice now?" It was the client response to this probe that was recorded and subsequently coded by the rater.

[1] Shapiro (2001) noted that other stimuli, besides eye movement, can be effective in achieving accelerated information processing. For instance, alternating bilateral hand taps and auditory tones have also been advocated. The therapists used these procedures for only three participants.

In accordance with EMDR procedure, the therapist's immediate response to the participant's report was to state, "Stay with that" or "Notice that" or "Go with that" and began to move the fingers which implicitly invited the client to follow with his or her eyes. These responses were given independent of whether the participant reported a positive or negative experience. However, if the participant gave a positive response (either a positive thought or affect) and then the response to the subsequent eye movement set did not significantly change, he or she was asked to recall the original trauma and describe it. This occurred an average of 1.71 times per participant. The next step was to obtain a SUDS (Subjective Units of Discomfort Scale) rating of the memory. If the rating was above one, Desensitisation continued as above, if one or below, Desensitisation was concluded.

Results

The mean score on the SIP was 34.85±8.13. This is similar to the mean scores reported in other treatment studies which range from 30.4 to 39.7 (Davidson et al., 1997; Lee et al., 2002; Vaughan, Armstrong, Gold, O'Connor, Jenneke, & Tarrier, 1994).

The mean score on the IES at the beginning of the Desensitisation stage was 39.91±14.06, with a range from 20-66. This is somewhat lower than other studies of trauma populations where the mean score has ranged from 46.8 to 55.3 (Lee *et al.*, 2002; Vaughan *et al.*, 1994). This probably reflects differences in when the measure was administered. The measure was given in this study just prior to Desensitisation, whereas the other studies cite scores from when the participant was first seen. The mean of the change in IES scores after the single Desensitisation session was a decrease of 16.50±8.56. The change in IES scores ranged from a decrease of 31 to an increase of 4.

The number of ‘Distancing’, ‘Reliving’, ‘Associated’ and ‘Affect’ responses to each set of eye movements was summed for each participant. This sum was then divided by the total number of sets in the session for the participant to give a ratio. The mean and standard deviations of these subsequent ratios for the 44 participants are presented in Table 1, along with the Pearson Correlation values for all of the numeric demographic data. As can be seen from this table, none of the correlations between any of the process variables and age were significant. Nor were there any significant associations between the process variables and the participant’s score on the IES prior to the first EMDR session.

EMDR was administered at different times in each participant’s therapy. The modal point was the third session (mean=3.95$\pm$3.31) but ranged from the first session (one participant only) to the fifteenth. The effect of this on the process variables was investigated. There was a significant association between Session Number and ‘Associated’ ($r = 0.41$, $P < 0.01$) and between Session Number and ‘Affect’ ($r = -.39$, $P < 0.01$). However Session Number was not significantly associated with ‘Distancing’ or ‘Reliving’ (see Table 1).

The other demographic variable that could have affected the process variables was sex. However there were no significant effects of sex on ‘Reliving’, $t(42)=-1.35$, $p>.05$, ‘Distancing’, $t(42)=.88$, $p>.05$, ‘Associated’, $t(42)=-.46$, $p>.05$, or ‘Affect’, $t(42)=.55$, $p>.05$.

Insert Table 1 here.

The effect of participant demographic variables on change in IES scores was assessed. Using a two tailed test of significance neither age ($r= .21$, $p>.05$), Session

Number (r= .07, p>.05), nor Sex, t(42)=.71, p>.05, was significantly associated with change in IES scores. However pre-treatment IES scores were associated with change in IES scores (r= .31, p<.04), indicating that IES scores decreased more in participants with the highest pre-treatment scores.

The main hypothesis concerned whether the process variables were associated with change in IES scores (see Table 2). The only process variable that was related to change in IES scores was 'Distancing' (r= .48, p< .001). The hypothesis that 'Reliving' would be associated with greater improvement was not supported (r= -.07, p>.05). Given the significant association between Session Number and two of the process variables, correlations were also calculated between all four process variables after controlling for the effect of Session Number. 'Distancing' remained the only process variable associated with change in IES scores (see Table 2). 'Distancing' also remained the only process variable associated with change in IES scores after controlling for the effect of pre-treatment IES scores and Session Number (see Table 2).

The association between each of the process variables was investigated. As can be seen from Table 2, the only correlation between the process variables that proved significant was 'Associated' with 'Affect' (r=-.56, p<.001).

Insert Table 2 here.

Given that distancing was associated with improvement, it was important to understand whether or not people simply distanced more as they improved or that the procedure led to more distancing which in turn led to symptom reduction. Crosslagged panel correlation analysis was undertaken to address this issue examining the relationship between initial distancing, distancing at the end, symptom level at the

start of the session and symptom level after the intervention. Initial distancing was calculated by summing the number of distancing responses during the first 3 sets and distancing at the end was calculated as the sum of all the distancing responses in the last 3 sets for each individual. The resulting correlations are presented in figure 1.

Insert figure 1 here

After controlling for initial pre-treatment scores and distancing at the end, the correlation between initial distancing and IES scores post-treatment was significant ($r = -.29$, $p < .05$). This is consistent with the idea that distancing produced a reduction in symptoms. The data was not consistent with the view that people distanced more as a result of lower symptom levels as distancing at the end of treatment was not related to pre-treatment symptom scores ($r = .06$, $p > .05$). The other crosslagged diagonal in figure 1 tests the association between pre-treatment symptom severity and the frequency of distancing at the end after controlling for symptoms at post treatment and initial distancing. This correlation although not significant ($r = .17$, $p > .05$) was in fact in the opposite direction in that the tendency with higher symptom severity to do more distancing at the end.

A crosslagged analysis was also undertaken for reliving. None of the relationships between reliving and symptom severity were significant (see figure 2).

Insert figure 2 here.

Given that the distribution of some of the process variables appeared skewed, log transformations were computed. However none of the correlations reported above involving the process variables were altered in any substantial way.

Discussion

The hypothesis that ‘Reliving’ responses would be associated with more improvement in symptoms than ‘Distancing’ or ‘Associated’ responses was rejected. Thus, the theoretical position that improvement as a result of EMDR desensitisation is similar to that which occurs during the process of imaginal exposure was not supported in this study.

The only process variable that was significantly related to improvement was ‘Distancing’. This finding proved particularly robust. Even after controlling for possible contaminating variables such as initial trauma severity, as indicated by scores on the IES, and the session number when Desensitisation was administered, ‘Distancing’ responses were moderately associated with improvement. This finding supports the view that the dual focus of attention in the Desensitisation phase of EMDR is an important part of the therapy.

Cross-lagged correlations between distancing responses and symptoms supports the notion that distancing was an important part of therapeutic process rather than a secondary outcome of the treatment. A problem with cross-lagged analyses such as these is that on their own they do not add up to a causal argument and do not replace experimental designs that directly tests causation (Kenny, 1975). Nevertheless, an examination of the relevant lagged associations indicated that after controlling for initial pre-treatment scores and distancing at the end, the correlation between initial distancing and IES scores post-treatment was significant. However competing notions that these factors merely co-vary or that initial symptom level affects distancing, were not.

During EMDR, the therapist actively encourages the client to simply observe his or her response to the memory of a trauma event. Many of the directions given to the client (such as the metaphor involving the train and directions during Desensitisation to "Just notice") are likely to promote 'Distancing'. However, therapist instruction may not have been the only factor to produce the Distance response. The eye movements themselves may produce this effect. Four studies that examined the effect of eye movements on autobiographical memory of negative events suggest that pairing eye movements with memories resulted in a reduction in vividness and associated negative emotions (Andrade, Kavanagh, & Baddeley, 1997; Kavanagh, Freese, Andrade, & May, 2001; Barrowcliff, Gray, Freeman, & MacCulloch, 2004; van den Hout, Muris, Salemink, & Kindt, 2001). The reduction in negativity and vividness was not found with another dual attention task such as tapping (van den Hout *et al.*, 2001), nor on a comparative non-memory task (Andrade *et al.*, 1997), nor when compared to exposure alone (Kavanagh *et al.*, 2001). However the treatment effect of eye movements has not always been clearly demonstrated. A meta-analysis of treatment studies found no incremental increase in effect size for eye movements above no eye movements and alternative stimulation (Davidson & Parker, 2001). This finding is complicated by the inclusion of some studies with serious methodological flaws that have been discussed in detail in other reviews (Lee et al., 1996; Maxfield & Hyer, 2002; Shapiro, 2002). In addition, Davidson & Parker (2001) noted that their data indicated that the difference in effect size between EMDR-with-eye-movements and EMDR-without-eye-movements was "marginally significant if one examines only clinical populations satisfying [DSM] diagnostic criteria" (p. 311).

Procedures that distract the client from the feared stimulus would be expected to reduce the rate of habituation (Foa & McNally, 1996). In contrast, in this study the

EMDR procedure, which involved a distraction component of eye movements, as well as an encouragement of distancing, was linked with a better treatment outcome. Distraction tasks have been observed in other more recent studies to facilitate exposure (Oliver & Page, 2003; Penfold & Page, 1999). However, these findings are at odds with earlier work (Rodriguez & Craske, 1993, 1995).

There are three current explanations of how an external stimulus such as eye movements facilitates processing of trauma memories in EMDR. One model hypothesises that bi-lateral eye movement facilitates interhemispheric interaction which then improves the processing of trauma-related memories. It has received empirical support in that saccadic movements (but not vertical or horizontal smooth pursuit) have been found to enhance processing of episodic memories (Christman, Garvey, Propper, & Phaneuf, 2003; Christman, Propper, Dion, 2004). The other two models both consider that the eye movements produce an effect that is part of the orienting response but differ in the subsequent effect of this response on processing. The current study has some indirect implications for these two models.

According to MacCulloch & Feldman (1996), the investigatory component of the orienting response could either produce avoidance behaviour or inhibit avoidance responses, including cognitive and negative somatic responses, and allow fresh investigatory behaviour to commence. They proposed that providing no danger was identified, the investigatory reflex induces a positive physical response. In their opinion the eye movement induces this investigatory reflex and produces a relaxation response. Support for this belief was obtained in a study that investigated the autonomic responses of participants when they were engaged in an eye movement task as part of EMDR treatment (Wilson, Silver, Covi, & Foster, 1996). Galvanic skin responses consistently decreased, suggesting a relaxation response, and respiration

synchronized with rhythm of the eye movements in a shallow regular pattern. Barrowcliff et al. (2004) also found that electrodermal arousal to autobiographical memory decreased following an eye-movement task but not in an eye stationary condition. In line with this explanation, the eye movement task should be of sufficient novelty to induce the orienting response but not too demanding to prevent simultaneous access to the trauma material. Consistent with this idea was the finding that EMDR treatment was associated with increased left pre-frontal hemisphere activation (Levin, Lazrove, & van der Kolk, 1999) and that investigatory and approach behaviour has been shown to be associated with the anterior left hemisphere regions (Kinsbourne, 1978). Thus if the eye movements produce this orienting response by providing an alternate focus that is novel and stimulating (but not too demanding), and an associated effect of this is a reduction in arousal, then this enables approach behaviour towards the previously negative stimulus. The current study suggests that the negative stimulus is then perceived in a more distant manner.

