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A Controlled Comparison of Eye Movement Desensitization and Reprocessing Versus Exposure Plus Cognitive Restructuring Versus Waiting List in the Treatment of Post-traumatic Stress Disorder

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A total of 105 patients with post-traumatic stress disorder (PTSD) were randomly allocated to eye-movement desensitization and reprocessing (EMDR) ($n = 39$) versus exposure plus cognitive restructuring (E + CR) ($n = 37$) versus waiting list (WL) ($n = 29$) in a primary care setting. EMDR and E + CR patients received a maximum of 10 treatment sessions over a 10-week period. All patients were assessed by blind raters prior to randomization and at end of the 10-week treatment or waiting list period. EMDR and E + CR patients were also assessed by therapists at the mid-point of the 10-week treatment period and on average at 15 months follow-up. Patients were assessed on a variety of assessor-rated and self-report measures of PTSD symptomatology including the Clinician Administered PTSD Scale (CAPS), the Impact of Events Scale (IOE) and a self-report version of the SI-PTSD Checklist. Measures of anxiety and depression included the Montgomery Asberg Depression Rating Scale (MADRS), the Hamilton Anxiety Scale (HAM-A) and the Hospital Anxiety and Depression Scale (HADS). A measure of social function, the Sheehan Disability Scale was also used. Drop-out rates between the three groups were 12 EMDR, 16 E + CR and five WL. Treatment end-point analyses were conducted on the remaining 72 patients. Repeated measures analysis of variance of treatment outcome at 10 weeks revealed significant time, interaction and group effects for all the above measures. In general there were significant and substantial

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pre–post reductions for EMDR and E + CR groups but no change for the WL patients. Both treatments were effective over WL. The only indication of superiority of either active treatment, in relation to measures of clinically significant change, was a greater reduction in patient self-reported depression ratings and improved social functioning for EMDR in comparison to E + CR at the end of the treatment period and for fewer number of treatment sessions for EMDR (mean 4.2) than E + CR (mean 6.4) patients. At 15 months follow-up treatment gains were generally well-maintained with the only difference, in favour of EMDR over E + CR, occurring in relation to assessor-rated levels of clinically significant change in depression. However, exclusion of patients who had subsequent treatment during the follow-up period diminished the proportion of patients achieving long-term clinically significant change. In summary, at end of treatment and at follow-up, both EMDR and E + CR are effective in the treatment of PTSD with only a slight advantage in favour of EMDR.

INTRODUCTION

Post-traumatic stress disorder (PTSD) was first recognized in official psychiatric nosology in the third edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM III) (American Psychiatric Association, 1980). In DSM IV (American Psychiatric Association, 1994) PTSD remains within the anxiety disorders and may only be diagnosed following exposure to a traumatic event in which (a) the person experienced, witnessed or was confronted with an event that involved actual or perceived threat to life or physical integrity of self or others; and (b) the person's response to such event(s) involved intense fear, helplessness or horror.

PTSD symptoms fall into three main groupings: (a) re-experiencing the trauma via intrusive thoughts, images and dreams and intense distress when faced with real or symbolic reminders of the trauma; (b) persistent avoidance of stimuli associated with the trauma and emotional numbing; (c) symptoms of increased arousal such as sleep disturbance, irritability, anger and hypervigilance.

Most of the epidemiological studies of the incidence and prevalence of PTSD have been conducted in the United States and have produced a wide range of results. Helzer, Robins and McEvoy (1987) report that approximately 1–2% of the US population meet the criteria for PTSD. However, Kessler, Sonnega, Bromet, Hughes, and Nelson (1995) cite general population lifetime rates of up to 7.8%. Comparable rates among specific trauma groups are considerably higher, for example, 30% in Vietnam veterans and 32% in female rape victims (Resnick, Kilpatrick, Dansky, Saunders, & Best 1993).