The finding of a significant negative correlation between ‘Affect’ and ‘Associated’ responses is consistent with an alternate use of the orientating response to explain the underlying mechanism of EMDR described by Stickgold (2002). He proposed that PTSD occurs when an event is sufficiently arousing to prevent its transfer from encoding as an episodic memory to a semantic memory. As a result of high arousal levels, associations between the trauma event and other related events fail to develop. He argued that similar biological mechanisms in EMDR and REM sleep weaken trauma-related information that is closely associated with a target event, and strengthen ancillary information loosely related to the event. According to this theory recovery from PTSD would be accompanied by more associative responses. However in this study ‘Associated’ responses were not related to improvement.

There was a statistical link between when the person received EMDR and the type of response given by the participant. The later in the participant's treatment the therapists chose to administer Desensitisation the less likely the client gave 'Affect' responses. Thus participants who the therapist judged as likely to be overwhelmed by negative affect when undergoing EMDR were given other treatments to help contain their distressing emotions. It appears that these auxiliary treatments led to less negative affect being present in the EMDR treatment sessions.

Also the later in the participant's treatment the therapist chose to administer Desensitisation the more likely the client gave 'Associated' responses. A possible explanation for this finding is that participants whose Desensitisation treatment was delayed are more likely to have been given some Cognitive Therapy. Cognitive Therapy often involves helping the participant think beyond the immediate situation and draw from other life experiences. In this way the participant can decrease overgeneralisations, for example, "Although that man was abusive not all men I have known were abusive" or alter emotional reasoning, "Other times I have felt scared, and I wasn't in danger" (Foa & Rothbaum, 1998). Such treatment may have increased the likelihood that the participant recalled associated life experiences during the Desensitisation phase.

Unlike the 'Associated' and 'Affect' responses that were significantly related to when Desensitisation was administered in the participant's treatment, neither 'Distancing' nor 'Reliving' was related to 'Session Number'. This suggests that the therapist's treatment of the client prior to Desensitisation did not systematically affect the only process variables shown to relate to outcome ('Distancing'). In addition it suggests that the therapist's treatment of the client prior to Desensitisation did not

have any effect on the variables associated with the two main hypotheses described above.

Potential Study Limitations

The optimal time to examine the association between type of responses and change in symptoms would be immediately after the intervention. This is difficult when assessing post trauma symptoms. The outcome variable chosen assessed the amount of intrusion and avoidance symptoms in the previous week. This meant that at least a week had to elapse before the effect of the intervention could be studied and leaves the treatment effect open to the influence of other variables. The only alternative would be to measure another facet of PTSD symptomatology such as increased arousal. However, a subjective measure of increased arousal (e.g., SUDS scores) would not be informative because most ratings at the end of the session were very low. Another alternative would be a physiological measure, but these have been found to be relatively insensitive to treatment effects within sessions (Boudewyns & Hyer, 1990). In any event, there appears no obvious way that the week delay in measuring symptoms would have differentially affected the impact of 'Distancing' versus 'Reliving'.

Secondly, whilst this study demonstrated a clear link between distancing and reduction in symptoms, the link does not establish causality. This needs to be tested more directly by manipulating the extent of distancing during the treatment and studying the subsequent effect. A future study might also test the relative contribution of therapist instruction and eye movements to the distancing process and to treatment outcome.

Conclusions

This study provided further weight to the notion that the active processes during EMDR and that of traditional exposure are different (Rogers & Silver, 2002). A distancing process that occurs during EMDR treatment was associated with more improvement than when participants relived the trauma experiences. The distancing may be partly facilitated by the distraction of the eye movement task. It might also be facilitated by the therapist encouraging a dual focus of attention, that is, simultaneously being aware of the trauma material and of being in the therapist's office.

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Appendix

Table 1. Type of participant responses as a percentage of his/her total responses and correlations between each of the primary process variables and the pre-treatment variables.

	Mean proportion	Standard Deviation	Correlations		
			Session Number	Pre-treatment IES	Age
Distancing	26%	18%	-0.09	0.25	0.15
Reliving	16%	16%	0.12	-0.14	0.28
Associated	22%	22%	0.41*	-0.08	0.08
Affect	38%	22%	-0.39*	0.14	-0.17

* Correlation is significant at the .01 level (2-tailed).

Percentages do not add up to 100 as not all responses were classifiable (23%) and some responses had both a content and 'Affect' code.

Table 2. Intercorrelations of process variables, correlations of participant responses with change in the IES scores (baseline minus final score), and the correlation with IES scores after partialling out potentially confounding variables.

	'Distancing'	'Reliving'	'Associated'	'Affect'
'Reliving'	-.09			
'Associated'	-.28	.16		
'Affect'	-.13	-.26	-.56**	
Change in IES	.48**	-.07	-.09	-.08
Change in IES controlling for Session Number	.51**	-.10	-.19	-.01
Change in IES controlling for Session Number and IES-Pre	.46*	-.05	-.16	-.07

** Correlation is significant at the .001 level (2-tailed). * Correlation is significant at .005.

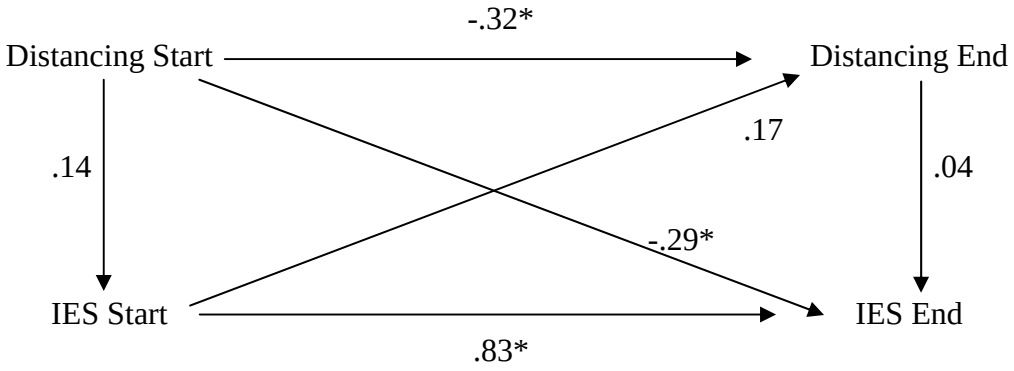

Figure 1. Correlations between IES scores and distancing at beginning and end of treatment. The diagonal values are the partial correlations after controlling for within-time associations. *Correlation is significant at the .05 level

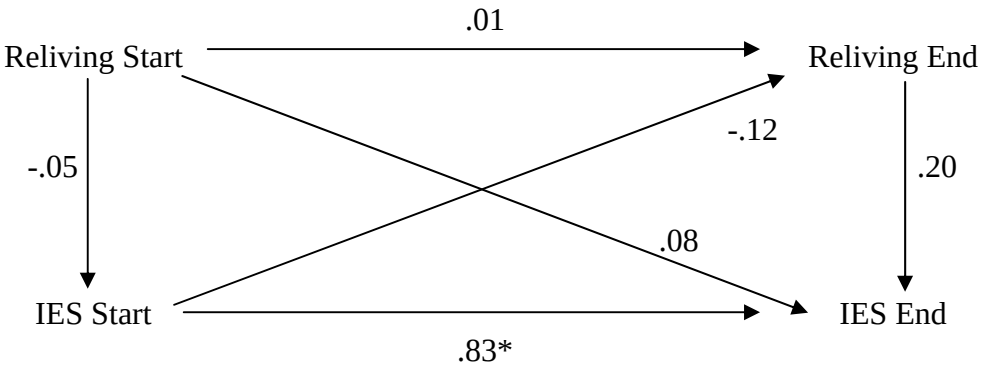

Figure 2. Correlations between IES scores and reliving at beginning and end of treatment. The diagonal values are the partial correlations after controlling for within-time associations. *Correlation is significant at the .05 level

CHAPTER 4

DOES EYE MOVEMENT CONTRIBUTE TO EMDR'S EFFECT?: A RANDOMIZED CONTROL STUDY AND A META-ANALYSIS.

4.1 Preamble to studies 3 and 4

The major finding from Lee, Taylor, and Drummond (2006) was that there was more improvement with EMDR treatment when in session responses were classified as distancing than reliving. Given that reliving is considered to be an essential process and is associated with improvement in traditional exposure, this suggests that different mechanisms underlie the two treatments. Whilst Lee, Taylor, and Drummond (2006) found an association between distancing and reduction in symptoms, the question as to the relevant components of the treatment that produces this improvement remains unanswered.

Two competing factors may account for the distancing response in EMDR - therapist instruction or eye movement (Lee, Taylor, & Drummond, 2006). It is also possible that an interaction between the two factors might best produce this effect. In the introduction section of the next paper, the evidence as to why eye movements or therapist instruction would produce the distancing responses associated with improvement was examined.

The results of the study were a significant effect for eye movement on a measure of distress and an eye movement-therapist instruction interaction for vividness (pages 130-132). As discussed on page 133 this was at odds with some of

the studies that had looked at the component of eye movement in EMDR, and with the general conclusions of a previous meta-analysis (Davidson & Parker, 2001). In attempting to discern a pattern as to why some studies failed to find an effect for eye movement and some did not, I noticed statistical errors in the way the data was analysed by Davidson and Parker (2002). These are detailed on pages 134-135. Therefore, the data from past component studies were reanalysed and the resultant meta-analysis is presented on pages 136-138.

The results of the randomised control study and the meta-analysis were written up and the attached article is under review. Peter Drummond functioned as my PhD Supervisor during this period and assisted in the development of my ideas and provided valuable editing assistance. His contribution is acknowledged by a co-authorship.

Does eye movement contribute to the effect of EMDR? A randomized control study and a meta-analysis.

Article under review

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Abstract

The effectiveness of components of Eye Movement Desensitization and Reprocessing (EMDR) was tested by randomly assigning 48 participants to either an eye movement or an eye stationary condition and to one of two types of therapist instructions (reliving or distancing). Participants were asked to recall a personal distressing memory with measures of distress and vividness taken pretreatment, posttreatment and at follow-up. There was no significant effect of therapist's instruction on the outcome measures. Eye movement reduced distress at posttreatment and at follow-up but did not result in a reduction in vividness. In a second study the data from a previous meta-analysis on the effectiveness of eye movement was re-analyzed. The results supported a significant contribution of eye movement in EMDR.

Keywords: EMDR, eye movement, randomized comparison, trauma memory

Eye movement versus therapist instructions: which is the effective component in EMDR?

Whilst EMDR has been acknowledged as an evidence-based form of treatment by committees linked to the American Psychological Association and the International Society for the Study of Traumatic Stress, the mechanism of action for the success of EMDR remains controversial (Rogers and Silver, 2002; Shapiro, 2002; Smyth & Poole, 2002). In an attempt to understand important process variables in recovery during EMDR, Lee, Taylor and Drummond (2006) classified the verbal responses given by 44 clients after each set of eye movements into one of four categories: Reliving, Distancing, Associated, and Affect. 'Reliving' was defined as any response that suggested that the person was re-experiencing the trauma with the perceptual or cognitive experience that occurred at the time of the event. This was thought to be evident when participants described the event using present tense or used phrases expressed in the first person. 'Distancing' involved focusing on the trauma material but from an observational or detached perspective. An 'Associated' classification was given when the client described material not directly related to the trauma event that was being targeted by the intervention. An 'Affect' classification was given to any response that contained a negative emotion. The greatest improvement occurred when clients gave distancing responses. Furthermore, cross-lagged panel correlations were consistent with the proposition that distancing responses were a consequence of the EMDR procedure rather than something that covaried with improvement.