Cognitive-behavioural interventions, such as exposure procedures, cognitive restructuring techniques and anxiety management training are among the most extensively investigated treatments for anxiety disorders. The common feature of exposure procedures is a confrontation of the feared stimuli. These procedures may vary according to the medium of exposure (imaginal versus *in vivo*), length of exposure (short versus long) and arousal level during exposure (low versus high) (Foa, Rothbaum, & Kozak, 1989). With regard to PTSD, a number of studies have attested to the efficacy of imaginal and *in vivo* exposure techniques (Richards, Lovell, & Marks, 1994; Thompson, Charlton, Kerry, Lee, & Turner, 1995) while others have illustrated comparative efficacy in relation to supportive counselling (Foa, Rothbaum, Riggs, & Murdock, 1991), and relaxation (Marks, Lovell, Noshirvani, Livanou, & Thrasher, 1998). Trauma desensitization, hypnotherapy and brief psychodynamic therapy have been shown to be equally effective and superior to waiting list (Brom, Kleber, & Defares, 1989). Studies which have produced more equivocal results regarding the efficacy of exposure techniques in the treatment of PTSD have invariably been confounded by the inclusion of additional 'standard treatment' between comparative groups. For example in comparisons of 'direct therapeutic exposure' versus 'conventional therapy

or counselling' among inpatient Vietnam veterans all subjects appeared to receive 'regular unit milieu treatment' which also included many elements of 'direct therapeutic exposure' (Boudewyns & Hyer, 1990; Boudewyns, Hyer, Woods, Harrison, & McCranie, 1990).

Similarly, comparisons of 'standard treatment' with or without imaginal flooding have produced equivocal results probably due to the large variety of confounding treatments offered under standard care (Cooper & Clum, 1989; Keane, Fairbank, Cadell, & Zimering, 1989). It therefore appears that in the case of exposure treatments for PTSD equivocal results are associated primarily with contaminated treatment designs while well-controlled studies indicate clear superiority of exposure-based approaches.

A relatively new form of treatment for PTSD has been proposed by Shapiro (1995) entitled Eye Movement Desensitization and Reprocessing (EMDR). In brief, the EMDR procedure requires the patient to focus upon a disturbing image or memory and related cognitions and emotions, while the therapist induces bilateral stimulation either by visual tracking, auditory stimulus or tactile stimulation. Shapiro (2001) now regards dual attention stimulation as possibly providing the most useful explanation of EMDR's accelerated effects. There has been considerable debate concerning the theoretical basis of EMDR (e.g. Hassard, 1996; McCulloch and Feldman 1990) and disagreement as to its efficacy (Poole, deJongh, & Spector, 1999; Rosen, Lohr, McNally, & Herbert, 1998). In recent years there has been an increase in the number of well-controlled studies regarding the efficacy of EMDR. Some studies have concentrated on examining the role of specific components of EMDR (Pitman *et al*., 1996; Renfrey & Spates, 1994; Wilson, Silver, Covi, & Foster, 1996). In these studies EMDR has been compared with variants such as EMDR saccadic eye movements induced by alternating flashing lights; EMDR minus eye movements, i.e. eyes fixed; EMDR minus eye movements but with alternating thumb tapping. Renfrey and Spates (1994) and Pitman *et al*. (1996) have reported that there is little difference in outcome between standard versus modified EMDR and therefore conclude that the eye movements are not essential to treatment. Conversely, Wilson *et al*. (1996) report that eye movements correlate with changes in autonomic measures such as respiration and galvanic skin response and consequently eye movements are considered the source of a relaxation response. EMDR is therefore seen as effective as it pairs 'distress with an internally-generated and ''compelled'' relaxation response' in a manner equivalent to reciprocal inhibition. (Wilson *et al*., 1996, p. 227).

Other EMDR controlled studies have investigated absolute efficacy by comparing EMDR versus no treatment (i.e. either waiting list or delayed treatment) (Grainger, Levin, Allen-Byrd, Doctor, & Lee, 1997; Rothbaum, 1995; Wilson, Becker, & Tinker, 1995). Each of these studies report EMDR to be more effective than no treatment. Studies have investigated the relative efficacy of EMDR in comparison with other psychotherapy treatments. In terms of treatment outcome there is evidence to suggest that EMDR is superior to biofeedback (Carlson, Chemtob, Rusnak, Hedlund, & Muraoka, 1995; Silver, Brooks, & Obenchain, 1995), non-directive active listening (Scheck, Schaeffer & Gillelte, 1998), and 'exposure control' (i.e. EMDR with eyes closed) (Boudewyns and Hyer 1996; Boudewyns, Stwertka, Hyer, Albrecht, & Sperr, 1993; Shapiro, 1989). A number of studies have incorporated a comparison of EMDR with 'standard care', some of which report superiority of EMDR (e.g. Carlson *et al*., 1998; Marcus *et al*., 1997) while others report no difference in clinical outcome between 'standard care' and EMDR (Boudewyns *et al*., 1993; Jensen, 1994). One controlled study has compared EMDR versus imaginal exposure (i.e. image habituation training), these treatments are also being compared with applied muscle relaxation and waiting list (Vaughan *et al*., 1994). All three treatments showed equal levels of improvement which were superior to waiting list, albeit a trend for superiority of EMDR in most measures, and there was a significant superiority for EMDR with regard to intrusive memories. More recently, Devilly and Spence (1999) compared EMDR and a CBT variant entitled Trauma Treatment Protocol (TTP). It was found that TTP was more effective than EMDR but unfortunately a waiting list control group was not included and statistical analysis was carried out without controlling for very significant differences in expectancies between the treatment groups.

In summarizing the controlled studies mentioned above, it appears that many indicate a positive outcome of EMDR in comparison with no treatment or other forms of psychotherapy, while many other studies indicate no difference between EMDR and other treatments. This ambiguity is reflected in recent reviews of this topic (Chambless *et al*., 1998; Davidson & Parker, 2001; Van Etten and Taylor, 1998).

However, it is important to temper overall conclusions with consideration of a number of

methodological problems associated with certain EMDR studies. With regard to treatment fidelity, a small number of studies have probably incorrectly applied EMDR by using untrained therapists. In addition, only in some studies did all subjects meet DSM PTSD criteria, in other studies only a proportion of subjects met such criteria and in the remainder diagnostic criteria were either not provided or subjects were simply described as having had a traumatic experience and/or traumatic memories. In certain studies it is difficult to ascertain exactly what was responsible for change over treatment time. For example, with regard to the use of concurrent psychotropics during treatment, some studies openly permitted this provided subjects were on a stable dosage, other studies prohibited all psychotropics and the remainder did not mention the issue of concomitant psychotropics at all. With regard to non-study concurrent psychotherapy, some studies permitted this, other studies did not mention the issue, and a few studies openly stated that this was not permitted during the study period but did note that such prohibition was not implemented between end of study treatment and follow-up. With these exceptions, the remainder of studies failed to take account of post-study treatment (psychotherapy and/or psychotropics) at time of follow-up. In addition, some studies provided no follow-up and in many the maximum length of follow-up was of short duration (e.g. 1 month) with relatively few studies providing long term follow-ups beyond 9 and 12 months.

One of the major problems in comparing such studies is the variable amounts and type of treatment offered, for example one session of EMDR as used by Shapiro (1989) in comparison with four sessions of EMDR used by Vaughan *et al*. (1994). A further confound is the issue of EMDR in comparison to 'standard treatment'. Unfortunately both between and within such studies the content of 'standard treatment' varies considerably, for example described as briefly as 'milieu treatment' by Boudewyns *et al*. (1993). A more detailed description of 'standard treatment' involved patients receiving 'one or more of the following: individual psychotherapy (cognitive, psychodynamic, or behavioural); medication (antidepressants, anti-anxiety medication); and/or group therapy (relaxation training, panic and anxiety reduction, medication stabilization groups)', brief inpatient hospitalization and day-treatment also having been used Marcus *et al* 1997, p. 309). In many studies it is uncertain what EMDR is actually being compared with.