Although this study suggested that distancing during EMDR is related to improvement, it did not provide any evidence as to what ingredients of EMDR cause the distancing. Distancing could be promoted by two distinct mechanisms: therapist instructions or eye movement (Lee, Taylor, & Drummond, 2006). For example, in the introduction to the Desensitization phase, Shapiro (1995) recommended that the client be instructed to "Imagine you are on a train and the scenery is passing by. Just notice the scenery without trying to grab hold of it or make it significant." (Page 107). The emphasis in the process has always been to "Let whatever happens happen" and "To just notice….whatever arises" (Shapiro, 1995: pages 127-128). Smyth & Poole (2002) also observed that the therapist instructions during EMDR may encourage 'mindful observation' of the trauma experience which is similar to the distancing concept described above. They likened the instructions during EMDR to the practice of mindful acceptance which has been recommended as an important process in facilitating treatment in traditionally difficult-to-treat populations (Linehan, 1993; Segal, Williams, & Teasdale, 2002).

Alternatively, eye movements themselves might generate distancing. This possibility received empirical support from a study on the effects of eye movements, finger tapping and a control condition on the emotive memories of undergraduate students (van den Hout, Muris, Salemink, & Kindt, 2001). The memories were rated as less aversive after an exposure intervention accompanied by eye movements, but not after the other interventions. In addition, eye movements led to a greater reduction on a vividness measure.

Similarly Andrade, Kavanagh, and Baddeley (1997) found that the degree of aversiveness of personal memories was significantly reduced by an exposure task that

included eye movement. They found that images of personal experiences associated with fear or distress were rated as less vivid after an eye movement task than after a comparative concurrent task of spatial tapping not involving eye movement. They suggested that eye movement in EMDR might reduce the vividness and emotiveness of trauma images through the disruption of the 'visio/spatial sketchpad'. Despite finding a reduction in vividness on emotive memories for the effects of eye movement and not other tasks, the authors remained cautious about the overall efficacy of EMDR. It is also important to note that Andrade et al. (1997) failed to find differential effects of eye movement on distress using a task that did not involve autobiographical memory (photographs that contained a negative content). This is consistent with other research that has shown that eye movement facilitates memory processing for episodic memory but not semantic memory (Christman, Garvey, Propper, & Phaneuf, 2003).

A greater reduction in arousal for memories associated with fear and anxiety was also found for eye movement over an eye stationary condition using physiological measures of arousal (Barrowcliff, Gray, Freeman, & MacCulloch, 2004). In keeping with earlier studies, greater reductions in vividness and subjective emotional arousal were found for the eye movement condition.

Finally, Kavanagh, Freese, Andrade, and May (2001) found that eye movement resulted in reduced ratings of distress and vividness compared to a no eye movement condition and a passive visual interference task. However this difference had disappeared by follow-up. The time involved in each of the three conditions was only 64 seconds (8 trials of 8 seconds each). This is considerably less than recommended in treatment (Shapiro, 2001). Therefore the failure to find a differential effect a week after the intervention may be due to insufficient intervention dose.

The present study attempted to identify the active ingredients of EMDR that produce the distancing response that has been associated with improvement during treatment (Lee, Taylor, & Drummond, 2006). Participants were randomly assigned to either an EMDR treatment, which involved eye movement, or an identical procedure that did not involve eye movement. The duration of both conditions was in keeping with standard EMDR practice. In addition, therapists were instructed to either encourage the participant to take a distancing perspective on the trauma memory or to maximize the reliving in a similar manner to that which occurs during traditional exposure treatments. The objective was to test the effects of these conditions on changes in vividness and emotional response immediately after treatment and at one-week follow-up.

Method

Participants

Study participants were recruited from psychology undergraduate courses at an Australian University in the second half of 2004 and received course credit for participating in the research. None of the 59 participants identified themselves as of aboriginal decent. Of the 59 recruited, 10 were excluded because their distress at pretest was so high that the intervention might have been harmful. Another participant was excluded because the level of distress was too low. The 14 men and 34 women who completed treatment ranged in age from 18 to 38 years (mean age 23, median 21). All participants were given an information sheet on the study and were asked to sign a consent form approved by the Murdoch University human research ethics committee.

Measures

Dissociative Experiences Scale (DES-II: Carlson & Putnam, 1993). This is a 28 item questionnaire designed for screening of dissociative tendencies in both non-clinical and clinical samples. High scorers in college student samples have been identified as those scoring above 30 (Zingrone & Alvarado, 2001). The DES-II appears to have satisfactory internal consistency with coefficient alpha values for college students ranging from .92 to .94 (Gibbs & Rude, 2004; Zingrone & Alvarado, 2001).

Impact of Event Scale (IES: Horowitz, Wilmer, & Alvarez, 1979). This is one of the most widely used self-report measures of post-trauma symptomatology. The IES assesses the extent of avoidance, numbing and intrusion symptoms. Its advantages are that it has been used across a number of different trauma samples and that it is very easy to administer (Newman, Kaloupek, & Keane, 1996). Coefficients of internal consistency across studies range from .79 to .92 and it has proven sensitivity for detecting treatment effects (Weis & Marmar, 1995). There are published guidelines on three levels of clinical concern with scores less than 9 as low, 9-19 as medium and greater then 19 as high (M. J. Horowitz, 1982).

Subjective Units of Discomfort Scale (SUDS). This was one of two primary outcome measures used in the study. SUDS is a widely used measure of intensity of subjective distress (Wolpe, 1991). It is an 11-point scale where 10 reflects the highest level of distress or disturbance and 0 the lowest level or absence of distress/disturbance. It has been shown to correlate with several physiological measures of stress (Thyer, Papsdorf, Davis, & Vallecorsa, 1984).

Vividness Scale. This was the second primary outcome measure used in the study. The indication of the degree of vividness associated with a particular image

involved asking the participant to hold the image in mind for 10 seconds and then indicate on a 10 centimeter visual analogue line the degree to which the image appeared vivid from "not clear at all" (extreme left) to "very clear" (extreme right). This is identical to a procedure used in previous studies on vividness (van den Hout et al., 2001). A 0-10 scale of vividness was also used in other studies investigating effects of eye movement (Andrade et al., 1997; Barrowcliff et al., 2004; Kavanagh et al., 2001).

Expectancy Scale. This measure was designed to assess the degree to which the student expected their assigned treatment condition to be successful. The 10 point scale was based on expectancy and credibility items used in previous research (Borkovec & Nau, 1972; Feske, 1998; Feske & Goldstein, 1997). However, given that only expectancy has been found to contribute to treatment outcome (Devilly & Borkovec, 2000), the credibility items were dropped.

Treatments

Participants were assigned to one of the four conditions (eye movement/distancing, eye movement/reliving, eye stationary/distancing, eye stationary/reliving). Treatment rationales were given for each of the four conditions. For example, those assigned to an eye movement condition were told that their treatment was probably utilizing a natural healing process that occurs during REM sleep. They were told that upsetting memories are processed at this time except for those memories that are very distressing because these can cause the person to wake. The waking disrupts natural healing because it does not allow the mind to continue to process the event. They were then told that the therapist would assist them to

simultaneously focus on processing the memory and the eye movement in a waking state to allow this natural healing to occur.

Alternatively participants in the eye stationary condition were informed that 'focusing on a previously upsetting memory very closely while simultaneously fixing your eyes on a single spot can free you from potential distractions and you more quickly habituate to the emotional component of a memory than in situations where it is easy to get distracted by other things in the room.' The participant's belief in the merits of each treatment condition was then tested using the Expectancy Scale.

After the baseline measures were collected, the rest of the steps of Phase Three of the EMDR protocol were followed (Shapiro, 2001). First the therapist guided the client to identify the worst moment/image from the trauma memory. The therapist then attempted to elicit a negative cognition (self-statement related to the memory) using Socratic dialogue. If this was not successful after 5 minutes, the participant was shown a list of generic negative cognitions and asked to select the one that best matched their experiences. A similar process occurred for a positive cognition. Participants then identified the present affect associated with the experience, the physical location of any distress associated with this affect, and rated their overall distress on the SUDS. Phase 4 of the EMDR treatment – focusing on a moving (or stationary) finger – began at this point and proceeded until the SUDS was 0 or 45 minutes had elapsed since the beginning of this treatment phase.

In both the eye movement and eye stationary conditions the therapist followed the Shapiro (2001) recommendations for targeting an old memory, except that participants in the eye stationary condition were instructed to keep their eye stationary

for an equivalent amount of time to the time spent performing eye movement in the other condition (approximately 24 seconds for each trial).

In the group of participants receiving reliving instructions, the therapist directions differed from the standard protocol. If the participant did not give a response following a set of eye movements (or an eye stationary period) consistent with reliving, the therapist instructed him or her to refocus on the experience to try to imagine that it was still happening to them now; the therapist then proceeded with the next set of either eye movements or a period of eye stationary time. If the participant gave a response consistent with reliving, the therapist said "good, you are doing well".

For those given distancing instructions, failure to give a response that indicated distancing had occurred resulted in the therapist giving instructions to imagine being removed from the scene in some way. This included suggestions of a perceptual distortion. Examples of this were to ask the participant to see the event projected onto a movie screen or to see the event as if it was happening to somebody else. If the participant gave a response consistent with distancing the therapist would say "good, you are doing well".

At the conclusion of the desensitization phase each participant was re-tested on the SUDS and Vividness Scale by the therapist who was therefore not blind to the treatment. A contact time was then arranged one week later for a follow-up phone call. At that time the SUDS and Vividness Scale were re-administered by the therapist. In the follow-up call, the Vividness Scale was amended such that participants were asked to give a rating on a 0-10 scale rather than indicate a point on a 10 cm VAS.

Procedure

Participant screening and safety issues. In order to avoid increasing the distress levels of participants with dissociative tendencies, those eight who scored more than 30 on the DES-II were excluded prior to any discussion of trauma memories. The remaining 51 participants were asked to recall a stressful or traumatic experience. However, they were asked not to choose anything that was highly distressing. This was quantified for them by introducing the SUDS. They were asked to recall an incident that was associated with a score of approximately 6 on this scale. Participants were also advised not to use trauma material that they were currently dealing with in therapy or that had a present reference; that is, material from the past that they felt still significantly impacted upon their current life circumstances. Three participants were excluded at this point, two because their SUDS scores were too high (9) and one because she could not recall a memory associated with any distress greater than a SUDS of 2. Participants were then asked to describe the memory and to fill out an IES for that event. They were then taught a relaxation procedure that involved controlled breathing (rate of 10 breaths per minute) as a tool to enable them to calm themselves should they become distressed during the treatment. Developing capacity for self-calming is an important part of safety preparation in EMDR (Shapiro, 2001). Controlled breathing is also common in other treatments for trauma symptoms (Everly & Lating, 2004).

After the breathing training, the participant was allocated to a treatment condition by drawing an unmarked therapist instruction package from a shuffled pile. Since four therapists drew packages at various times, allocation concealment was thought to be achieved.

Therapists. Four post graduate clinical psychology students administered the procedures. Prior to the study, each therapist had undergone level I EMDR training (accredited by the international EMDR association) and had seen 6 clients under supervision of the primary author.

Testing condition integrity. After all the data had been collected, a rater who had been trained in a previous study (Lee, Taylor, & Drummond, 2006) examined half the tapes and coded each participant's response according to whether distancing or reliving content occurred. This data was then analyzed to test the effects of the therapist instruction manipulation.

Power analysis. Prior to beginning recruitment we estimated the number of participants based on the means provided in a previous study that investigated the effects of eye movement on SUDS and Vividiness (Andrade, Kavanagh, and Baddeley, 1997). A statistical power analysis with minimal power set at 80% with a Type I error rate of .05 indicated that a total sample size of 28 was needed for the Vividness measure and 48 for SUDS.

Results

Preliminary analysis

The SUDS scores of the participants indicated that most chose memories with a moderate degree of discomfort (mean=6.40, SD=1.96). The associated scores on the IES indicated a medium level of trauma symptomatology (mean=13.23, SD=10.66). Table 1 provides the mean outcome scores for each treatment condition over time. There were no significant mean differences in pre-treatment scores between participants assigned to the eye movement or eye stationary conditions in SUDS, $t(46)=.50$, $p>.05$, or vividness, $t(46)=.81$, $p>.05$. There were also no significant mean

differences in pre-treatment scores between participants assigned to the distancing or reliving conditions in SUDS, $t(46)=.83$, $p>.05$, or vividness, $t(46)=-.29$, $p>.05$. Thus the random assignment appears to have resulted in each condition having equivalent dependent measure scores prior to the intervention.

Most participants did expect that the treatment would help them. The mean expectancy rating for the reliving condition with eye movement was 6.25, for the reliving condition without eye movement was 5.92, for the distancing condition with eye movement was 5.63, and for the distancing condition without eye movement was 5.58. A 2X2 (Eyes [moving, fixed] x Therapist Instructions [distancing, reliving]) ANOVA was conducted to calculate the effects that condition assignment had on treatment expectancy. The ANOVA indicated no significant main effects for eye movement, $F(1,44)=.31$, $p=.58$, or therapist instructions, $F(1,44)=2.05$, $p=.16$. Neither was there a significant interaction between these effects, $F(1,44)=.19$, $p=.66$. Thus there was no evidence that expectancy played a part in treatment effects.

The effect of therapist instruction condition on the responses of participants was tested. Table 2 indicates the percentage of reliving and distancing responses in each of the therapist instruction conditions. The proportion of distancing responses in the distancing condition was greater than the proportion of reliving conditions, $t(46)=3.77$, $p<.001$. Also the proportion of reliving responses in the reliving condition was greater than the proportion of distancing responses, $t(46)=-3.71$, $p<.001$. Thus the manipulation on therapist instruction did affect participant responses.

Main analysis

A 2 X 2X3 mixed model multivariate analysis of variance (MANOVA) was performed on SUDS and Vividness. Between subject variables were Eyes (stationary

versus moving) and Therapist Instruction (distancing versus reliving). Time was analyzed as a within-subjects variable given that data was collected on 3 occasions (pre, post and follow-up). A full factorial model was used. The assumption that the variance matrices were the same across the cells formed by the between-subjects effects was examined using Box's M test and found to be satisfactory ($p>.05$).

With the use of Wilks' criterion, there were no significant main effects for eye movement, $F(2,43)=2.20$, $p>.05$, $\eta^2 = .09$, nor instruction condition, $F(2,43)=1.40$, $p>.05$, $\eta^2 = .06$. There was a significant eye movement by time interaction indicating that the combined dependent variables were affected by eye movement across the course of the study, $F(4,41)=3.13$, $p<.05$, $\eta^2 = .19$, but not by therapist instruction $F(4,41)=2.43$, $p>.05$. $\eta^2 = .11$, or by an eye movement and therapist instruction interaction $F(4,41)=1.28$, $p>.05$, $\eta^2 = .11$.

Univariate analyses indicated a significant interaction between time and eye movement for SUDS, $F(2,45)=6.67$, $p<.005$. $\eta^2 = .13$. The greater reduction in SUDS for the eye movement condition compared to no eye movement is shown in Figure 2. The decrease in SUDS immediately after the intervention was greater in the eye movement group than in the eye stationary group, $F(1,46)=11.09$, $p<.005$, $\eta^2 = .19$. The change in SUDS scores from immediately after treatment to follow-up did not differ between the eye movement and eye stationary conditions, $F(1,46)=3.40$, $p>.05$, $\eta^2 = .07$.

Unlike the results for SUDS, there was no interaction between time and eye movement for vividness, $F(2,45)=1.04$, $p>.05$, $\eta^2 = .01$. This was in contrast to previous research that had found an effect of eye movement on vividness immediately after an intervention (Andrade, Kavanagh, & Baddeley, 1997; Barrowcliff, Gray,

Freeman, & MacCulloch, 2004; Kavanagh, Freese, Andrade, & May, 2001; van den Hout, Muris, Salemink, & Kindt, 2001) but consistent with no differential effect at follow-up (Kavanagh, Freese, Andrade, & May, 2001). Separate univariate analyses were performed investigating the effects from pre-test to post-test on the dependent variable vividness for both eye movement and instruction conditions. There was no significant main effect for eye movement $F(1,44)=1.47$, $p>.05$, $\eta^2 = .03$, nor instruction condition, $F(1,44)=2.59$, $p>.05$, $\eta^2 = .06$. However there was a significant interaction between eye movement, instruction type and time $F(1,44)=4.14$, $p<.05$, $\eta^2 = .09$.

The source of this interaction was investigated with t-tests. To control for type I errors, the Bonferroni correction was applied. Figure 3 indicates that instruction had a significant impact in the eye movement condition but not in the eye stationary condition. To test whether the reliving condition diluted the effects of eye movement on vividness, separate pre versus post paired t-tests were conducted on the effect of eye movement in the reliving and distancing conditions. There was a significant reduction in vividness post treatment in the distancing condition $t(11)=3.37$, $p<.01$ but not in the reliving condition $t(11)=.57$, $p>.05$.

Adverse effects: There were no major adverse effects. For all but two participants the SUDS levels decreased after the intervention. Both of these had been assigned to the eye stationary/reliving condition. For one of these the distresses had decreased by follow-up and for the other a further debrief session was offered which was declined. Although the participant's distress was higher than at pretreatment, it was still low (4).

Discussion

The results of this study indicated that the eye movement component of EMDR rather than the suggestions made by therapists facilitated treatment effects. Participants in the eye movement condition reported less distress immediately after treatment and at follow-up than participants who were encouraged to keep their eye stationary, irrespective of whether they were told to relive the incident or encouraged to distance themselves. This is consistent with previous research on the effect of eye movement on levels of distress for personal memories (Andrade et al., 1997; Barrowcliff et al., 2004; Kavanagh et al., 2001; van den Hout et al., 2001). The finding that reductions in distress following eye movement were maintained at follow-up suggests that a previous investigation (Kavanagh, Freese, Andrade, & May, 2001) may not have included a sufficient dose of eye movement to adequately assess a specific treatment effect.

However, contrary to these previous findings, the eye movement procedure in this study did not lead to a significant decrease in vividness compared to an eye stationary task. The failure to find an overall effect may have been to do with the therapist instruction condition affecting the eye movement process. In the present study participants were extensively redirected or reinforced by the therapist to relive the experience or to distance themselves from the memory. A significant interaction in the eye movement condition between therapist instruction and time was found for vividness ratings. Post hoc analysis indicated that there was a reduction in vividness over time in the eye movement condition with distancing instructions, but no significant change in vividness in the eye movement condition with reliving instructions. Thus, the reliving instruction seemed to have nullified the reduction in

vividness ratings reported in other studies (Andrade et al., 1997; Barrowcliff et al., 2004; Kavanagh et al., 2001), whereas the distancing instruction either allowed or supported the reduction in vividness.

This study also tested whether the superior treatment effects obtained in eye movement conditions were due to participants expecting to obtain a greater benefit. We found no differences in expectancy levels between the eye movement and no eye movement condition. This is consistent with previous studies that also failed to find any significant difference in expectancy ratings for eye movement treatment compared with an eye stationary control condition, even when there was a significantly greater reduction in subjective distress from the eye movement task (Feske & Goldstein, 1997; Gosselin & Matthews, 1995). There were also no differences in the expectancy levels between the distancing and reliving conditions.

Introduction to study 2

The studies cited above directly investigate the effects of eye-movements on processing of particular stimuli. They do not involve all the procedural elements of EMDR (Shapiro, 1995). Whilst the analogue studies show a clear processing effect for eye movement, the studies that have attempted to isolate this component from the full treatment package have produced results ranging from a very large effect size consistent with eye movement enhancing processing (Wilson, Becker, & Tinker, 1997) to findings of no differences (Renfrey & Spates, 1994).

In an attempt to discover any general trends in this research, Davidson & Parker (2001) conducted a meta-analysis of previously published studies investigating effect size differences between eye movement and no eye movement. Their conclusion when looking at pre-versus post single session measures was that there

was no effect of eye movement. Their measure of effect size was R, which ranges from plus one to minus one; R^2 is the amount of variance in the dependent variable accounted for by the independent variable. However there were methodological problems in this meta-analysis. Initially they converted R scores to Z scores, found the simple mean of these scores, converted this mean back to R, and then subjected this R to a t-test using the number of studies to determine the degrees of freedom. The problem with this approach is that it treats all studies as if they are of equal weight. However, the usual practice in meta-analysis is to weight each study in relation to the number of participants and for the degrees of freedom to be calculated using the total number of participants (Rosenthal & DiMatteo, 2001). This provides a more appropriate test of significance and provides more power to investigate small magnitude effect sizes (Rosenthal, 1991). In addition, Davidson and Parker (2001) did not include the data from an earlier study (Shapiro, 1989). They reported that no data on process measures were provided; however Shapiro provided an F ratio which does enable an R to be calculated (Rosenthal, 1991). Therefore we decided to recalculate the meta-analysis.

Also of interest in the meta-analysis of treatment studies was the possible moderating effect of using artificial stimuli rather than trauma memories as the stimulus targeted in EMDR. In analogue studies, eye movement has been found to result in significant reductions in distress for autobiographical memory of negative material but not pictures of negative events (Andrade, Kavanagh, & Baddeley, 1997). Similarly, eye movements were found to enhance memory processing for episodic memories and memory for everyday events but not for implicit memory (Christman, Garvey, Propper, & Phaneuf, 2003). This suggests that studies that have tested the

efficacy of EMDR therapy for negative images that are not autobiographical are not likely to give the same results as those that targeted autobiographical memories. Therefore the effect of the two studies that used such targets (Sanderson & Carpenter, 1992; Tallis & Smith, 1994) on trends within the previous literature was examined.