A further problem is that EMDR has not been adequately compared with exposure-based treatments either imaginal or *in vivo*. As previously mentioned, a number of studies have compared EMDR with an 'exposure control' for example EMDR with eyes closed. Such an 'exposure control' is not equivalent to image habituation training as practised by Vaughan *et al*. (1994) in one of the few studies to investigate imaginal exposure in comparison with EMDR. Furthermore, there is a dearth of studies that have investigated EMDR in comparison with an exposure-based technique which incorporates prolonged imaginal exposure, cognitive restructuring, and where appropriate *in vivo* exposure as utilized by Foa *et al*. (1991) and Marks *et al*. (1998). The present study attempts to address some of these issues in the treatment of PTSD by comparing EMDR versus exposure plus cognitive restructuring versus waiting list.

METHOD

Subjects

Outpatient referrals were taken from general practitioners and psychiatrists within central Scotland. Patients were considered suitable for study inclusion if they met the following criteria: willing to participate voluntarily and give written consent; able to satisfy DSM IV criteria for PTSD; if on medication, had been on a stable dose for at least 6 weeks, and were required to remain so for the duration of the treatment trial; aged between 18 and 65 years. Patients were excluded if they exhibited any of the following: concurrent severe depressive illness; past or present psychotic illness; history of alcoholism or drug abuse within the last 6 months as defined by DSM IV; suicidal ideation or intent as assessed at clinical interview; physical illness of clinical significance; psychotherapy commitments outwith the study.

Measures

Assessments pre- and post-treatment were conducted by two independent assessors respectively, who were blind to treatment conditions. Assessments at mid-point of treatment and follow-up were made by therapists who were not blind to treatment conditions. In addition patients

completed a number of self-report measures, pre-, mid- and post-treatment and at follow-up.

Assessor Measures

Frequency and intensity of individual symptoms was assessed by the following measures:

(a) Clinician-Administered PTSD Scale (CAPS) (Blake *et al*., 1990). This is comprised of 17 DSM III-R PTSD symptoms each assessed according to frequency and intensity over the past week, each symptom rated on a 0–4 scale. The 17 symptoms cluster into three subscales, each rated in regard to frequency and intensity, CAPS-B, Re-experience; CAPS-C, Avoidance; CAPS-D, Arousal.
(b) Montgomery Asberg Depression Rating Scale (MADRS) (Montgomery & Asberg, 1979). This interviewer-rated scale assesses 10 symptoms of depression each rated on a 0–6 scale.
(c) Hamilton Rating Scale for Anxiety (HAM-A) (Hamilton, 1959). This scale incorporates 14 anxiety-related symptoms each rated 0–4.

Self-Report Measures

Patients completed a number of self report measures including:

(a) Impact of Events Scale (IOE) (Horowitz *et al*., 1979). This comprises 15 questions each rated on a 4-point scale and subdivided to provide two ratings of intrusion and avoidance symptomatology.
(b) A self-report version of the SI-PTSD Symptom Checklist (Davidson, Smith, & Kudler, 1989). This comprises 12 self-rated questions assessing the severity of DSM III-R symptoms each on a 0–4 scale. Three subscales can be derived from this measure relating to intrusive, avoidant and hyperarousal symptoms of PTSD.
(c) The Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983). This 14-item measure assesses the presence and frequency of symptoms each on a 4-point scale and provides two subscale scores for anxiety symptoms and depressive symptoms.
(d) The Sheehan Disability Scale (Sheehan, 1986) is a simple measure of social functioning. It assesses disruption to daily lifestyle and comprises three 10-point subscales on which patients self-rate disruption to work, social life, and family or home life.