Method and results

The effect sizes reported by Davidson and Parker (2001) for the differential effects of eye movement versus eye stationary on pre and post intervention measures were used. In addition we conducted a series of searches on Medline and Psychinfo from April 2000 to August 2005 to search for additional studies investigating this effect. There was only one such study (Lytle, Hazlett Stevens, & Borkovec, 2002). However, this study did not provide sufficient data to determine an effect size. Two other studies were added to those reported by Davidson and Parker (2001). The first (Shapiro, 1989) reported an F ratio of 44.46 with an N of 22 which corresponds to an R of .83. We also calculated an R effect size value from the data presented in study one. The effect sizes are presented in Table 3.

The heterogeneity of the studies was tested by converting each R to a Z score then determining the mean Z score using the following formula:

In this equation Z_{r_j} is the Fisher Z_r corresponding to the R value from a study, and $\overline{Z_r}$ is the weighted mean

$$\overline{z_r} = \frac{\sum (N_j - 3) z_{r_j}}{\sum (N_j - 3)}$$

The statistical significance of the heterogeneity can then be obtained by computing

$$\sum (N_j - 3)(Z_j - Z)^2$$

which is distributed as χ^2 with K-1 degrees of freedom where K is the number of studies being combined, Z_j is the Z value for any one study, N_j is the number of participants in that study, and $\bar{Z}$ is the mean of all the Z's obtained (Rosenthal, 1991). Based on all of the studies cited in Table 3 the associated mean R was .31. However this sample was significantly heterogeneous $\chi^2(10)=65.39$, $p< .001$.

Before determining average effect size, it is common practice in samples that are heterogeneous to remove outliers and studies that may contain moderating factors (Rosenthal & DiMatteo, 2001). Figure 4 represents the effect sizes of each study with the associated standard of error. Examining this table suggests one study (Wilson, Silver, Covi, & Foster, 1996) is a clear outlier. This is also reflected in Table 3. However, eliminating this study still left the sample highly heterogeneous with a mean R of .25, $\chi^2(9)=29.19$, $p< .001$.

Table 3 shows the studies ranked in order according to their relative contribution to overall heterogeneity ie

$$(N_j - 3)(Z_j - Z)^2$$

It indicates that after the Wilson, Silver, Covi, and Foster (1996) study, Shapiro (1989) contributed most to heterogeneity. The other large contributions were from the two studies that both tested the EMDR procedure on stimuli which were not autobiographical memories (Sanderson & Carpenter, 1992; Tallis & Smith, 1994). The removal of these three studies led to a mean Z of .28 and a corresponding mean R of .28. The resultant group of studies appear to be homogeneous, $\chi^2(6)=6.02$, $p>.05$.

Thus the remaining studies could now be combined to obtain an estimate of central tendency. The mean R of .28 for these 7 remaining studies was significantly greater than zero, $t(186)=3.91$, $p< .001$. Thus the effect of eye movement is highly

significant after removing appropriate outliers. The mean R of .28 has a confidence range of .14 to .41. It is equivalent to a Cohen's d of .60 using the equation provided by Rosenthal (1991)

$$d = \frac{2r}{\sqrt{1 - r^2}}$$

Restricting the meta-analysis to only those studies cited in Davidson and Parker (2001) and excluding only a single outlier as they did (Wilson, Silver, Covi, and Foster, 1996), a significant effect for eye movement was found on pre versus post single session measures. After weighting by the degrees of freedom based on the number of participants, the mean R of .15 was significantly greater than zero, $t(217)=2.13$, $p< .05$.

Davidson and Parker (2001) also reported that if outcome measures for EMDR with eye movement are compared to EMDR without eye movement then for the five studies that used only clinical populations satisfying DSM criteria, a significant effect was found. This conclusion was tested again adjusting for the number of participants in each study as above. The effect for the 5 studies remains significantly greater then zero, $t(109)=2.09$, $p<.05$.

Discussion

The meta-analysis indicated that eye movement makes a significant contribution to EMDR's effect. The average effect size has a medium value, R=.28, which is significantly greater then zero. This analysis differed from that of Davidson and Parker (2001) in that extra studies were included. However this was not the crucial difference. When only the studies selected by Davidson and Parker were included, and each assigned a weighting based on the number of participants, and the degrees of

freedom were calculated in a more traditional manner (Rosenthal & DiMatteo, 2001), then eye movement was again found to have a significant advantage over no eye movement.

Secondly, analysis of heterogeneity revealed that studies testing EMDR that do not target autobiographical memory raise the heterogeneity to significant levels. This is in keeping with the analogue research on eye movement (Andrade, Kavanagh, & Baddeley, 1997; Christman, Garvey, Propper, & Phaneuf, 2003).

There were many methodological differences in the studies that compared EMDR with and without eye movement. Researchers did not always use exactly the same control condition (some researchers used a flashing light as the non eye movement condition whereas others used staring at a stationary finger). The studies also differed on the degree to which therapists were trained, the population studied, and the type of eye movement used (Maxfield & Hyer, 2002). The type of eye movement used has been shown to affect outcome, with differences between saccadic eye movement, horizontal smooth pursuit movement and vertical eye movement (Christman, Garvey, Propper, & Phaneuf, 2003). Saccadic eye movement has been found to produce greater cerebral activation than smooth pursuit eye movement measured by positron emission tomography (O'Driscoll et al., 1998). A number of researchers have also proposed that some of the studies included have serious methodological flaws (Lee, Gavriel, & Richards, 1996; Shapiro, 2002) which systematically affect outcome (Maxfield & Hyer, 2002). One approach to this could be to assess each study on a rating scale of methodological rigor and then weight its effect by this score (Rosenthal & DiMatteo, 2001). However, in the current meta-analysis there was sufficient homogeneity to enable the studies to be combined.

Underlying mechanism

There is now empirical support for three explanations on how an external stimulus such as eye movement facilitates the processing of trauma memories in EMDR. The first hypothesis views PTSD as a failure to process episodic memory (Shapiro, 2001; Stickgold, 2002) and that bilateral eye movement facilitate interhemispheric interfacing which then improves the processing of trauma-related memories. Support for this first hypothesis comes from a study testing the effects of eye movement on ability to retrieve episodic memory, which found better recall accuracy following a horizontal eye movement task compared to a no eye movement task and a vertical eye movement task (Christman, Garvey, Propper, & Phaneuf, 2003). However, horizontal eye movement did not enhance the retrieval of semantic memory. Similar enhanced performance for episodic memory following horizontal saccadic eye movement was reported in a study of false memories (Christman, Propper, & Dion, 2004). In a review of 275 brain imagery studies, Cabeza and Nyberg (2000) concluded that episodic memory processing is generally bilateral in nature whereas semantic memory processing generally occurs in the left hemisphere. Thus, processing of trauma memories which are episodic in nature may benefit from a temporary increased activation of both hemispheres. Bilateral eye movement may well produce this given that eye movement to one side have been found to result in a contralateral increase in hemispheric activation as measured by alpha activity using EEG (Bakan & Svorad, 1969).

The second hypothesis as to why eye movements facilitate processing of trauma memories suggests that they do so by activating a neurobiological state similar to REM sleep, where associative links to episodic memories are formed and these

memories are then integrated into general semantic networks. Stickgold (2002) proposed that PTSD occurs when an event is sufficiently arousing to prevent its transfer from encoding as an episodic memory to a semantic memory. As a result of high arousal levels, associations between the trauma event and other related events fail to develop. He argued that the attentional redirecting in EMDR induces a similar neurobiological state to REM sleep. He then reviewed the research that suggests that REM sleep enhances processing of episodic memory through the preferential activation of weak associative and semantic links. Thus in EMDR, trauma-related information that is closely associated with a target event is weakened and ancillary information loosely related to the event is strengthened, allowing the integration of trauma related material with other loosely associated events in the person's life. Support for this argument comes from a study that found compared to eye fixation, eye movement promoted attentional flexibility and increased preparedness to process metaphorical material (Kuiken, Bears, Miall, & Smith, 2001).

A third theory suggests a similarity between processes in EMDR and the orienting response. MacCulloch and Feldman (1996) argued that eye movements trigger the investigatory component of the orienting response which can either produce avoidance behavior or inhibit avoidance responses. Inhibiting avoidance behavior includes reductions in negative somatic responses, and cognitive changes to allow fresh investigatory behavior to commence. They proposed that initially when danger is identified negative affect is generated. However, a second part of the orienting response is to scan for further danger, and this investigatory reflex seems to accompany a positive physical response. In their opinion the eye movement induces this investigatory reflex and produces a relaxation response. A relaxation response

was found in a study that investigated the autonomic responses of participants when they were engaged in an eye movement task as part of EMDR treatment (Wilson, Silver, Covi, & Foster, 1996). In addition electrodermal arousal to autobiographical memory containing negative affect has been found to decrease following an eye-movement task but not in an eye stationary condition (Barrowcliff, Gray, Freeman, & MacCulloch, 2004). However there was no differential reduction in arousal for autobiographical memory containing positive affect (Barrowcliff, Gray, Freeman, & MacCulloch, 2004). This supports the hypothesis of an orienting response mechanism for eye movement rather than a simple relaxation effect.

Further data consistent with the orienting response hypothesis was the finding that EMDR treatment was associated with increased left pre-frontal hemisphere activation (Lansing, Aemon, Hanks, & Rudie, in press; Levin, Lazrove, & van der Kolk, 1999). Investigatory and approach behavior has been shown to be associated with the anterior left hemisphere regions (Kinsbourne, 1978).

In conclusion, the results of the first study suggested that it was the eye movement component of EMDR rather than therapist instructions that led to a reduction in distress. The role of eye movement in EMDR was then further examined by recalculating a previous meta-analysis of past studies comparing EMDR outcomes with and without eye movement. After removing outliers, past research also supported eye movement's significant contribution in EMDR's effect. Some of these outliers had used contrived events or non personal memories as EMDR targets. The fact that these were outliers was consistent with experimental data that eye movement only has a significant differential effect when it is associated with negative autobiographical memory. This supports the generalizability of the results from the first study in that

although EMDR components were tested on a non-clinical population, the effect of eye movement seems to be consistent in any group who has a negative emotional memory.

Contrary to earlier studies, eye movement by itself did not lead to a greater reduction in vividness in Study One. However this appears to have been because the therapist instruction had an effect on vividness in the eye movement condition but not in the eye stationary condition. This raises the possibility that certain combinations of therapist instructions and eye movement may be developed to enhance the effects of EMDR.

Appendices

Table 1. The effects of eye movement and therapist instructions on measures of emotional distress and vividness.

Stimulus	Instruct	Time	SUDS		Vividness	
			Mean	SD	Mean	SD
Eyes	Distancing	pre	5.25	1.76	6.13	1.87
moving		post	1.29	0.84	3.75	1.90
		follow-up	2.37	1.03	4.21	2.29
	Reliving	pre	5.63	2.00	7.04	1.21
		post	1.88	1.33	6.42	2.19
		follow-up	1.58	1.49	4.58	2.18
	Total	pre	5.44	1.86	6.58	1.61
		post	1.58	1.13	5.08	2.43
		follow-up	1.97	1.31	4.40	2.20
Eyes	Distancing	pre	5.79	1.34	6.75	1.66
stationary		post	3.46	1.80	6.04	2.32
		follow-up	3.42	1.93	4.67	1.96
	Reliving	pre	4.58	1.73	5.92	2.30
		post	2.96	1.94	5.35	2.48
		follow-up	2.29	1.84	4.08	1.16
	Total	pre	5.19	1.63	6.33	2.01
		post	3.21	1.85	5.70	2.37
		follow-up	2.85	1.93	4.38	1.60
Total	Distancing	pre	5.52	1.56	6.44	1.76
		post	2.38	1.76	4.90	2.38
		follow-up	2.90	1.60	4.44	2.10
	Reliving	pre	5.10	1.91	6.48	1.89
		post	2.42	1.72	5.89	2.35
		follow-up	1.94	1.68	4.33	1.73
	Total	pre	5.31	1.73	6.46	1.81
		post	2.40	1.72	5.39	2.39
		follow-up	2.42	1.69	4.39	1.90

Table 2. Mean percentage of distancing and reliving responses of a participant's total responses in each of the therapist instruction conditions

	Percentage distancing	Percentage reliving
Distancing condition	27.32	17.84
Reliving condition	9.64	37.00

Table 3. Previous studies investigating the effects of eye movement listed in order of their contribution to heterogeneity using: $\mathrm{df} \times (\mathrm{Z} - \overline{\mathrm{Z}})^2$

	Study	Participant Number	R value	$\mathrm{df} \times (\mathrm{Z} - \overline{\mathrm{Z}})^2$
1	Wilson et al., (1996)	12	0.98	35.08
2	Shapiro (1989)	22	0.83	14.26
3	Sanderson & Carpenter (1992)	58	0.01	5.40
4	Tallis & Smith (1994)	24	-0.13	4.33
5	Renfrey & Spates (1994)	15	-0.19	3.19
6	Boudewyns, Stwertka, Hyer, Albrecht, & Sperr (1993)	15	0.54	0.95
7	Carrigan & Levis (1999)	36	0.16	0.87
8	Devilly, Spence, & Rapee (1998)	24	0.16	0.55
9	Lee (study one)	48	0.40	0.50
10	Dunn, Schwartz, Hatfield, & Wiegele (1996)	28	0.23	0.20
11	Gosselin & Matthews (1995)	41	0.35	0.07

The numbers assigned to each study are again referred to in Figure 4.

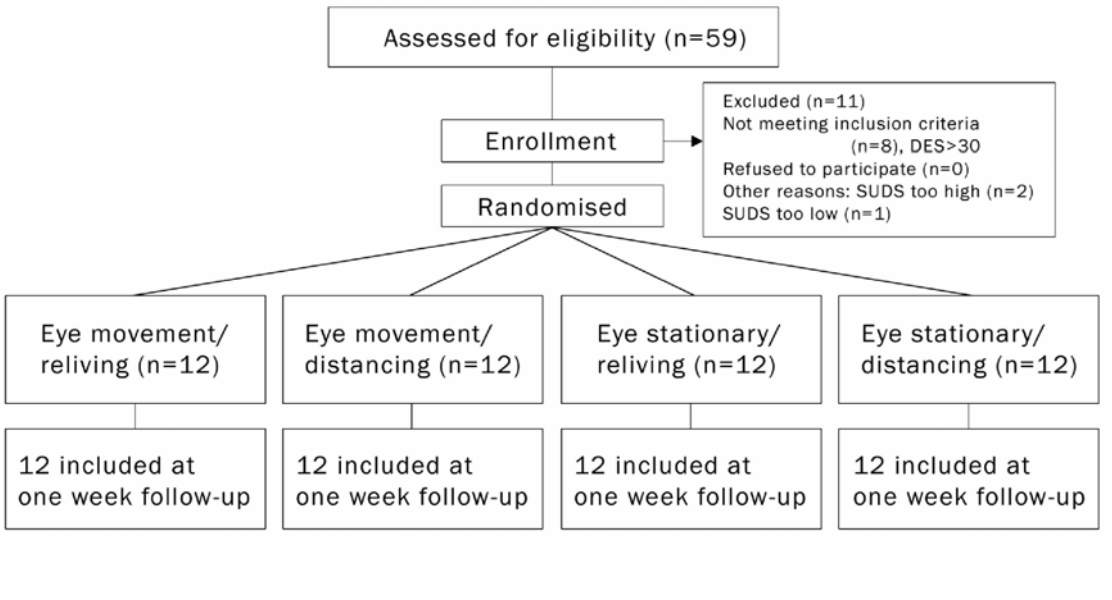

Figure 1. Participant flow through the study

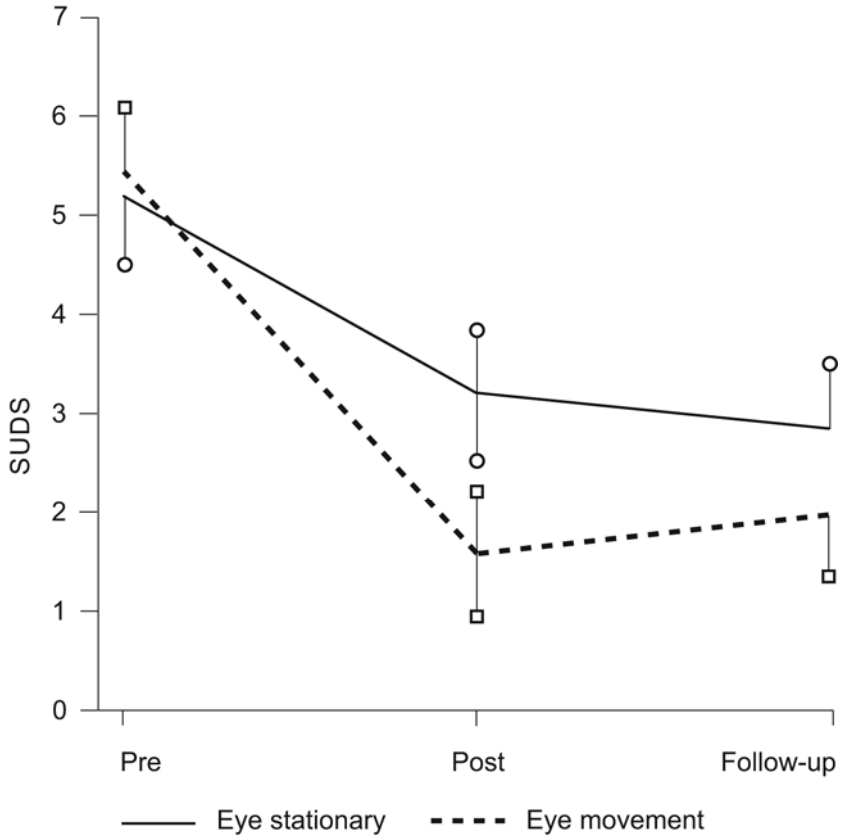

Figure 2. Effect on distress of eye movement averaged across reliving and distancing conditions (mean and standard error).

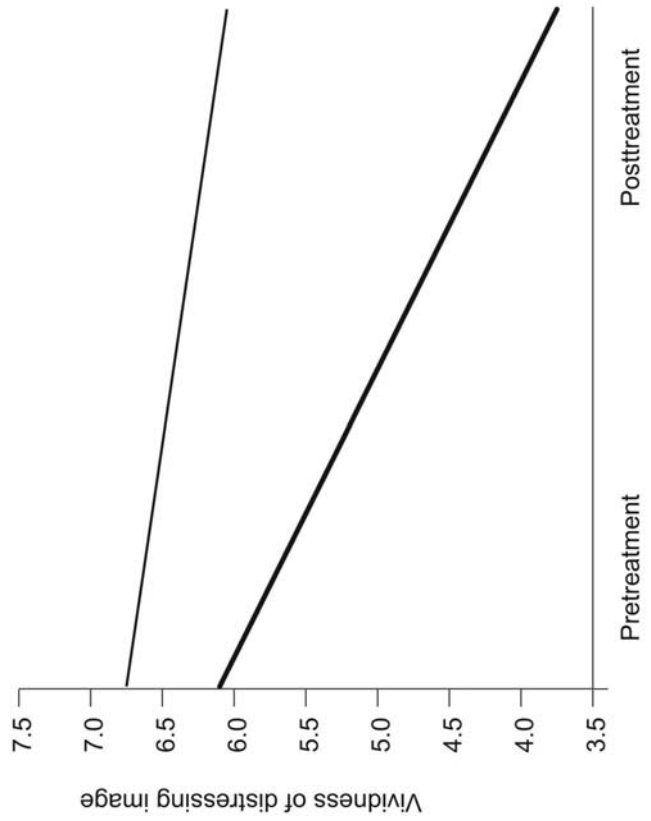

Figure 3b. Pre and post treatment vividness scores for therapist distancing instruction under eye movement and eye stationary conditions.

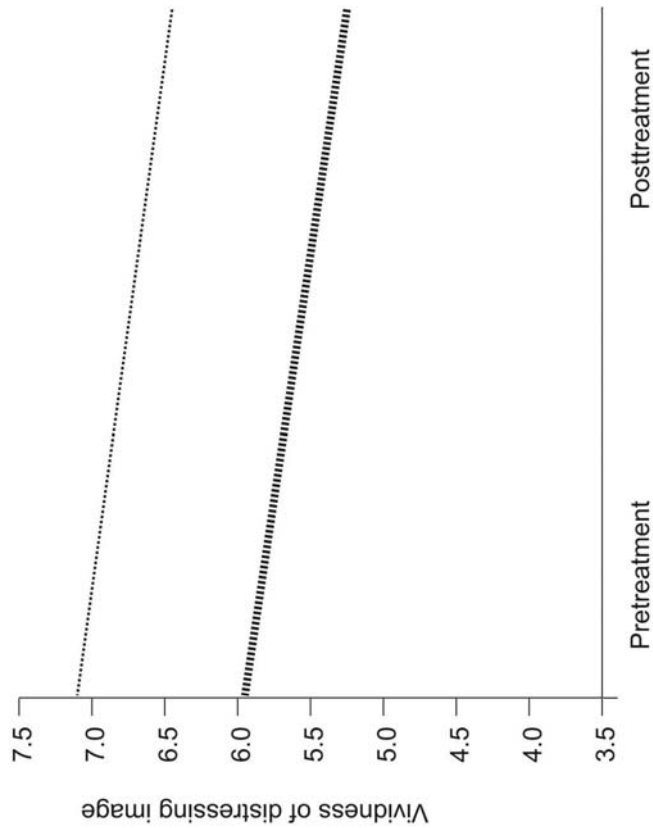

Figure 3a. Pre and post treatment vividness scores for therapist reliving instruction under eye movement and eye stationary conditions.