Procedure

Following initial assessment to establish diagnosis, inclusion/exclusion criteria, plus completion of self-report and assessor measures, patients were randomly allocated to EMDR, 'exposure plus cognitive restructuring' (E + CR) or waiting list control (WL). Randomization was by means of a predetermined schedule unbeknown to the assessors, therapists or patients. Following completion of the entire initial assessment, for those patients who met entry criteria, the blind assessor then opened a sealed envelope that informed as to which group patients were to be allocated. Our aim was to achieve cell sizes of approximately 30 completers per group. However, as the study progressed the drop-out rate for both active treatment groups was considerably higher than that of the WL and consequently the randomization ratio was modified to increase allocation to both EMDR and E + CR groups.

Some studies have suggested that very few sessions of EMDR are necessary to achieve treatment gains (e.g. Shapiro, 1989) while others have suggested that between five and seven sessions of EMDR are required (Boudewyns & Hyer, 1996) and yet others set no limits to the number of EMDR treatment sessions (Marcus *et al*., 1997). Since there is no widely accepted agreement on the number of EMDR treatment sessions required (Shapiro, 1995) it was thought appropriate for the present study that the maximum number of treatment sessions permitted be more in keeping with traditional brief psychotherapy (i.e. 10 sessions) and with previous exposure-based studies for PTSD (e.g. Keane *et al*., 1989). This rationale for determining the number of treatment sessions has been proposed by Carlson *et al*. (1998). However, if as argued in the literature, EMDR is highly effective after only a few treatment sessions, then it would be inappropriate to continue with further treatment appointments following positive treatment outcome. As a pragmatic compromise a maximum number of treatment sessions were determined. Active treatment groups received up to 10 weekly sessions of 90 min duration. EMDR and E + CR groups completed a mid-point assessment at week 5 with their respective therapists and at the end of the 10-week study period completed a final blind assessment. At end of waiting list period patients were offered active treatment and therefore the WL group was not assessed for post-study follow-up.

Treatment

Treatment was conducted by one behavioural psychotherapist who had considerable experience in the treatment approaches offered and by one psychiatric research registrar who, in relation to EMDR, was trained specifically for the research study. Both therapists had received Level I and II training in EMDR by the EMDR Institute. Prior to EMDR training, both therapists had considerable experience in exposure-based strategies, in particular in relation to the Lovell model as used by Marks *et al*. (1998). Each therapist provided both EMDR and E + CR treatment. Treatment sessions were conducted individually and both therapists were supervised by a consultant psychiatrist. A selection of treatment sessions were audio-taped to check for treatment integrity.

EMDR

The eight essential phases of EMDR treatment have been outlined in detail by Shapiro (1995). In brief, incorporated within these components are thorough screening of the patient's presenting picture, including evaluation of dysfunctional behaviours, symptoms and characteristics which need to be addressed and identification of suitable targets for processing. Explanation of treatment rationale and treatment plan entailed the patient and therapist identifying a traumatic memory, formulating a negative belief statement about the traumatic incident and identifying the sensory responses thus aroused, including images, beliefs, emotions and physiological correlates. The patient's attention is directed to an external stimulus while he/she simultaneously concentrates on an identified source of emotional disturbance. External stimuli used included bilateral saccadic eye movements or alternating hand taps. Feedback ratings, using subjective units of discomfort (SUDS) were taken regularly. When distress had sufficiently reduced on the part of the patient negative belief statements were replaced by preferred belief statements and saccadic eye movements or hand taps again induced. The reprocessing procedure was repeated during each treatment session, until the positive statement was rated as believable by the patient. EMDR was structured in accordance with the procedures outlined by Shapiro (1995).

E + CR

Following detailed assessment of the patients' presenting problem individuals were provided with a treatment rationale containing information about symptoms of PTSD and an explanation of the relationship between thoughts, feelings and behaviour. Intervention sessions initially took the form of imaginal exposure which were audio-taped. Therapists facilitated this process by prompting, questioning and encouraging. Patients were provided with audio-tape copies and asked to listen to the recording at least once per day as homework. This replicates procedures used by Foa *et al*. (1991). Latter sessions incorporated *in vivo* exposure where appropriate, plus evaluation and modification of negative thoughts, underlying assumptions and beliefs related to the trauma. E + CR was structured in accordance with a treatment manual for exposure and cognitive restructuring for post-traumatic stress disorder as devised by Lovell (personal communication) and used by Marks *et al*. (1998).