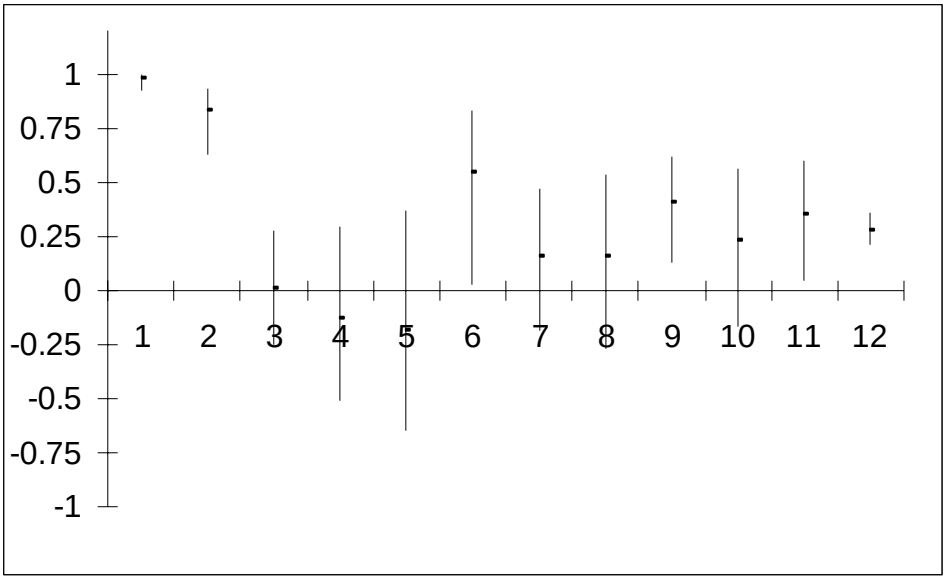

Figure 4. Mean effect size and standard error of measurement for each of the studies investigating the significance of eye movement in EMDR. The numbers on the horizontal axis correspond to study numbers cited in Table 3, except for 12 which is the mean after studies contributing the most to heterogeneity were removed (i.e., 1,2,3, & 4).

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CHAPTER 5

CONCLUSIONS

5.1 Summary of the four studies

The first study compared the effects of EMDR and SITPE as treatments for PTSD. Both treatments resulted in significantly lower scores on depression and trauma measures during the treatment phase compared to an equivalent wait list period. The effects for both treatments were considered to be large to very large according to criteria suggested by Cohen (1977). Although at the end of treatment there was not a significant main effect for treatment type on the measures of traumatic symptoms and depression, there was a significant advantage in favour of EMDR over SITPE at follow-up. A post hoc analysis of differences immediately following treatment indicated EMDR resulted in a larger reduction on both the intrusion measures and that this improvement was maintained at follow-up. In terms of clinically significant change, 67% of the participants in the EMDR condition compared to 50% SITPE achieved clinically significant improvement at follow-up and this difference was found to be statistically significant. There were no significant differences in the percentages of participants who no longer met diagnostic criteria for PTSD after treatment (83% for EMDR, 75% for SITPE). The limitations of the first study include a small sample size and that the assessor was not blind to treatment assignment.

The main finding from study 2 was a significant association between distancing and reduction in scores on a measure of trauma symptoms. The hypothesis that reliving responses would be associated with more improvement was rejected

which implied that the processes in EMDR are not the same as those that occur during imaginal exposure. The significant association between distancing and improvement was consistent with the notion that EMDR involves a dual focus of attention which facilitates information processing. Cross lagged correlations, that controlled for the amount of initial distancing and scores on a trauma symptom measure pre-treatment and the amount of distancing and trauma symptoms at the end of treatment, revealed a significant association between initial distancing and trauma scores at the conclusion of treatment. This finding was consistent with the idea that the treatment caused the change and not consistent with the competing hypothesis that distancing and trauma symptoms simply co-vary.

Another important finding from study 2 was that the relationship between negative affect and the percentage of associated material was positively correlated. As will be argued in the next section, this has implications for information processing models of PTSD. However, there was no relationship between the percentage of associated responses and reduction in symptom severity.

The third study then tested which component from EMDR produces the improvement. In study 2, it was argued that there were two possible key processes that produced the distancing process in EMDR associated with improvement: therapist instructions or the eye movement stimulus. The main analysis indicated a significant effect for eye movement on outcome variables, and univariate analysis indicated that the significant difference was on a measure of distress. There was no difference between the conditions on vividness, and there was no main effect for therapist instructions. However, there was a significant interaction between eye movement, therapist instruction, and time. Further investigation of this interaction indicated that for the eye movement condition, therapist distancing but not reliving

instructions resulted in significant reduction in vividness. Thus reliving directions which are common in traditional exposure-based treatments did not enhance the effect of the eye movement in EMDR. This is consistent with the results of study 2 where distancing responses were associated with a positive treatment effect but reliving was not. However overall the critical component of EMDR appears to be eye movement rather than the instructions given by the therapist.

The finding of a significant effect of eye movement was at odds with a previous meta-analysis. However this previous analysis had made an error in the way that the degrees of freedom were calculated. Recalculating the data resulted in the finding of a significant effect of eye movement. The average effect size for eye movement was at a medium level (r= .28). During the analysis outliers were systematically removed in the order of each study's contribution to the heterogeneity of the distribution. Two of the studies removed involved contrived trauma rather than negative autobiographical memory. The fact that these contribute to heterogeneity is consistent with other laboratory data that failed to find differential affect of eye movement on stimuli that did not involve personal memory.

5.2 Is EMDR is more effective than traditional CBT

In the first study (Lee, Gavriel, Drummond, Richards, & Greenwald, 2002) EMDR resulted in a better outcome at follow-up than SITPE. However, was the choice of a combination of prolonged exposure and stress inoculation training in study one the strongest traditional CBT treatment available, given that one study found that this combination was not as effective as prolonged exposure on its own (Foa et al., 1999)? Although the combination of prolonged exposure and stress inoculation was as effective as prolonged exposure on its own at the end of the treatment period,

prolonged exposure was more effective at follow-up. Thus, adding stress inoculation training might have reduced the effect of exposure. However, this argument is at odds with other findings that the combination of cognitive therapy and prolonged exposure was as effective as prolonged exposure (Marks, Lovell, Noshirvani, Livanou, & Thrasher, 1998). It is also at odds with a study that found that exposure therapy was as effective as cognitive therapy without any direct exposure (Frank et al., 1988), that cognitive therapy produced better outcomes to imaginal exposure at a five year follow-up (Nicholas, Tarrier, & Sommerfield, 2004), and that cognitive therapy was equivalent to prolonged exposure in reducing symptoms on most measures but superior on a measure of guilt (Resick, Nishith, Weaver, Astin, & Feuer, 2002).

As discussed in chapter 2.3, the finding of significantly larger treatment effects for EMDR with the same number of treatment sessions as SITPE was similar to other studies that have appeared since the publication of Lee et al., (2002). In one study clinically significant improvement happened more quickly with EMDR than in traditional exposure (Ironson, Freud, Strauss, & Williams, 2002) and in other studies equivalent improvement happened in fewer sessions (Jaberghaderi, Greenwald, Rubin, Zand, & Dolatabadi, 2004; Power et al., 2002). It is also consistent with studies published prior to study 1 that compared traditional CBT with EMDR (Rogers et al., 1999; Vaughan et al., 1994). Taken together, these findings suggest that the ratio of treatment gains divided by number of sessions is better for EMDR than traditional CBT. However two recent exceptions were noted where the treatments were equivalent (Rothbam, Astin, & Marsteller, 2005) or CBT produced some gains over EMDR (Taylor, 2003).

Aside from the positive ratio of symptom improvement to session number for EMDR over traditional CBT, there are other reasons to argue an improved efficiency for EMDR. The fact that EMDR participants have very little homework while those treated with traditional exposure have seven hours per week of scheduled re-exposure time between sessions can mean a difference in exposure time as large as 63 hours between sessions even when the in-session exposure time is the same. Thus the total exposure time to the traumatic memory in EMDR is often less than that of the traditional exposure group. So even if EMDR achieves only a similar treatment effect size it appears to be a more efficient treatment. A similar observation was made by other researchers who compared the two treatments (Jaberghaderi, Greenwald, Rubin, Zand, & Dolatabadi, 2004; Power et al., 2002; Rothbam, Astin, & Marsteller, 2005; Vaughan et al., 1994).

5.3 EMDR effectiveness: conditioning explanation

Conditioning theory offers a plausible explanation for EMDR efficiency. However, attributing the effectiveness of EMDR simply to habituation following exposure is not sufficient to account for the superior treatment effects argued in the preceding section. Dyck (1993) applied conditioning theory to EMDR in an innovative way that might account for the differences. He noted that during EMDR treatment, eye movement continues until the person reports a positive or neutral response. Moreover, eye movement does not stop there but continues until there is no further improvement in the response. Once this more positive response is stable it is then, and only then, that the therapist invites the participant to return to the targeted material (CS). Thus, on each of these occasions a new response (usually positive but sometimes neutral) becomes paired with the CS (i.e., mental images or verbal

discussions about the event), thereby producing an habituation trial. This could then be considered a form of systematic desensitisation.

This process of pairing positive material to the CS is procedurally very different from traditional CBT exposure where the person is continually redirected to the traumatic material and is encouraged to relive the experience. This is in sharp contrast to EMDR where the person is encouraged to allow any material to emerge and is only redirected back to the trauma material when positive or neutral responses are given. Study 2 highlighted these procedural differences through the finding that the reliving responses found to be critical in traditional exposure therapy (Jaycox, Foa, & Morral, 1998) failed to have any effect on the treatment response in EMDR whereas distancing was significantly related to improvement. Thus, in EMDR the emphasis is on pairing the CS with positive or neutral material whereas in traditional CBT exposure treatments the emphasis is on repeated presentation of the CS simply in the absence of the UCR.

One aspect where this explanation breaks down is that the therapist is not continually pairing the CS with a positive or neutral response. Instead, as noted on pages 85-86, clients can give associated responses that are the focus of the EMDR rather than the original CS. The targeting of this associated material has implications for information processing theory. The next section discusses how the four studies impact on these theories.

5.4 EMDR effectiveness: information processing models explanation

Aspects of information processing theory better account for the efficacy of EMDR. As discussed in chapter 1, according to Foa and Kozac (1986), a necessary condition for successful trauma treatment is that all three components of the

emotional memory (perceptual elements of the traumatic event, the affect/somatic response, and the associated meaning) be activated. Stage 3 of the EMDR treatment protocol requires the therapist to direct the client to access all three of these components.

Also consistent with Foa and Kozac (1986) is that in EMDR the therapist spends considerable time helping the person access a meaning they can associate with the event that is incompatible with the original meaning accompanying the trauma. Shapiro (1995) called this the positive cognition. After desensitisation of the trauma memory has been achieved, the client is directed to focus on this predetermined positive cognition and the original memory in order to integrate these stimuli. This new meaning is required to be positive in nature, consistent with theories of recovery from PTSD discussed in chapter 1 that emphasize that this occurs when the person sees the experience as adding meaning to life by seeing a positive value in the experience (Janoff-Bulman, 1992; Janoff-Bulman & Frantz, 1997). As can be seen from Table 1, the positive cognition is also of a form that reflects schema changes thought to be crucial to trauma recovery (Epstein, 1991), namely that the world is benevolent and predictable, and that the self is worthwhile.