WL

Subjects were informed that they would receive treatment at the end of the waiting list period, when they would be randomly allocated to either EMDR or E + CR. WL patients were provided with a contact telephone number in case of any deterioration or impairment in their overall condition which necessitated urgent and/or immediate therapeutic intervention, however no patient availed themselves of this service.

RESULTS

Of those referred, four failed to attend for initial screening. Of those who attended initial screening, two failed to meet PTSD criteria, two had recently received psychological treatment for PTSD, three had concurrent psychiatric or physical illness or major social problems, and two refused consent. A total of 105 patients met entry criteria and were randomized to groups as follows: 39 to EMDR, 37 to E + CR and 29 to WL. Drop-out rates between these three groups were as follows, 12 (31%) from EMDR, 16 (43%) from E + CR and five (17%) from WL ($\chi^2 = 5.6$, df $= 2$, $p = 0.06$). When comparison was made between the two active treatments alone, of those allocated to EMDR, five dropped out after initial assessment and prior to commencement of treatment, while seven dropped out following commencement of treatment and failed to attend mid-point assessment. Of those allocated to E + CR, six dropped out after initial assessment and prior to

commencement of treatment, while 10 dropped out following commencement of treatment and failed to attend mid-point assessment. No differences existed between EMDR and E + CR groups in the drop-out rates after initial assessment but prior to commencement of treatment ($\chi^2 = 0.6$, df = 1, $p = 0.44$), or following initiation of treatment but prior to mid-point assessment ($\chi^2 = 1.5$, df = 1, $p = 0.22$).

Comparison between the 33 drop-outs and the 72 completers regarding presentation at time of initial assessment produced no significant differences on any of the demographic characteristics or treatment outcome measures with the sole exception of a higher frequency score on the CAPS-C Avoidance subscale for the drop-outs ($t = 2.2$, df = 103, $p < 0.05$).

Subsequent analysis was conducted on the 72 completers. One-way analysis of variance (ANOVA) revealed no significant differences between groups on any of the pre-treatment dependent variables such as severity of PTSD symptoms, and other measures of psychopathology, whether assessor rated or self-rated. Similarly, as illustrated in Table 1 there were no differences between groups with regard to age, length of time since initial trauma, gender, marital status, history of previous psychiatric illness, type of trauma, or prescribed psychotropic medication at time of inclusion in the study. However, it is noteworthy that, for the entire subject group, prescribed psychotropic medication rose from 5.5% at time of trauma to 72.2% at time of inclusion in the study.

Table 1. Demographic characteristics by treatment group

Variable	EMDR $n = 27$	E + CR $n = 21$	WL $n = 24$	Comparison
Age (SD)	38.6 (11.8)	43.2 (11.0)	36.5 (11.6)	$F = 2.0$, df = 2, n.s.
Time since trauma (weeks (SD))	180.0 (321.4)	155.4 (286.9)	259.5 (426.0)	$F = .56$, df = 2, n.s.
Gender				
Male	15	13	14	$\chi^2 = 0.2$, df = 2, n.s.
Female	12	8	10	
Marital status				
Married	20	11	14	$\chi^2 = 7.3$, df = 6 n.s.
Single	4	4	7	
Sep/Wid/Div.	3	6	2	
Previous psychiatric history				
Yes	10	4	6	$\chi^2 = 2.0$, df = 2 n.s.
No	17	17	17	
Type of trauma				
Vehicular passenger	7	5	5	$\chi^2 = 15.7$, df = 14, n.s.
Pedestrian	1	1	3	
Occupational accident	2	5	9	
Physical assault	4	5	4	
Sexual assault	2	1	0	
Traumatic death	3	0	0	
Real/implied physical threat	4	3	2	
Other	4	1	0	
Psychotropic medication				
At time of trauma				
Yes	2	0	2	$\chi^2 = 2.7$, df = 4 n.s.
No	24	21	21	
Unknown	1	0	1	
At time of study				
Yes	19	17	16	$\chi^2 = 1.2$, df = 2, n.s.
No	8	4	8	

Treatment Effects

Analyses were conducted in three separate stages. Because WL were only assessed at two points in time, the first set of analyses involves a series of 2×3 ANOVAS, Time (pre-treatment, post-treatment) $\times$ Group (EMDR, E + CR, WL) with time as the repeated measure. These results provide an indication of 'Treatment Outcome'.