Table 1. List of negative and associated positive beliefs frequently encountered in EMDR (Shapiro, 1995)

Negative cognition	Positive cognition
I am a bad person	I am a good/loving person
I am worthless/inadequate	I am worthwhile
I am not loveable	I am loveable
I cannot trust my judgement	I can trust my judgement

I cannot succeed	I can succeed
I am not in control	I am now in control
I am powerless/helpless	I now have choices
I am weak	I am strong
I cannot protect myself	I can (learn to) take care of myself
I am a failure (will fail)	I can succeed
I should have done something	I did the best I could
I am in danger	It's over; I am safe now
I cannot stand it	I can handle it
I cannot trust anyone	I can choose whom to trust

While EMDR treatment emphasises adding a positive cognition, and various theories predict that this should be beneficial, in the only study to test this no significant differences were reported between EMDR with and without a positive cognition (Cusack & Spates, 1999). However this study has two major methodological problems. First, it had a very small sample size (21 at follow-up) which may have been inadequate when the two treatments share so much in common. Second, there is doubt that adequate attention was paid to the fidelity of the underlying treatment in this study (Maxfield, Lake, & Hyer, 2004).

The third aspect of information processing theory that bears on EMDR treatment is that the client is given permission to make associative links from the traumatic event to other events in their lives. These events include other traumas, crucial life stage events, and even positive experiences (Shapiro, 1995). In fact, such

associated links are expected from information processing models of PTSD (Epstein, 1994; Foa & Kozac, 1986; Horowitz, 1979; Janoff-Bulman & Frantz, 1997). When this occurs in EMDR it may enable the person to access other events that provide a broader context with which to consider the targeted trauma (e.g., other times I went on a date and wasn't raped) or put the client in touch with positive experiences that gives them confidence or strength (e.g., I nearly lost my son in childbirth but I got through that so I can do anything). This is consistent with information processing theories that argue that the ability of the person to find meaning in the event or to place the trauma into a perspective based on the person's total experiences is necessary for recovery from PTSD (Epstein, 1991; Janoff-Bulman & Frantz, 1997). According to Stickgold (2002), arousal associated with PTSD interferes with this type of information processing and explains why people do not recover from trauma. Therefore, our finding in study 2, that greater distress was associated with fewer associative responses, was consistent with this. However if this was an important process in recovery, then greater improvement should follow more associative responses. Instead, we found that whilst participants made more associative responses as the session progressed, the proportion of associated responses was not related to improvement.

Further support for information processing being an underlying mechanism of change in EMDR are the findings from the third and fourth studies that eye movement is the critical process in EMDR, and previous research that has linked eye movements with information processing. As discussed in chapter 4.2, support for an association between eye movements and information processing was found in a study indicating that eye movement promotes attentional flexibility and facilitates associative semantic processing compared with an eyes fixed condition (Kuiken,

Bears, Miall, & Smith, 2001). Improved associative semantic function was also reported in a study that compared eye movements with a control task of periodic visual stimulation without eye movements (Christman, Propper, & Dion, 2004). These arguments were seen to support Stickgold's (2002) proposal that PTSD occurs when an event is sufficiently arousing to prevent its transfer from encoding as an episodic memory to a semantic memory. As a result of high arousal levels, associations between the traumatic event and other related events fail to develop. He argues that the attentional redirecting in EMDR induces a neurobiological state similar to REM sleep. Stickgold went on to review the research that suggested that REM sleep enhances processing of episodic memory through the preferential activation of weak associative and semantic links. He argued that in EMDR, trauma-related information that is closely associated with a target event is weakened and ancillary information loosely related to the event is strengthened, allowing the integration of trauma-related material with other loosely associated events in the person's life.

5.5 EMDR effectiveness: biological models

Stickgold's hypothesis to some extent bridges information processing theory and some of the data from studies of neuroanatomy and hypotheses of neurochemical effects of PTSD. Recently Sotres-Bayon, Bush, and LeDoux (2004) reviewed the literature on extinction of fear responses and concluded that laboratory studies with rats now suggest that extinction is not about forgetting but rather of learning new context associations to the CS. They went on to test this and found that lesions in the hippocampus interfered with processing of information in prefrontal-amygdala circuitry which inhibited fear extinction. Stickgold also emphasised that the role of

the hippocampus in recovery from PTSD was to facilitate weaker associative links so that the traumatic memory could be stored in less episodic form. He argued that this type of processing often occurs during REM sleep but that the arousal associated with PTSD prevents this from occurring.

According to Yehuda (2002), cortisol is crucial in its role as a stress hormone regulator that influences hippocampal function which, in turn, affects amygdala and prefrontal cortex activity (Shin, Rauch, & Pitman, 2005). Indeed, although cortisol levels were found to be generally lower than in control participants throughout the 24 hour period, the difference was most pronounced during sleep time (Yehuda, et al., 1996).

After finding a crucial role of eye movements in studies 3 and 4, I went on to review research that might explain how this link occurs. The research was consistent with eye movement leading to less arousal than control conditions, perhaps through activation of an orienting response mechanism for eye movement rather than a simple relaxation effect (pages 140-142).

Further data consistent with the orienting response hypothesis was the finding from a study using SPECT technology, that patients diagnosed with PTSD who were undergoing treatment with EMDR had increases in left frontal lobe functioning and decreases in amygdala activation (Levin, Lazrove, & van der Kolk, 1999). In another study of police officers who had PTSD, increased activation of prefrontal areas was found following EMDR treatment (Lansing, Aemon, Hanks, & Rudie, 2005). Investigatory and approach behavior has been shown to be associated with the anterior left hemisphere regions (Kinsbourne, 1978). However none of the neuroimaging studies to date have implicated the hippocampus in EMDR. The

theories on hippocampus involvement elucidated in the above section could be tested by investigating hippocampus activity during and following EMDR.

5.6 Other factors in the treatment of choice for PTSD

There is another advantage of a treatment based on an information processing approach such as EMDR over a procedure based on habituation through reliving and the elimination of avoidance behaviours. The experience for the client may be less traumatic because it may not be necessary to induce high levels of distress. High levels of arousal are usually required for successful traditional CBT treatments (Jaycox, Foa, & Morral, 1998). In study two distancing was the most frequent response when EMDR was administered in typical form and the extent of reliving was not associated with improvement. Thus apart from an initial activation of the memory network prior to eye movement, EMDR does not need the reliving component. Reliving responses are associated with higher distress (Jaycox, Foa, & Morral, 1998). This could account for the finding that participants rated their EMDR therapist as significantly warmer than therapists in an image habituation treatment (Vaughan et al., 1994). However, the therapists in each condition were identical; thus, this difference reflects not a therapist characteristic but the experiences of the treatment by the participant. Dropout rates are lower for EMDR than CBT, suggesting that EMDR is better tolerated (Ironson, Freud, Strauss, & Williams, 2002). In addition, compared to traditional CBT the level of subjective distress was lower for EMDR both during and between sessions (Ironson, Freud, Strauss, & Williams, 2002). However there were no significant differences in dropout rates between the two treatments in study 1 (Lee et al., 2002), nor in other studies comparing EMDR to traditional CBT (Power et al., 2002; Rothbam, Astin, & Marsteller, 2005). However researchers that have

conducted outcome studies on both traditional exposure and EMDR have suggested that EMDR is preferred by participants because less distress is associated with the treatment and there are fewer adverse complications (Boudewyns & Hyer, 1996; Pitman et al., 1996).

Client's adverse experiences during treatment have the potential to affect the palatability of their therapy and hence affect outcome. A problem with traditional prolonged exposure is that some participants become more symptomatic during treatment in comparison to treatments that include techniques to help control arousal (Tarrier et al., 1999). In one study only 21 of 37 clients completed the exposure based treatment, and compliance with treatment was related to initial PTSD symptom severity and the severity of co-morbid depression (Scott & Stradling, 1997). Therefore, it has been argued that exposure may be problematic for clients with more severe symptoms. Some studies have found that initial symptom severity does not significantly affect compliance or treatment response in traditional exposure treatments (Bradley, Greene, Russ, Dutra, & Westen, 2005). However, many of these randomised controlled studies have excluded co-morbid diagnosis such as depression which has therefore limited the generalisation of the findings to clients typically treated in practice (Bradley, Greene, Russ, Dutra, & Westen, 2005; Tarrier, 2001; Tarrier et al., 1999). It appears that it might be these co-morbid factors that complicate the client's engagement in traditional CBT for PTSD and hence produce a higher drop out rate (Scott & Stradling, 1997).

The issue of clients not being able or ready to benefit from a desensitising treatment has been raised by clinicians who recommend a stage model approach to treatment of PTSD. According to van der Kolk, McFarlane, and van der Hart (1996), before deconditioning dysphoria associated with a trauma it is first necessary to

ensure a certain level of client stability. This can be achieved through education of traumatic experiences, expression of feelings, arousal reduction coping strategies or through medication. Once the first stage has been completed, deconditioning of traumatic memories and responses can occur. The third stage involves reconstruction of the self and world views towards more stable and positive schema. Fourthly they recommended that the therapy targets a re-establishment of secure social communicants and a sense of interpersonal efficacy. Finally, they suggested a focus on positive emotional experiences be it helping others, spiritual, artistic or ecological pursuits.

Given an apparent advantage of EMDR over traditional CBT in the degree to which negative emotional states need to be activated, the therapist might be able to spend less time in stage one, moving to stage two more quickly. If the stage model is valid then another advantage of EMDR is that the focus on personal meaning and schemas recommended by the model spontaneously occurs in EMDR. This was found in study 2- as arousal decreased associated material increased.

Whilst EMDR does have an efficiency benefit, it is not universally acceptable for all participants. For example in study 1 it was found that 17% of the participants at the end of treatment still met the diagnostic criteria for PTSD. Alternative treatments such as medication or behaviourally based procedures may provide assistance for those non responders. In my own practice I have found that behavioural methods from traditional CBT that focus on invivo exposure could be of benefit. For example a client did not respond after two sessions of EMDR during which he indicated he was overwhelmed by the traumatic memories. He was then provided with an in-vivo exposure to one of the stimuli that previously produced an aversive response. The client had been involved in a prison riot where glass had been

broken and he had previously been avoiding any public place where he might come into contact with broken glass such as using a public footpath. The in-vivo exposure involved smashing a glass and placing this in a bucket and then directing his attention to the broken shards. He desensitised to this stimulus after an hour and a quarter. He reported in the following session a rediscovered sense of mastery and control. This deconditioning helped him face the trauma again so that after two further EMDR sessions he no longer met the criteria for PTSD.

The results from this thesis raised some interesting questions for further research. Given that there was an interaction between eye movement and therapist instruction in study 3, further research could examine which combinations of stimuli such as eye movement and therapist instructions might produce the best effect. For example distancing in study 2 and 3 was a generic category that included anything that assisted the participant to see their trauma as further away and not relive the experience. However the different instructions may not have produced a homogeneous effect. Some distancing instructions such as to just notice the experience are consistent with mindful based approaches (Segal et al., 2002) whereas others such as the direct suggestions to avoid experiencing the emotion of the material, and to see it on the screen in a faded form are the antithesis of mindfulness. Perhaps investigating the differential effects of these types of instructions may result in a more efficacious treatment procedure.

In conclusion, the thesis has demonstrated that EMDR is one of the most efficient treatments currently available for PTSD. I also found that the eye movement is a critical part of the process and that neurobiological models and information processing theory offer some plausible explanations for why this facilitates improvement. The treatment appears to be well tolerated by participants but not

everybody benefits from it. Further understanding provided by this thesis will hopefully improve its effectiveness.