Since it has been claimed that EMDR produces significant treatment gains with fewer appointments and clinical improvement at an earlier stage than conventional exposure treatments, the second set of analyses involves a series of 2×2 ANOVAs, Time (pre-treatment, mid-treatment) $\times$ Group (EMDR, E + CR) with time as the repeated measure. These results provide an indication of any differences in 'Treatment Response Rapidity' between EMDR and E + CR.

The third set of analyses involves assessment of the level of any treatment gains maintained at follow-up. Since the WL group were offered treatment after the waiting list period had elapsed, follow-up results are only presented for the EMDR and E + CR groups.

In a similar manner to that outlined by Foa *et al*. (1991) correlational analyses were conducted on the outcome measures pre-, mid- and post-treatment. As regards the self-assessment measures, SI-PTSD total, avoidance, re-experiencing and arousal were moderately to highly correlated (range 0.22 to 0.97) at different assessment times. Likewise, IOE total, intrusion and avoidance (range 0.21 to 0.93). A wide range of correlations between SI-PTSD and HADS Anxiety and Depression (range 0.35 to 0.91) and between IOE and HADS Anxiety and Depression (range 0.15 to 0.93) were also evident. For the respective assessor rating measures similar correlation ranges existed. Thus because of the wide range of intercorrelations between dependent variables, separate ANOVAs were conducted for each variable. This is also in keeping with the procedure adopted by Marks *et al*. (1998) who also argues that use of separate ANOVAs instead of a MANOVA facilitates comparison between studies.

Treatment Outcome: Self-Report Measures

Table 2 illustrates means and standard deviations for all three treatment groups pre- and post-treatment on all patient self-report measures. Table 3 illustrates the results of a series of 2×3 ANOVAs Time (pre-treatment, post-treatment) $\times$ Group (EMDR, E + CR, WL) with time as the repeated measure plus *post-hoc* Scheffe comparisons. A consistent pattern of results emerge.

IOE Scale

For the IOE total, significant time ($p < 0.001$), interaction ($p < 0.001$) and group ($p < 0.001$) effects emerged with *post-hoc* Scheffe tests revealing end-point difference between EMDR versus WL ($p < 0.001$) and E + CR versus WL ($p < 0.05$). No significant differences between EMDR versus E + CR were evident. Pairwise comparison of pre- and post-changes indicated significant reductions in IOE Total for EMDR ($t = 9.5$, $p < 0.001$) and E + CR ($t = 5.1, p < 0.001$) but no change in WL ($t = 1.9, p = 0.07$).

IOE Intrusion subscale produced significant time ($p < 0.001$), interaction ($p < 0.001$) and group ($p < 0.05$) effects with *post-hoc* Scheffe tests revealing end-point differences between EMDR versus WL ($p < 0.05$). No significant differences between EMDR versus E + CR were shown. Pairwise comparison of pre- and post- changes indicated significant reductions in IOE intrusion scores for EMDR ($t = 9.0, p < 0.001$) and E + CR ($t = 7.7, p < 0.001$) but no change in WL ($t = 1.1, p = 0.27$).

IOE Avoidance subscale similarly produced significant time ($p < 0.001$), interaction ($p < 0.001$) and group ($p < 0.001$) effects with *post-hoc* end-point differences between EMDR versus WL ($p < 0.001$). No differences between E + CR versus WL or between EMDR versus E + CR were apparent. Comparison of pre- post- changes showed reductions in IOE Avoidance scores for EMDR ($t = 8.8, p < 0.001$), E + CR ($t = 3.2, p < 0.05$) and WL ($t = 2.2, p < 0.05$).

SI-PTSD Scale

The SI-PTSD Total revealed significant time ($p < 0.001$), interaction ($p < 0.001$) and group ($p < 0.001$) effects with *post-hoc* Scheffe comparisons revealing end-point differences between EMDR versus WL ($p < 0.001$), and E + CR versus WL ($p < 0.01$). No differences between EMDR versus E + CR occurred. Pairwise comparison indicated pre–post reductions for EMDR ($t = 10.0, p < 0.001$) and E + CR ($t = 5.0, p < 0.001$) groups alone.

SI-PTSD Re-experience subscale produced significant time ($p < 0.001$), interaction ($p < 0.001$) and group ($p < 0.05$) effects. Avoidance and Arousal subscales both produced significant time (all $p < 0.001$) interaction (all $p < 0.001$) and group (all $p < 0.001$) effects. For the SI-PTSD Re-experience subscale, *post-hoc* end-point difference between

Table 2. Means and (SDs) of self-report measures by EMDR ($n = 27$), E + CR ($n = 21$) and WL ($n = 24$) groups at pre-, mid-, post-treatment

Variable	Pre-	Mid-	Post-
IOE total			
EMDR	35.1 (4.4)	24.0 (8.7)	11.8 (12.0)
E + CR	32.7 (5.0)	29.1 (9.2)	19.2 (12.3)
WL	32.6 (6.6)	—	29.6 (8.6)
IOE Intrusion			
EMDR	17.8 (3.0)	13.7 (5.1)	6.2 (6.6)
E + CR	15.8 (3.7)	14.6 (5.3)	8.5 (5.7)
WL	15.4 (4.4)	—	14.3 (5.2)
IOE Avoidance			
EMDR	17.3 (2.6)	10.3 (4.8)	6.0 (6.1)
E + CR	16.9 (3.5)	14.7 (4.6)	10.7 (7.7)
WL	17.3 (3.5)	—	15.3 (5.1)
SI-PTSD Total			
EMDR	50.6 (8.4)	33.4 (14.0)	16.8 (17.2)
E + CR	46.6 (9.9)	41.4 (15.0)	25.9 (17.9)
WL	47.9 (10.0)	—	45.5 (16.1)
SI-PTSD Re-experience			
EMDR	12.2 (3.1)	8.6 (4.5)	3.7 (4.8)
E + CR	11.2 (3.0)	10.8 (4.3)	5.4 (4.8)
WL	10.9 (3.7)	—	9.7 (4.3)
SI-PTSD Avoidance			
EMDR	19.6 (4.3)	11.6 (5.6)	5.7 (6.6)
E + CR	16.7 (6.5)	16.0 (7.5)	10.2 (8.0)
WL	18.3 (4.50)	—	17.8 (7.5)
SI-PTSD Arousal			
EMDR	18.6 (3.6)	13.2 (4.7)	7.5 (6.5)
E + CR	17.5 (3.6)	15.0 (5.8)	10.3 (6.8)
WL	18.2 (4.5)	—	17.5 (5.9)
HADS Anxiety			
EMDR	15.3 (3.0)	12.4 (3.9)	7.7 (5.1)
E + CR	13.5 (2.9)	12.5 (3.3)	9.6 (5.0)
WL	15.4 (3.9)	—	14.2 (4.6)
HADS Depression			
EMDR	11.2 (3.4)	8.9 (4.0)	4.0 (5.0)
E + CR	11.3 (3.7)	10.0 (5.4)	8.6 (5.8)
WL	12.7 (4.5)	—	12.8 (5.6)
Sheehan Total			
EMDR	21.3 (5.4)	20.6 (6.9)	9.2 (10.9)
E + CR	22.8 (6.3)	19.2 (7.7)	15.7 (10.5)
WL	23.3 (4.7)	—	21.7 (6.4)

EMDR versus WL ($p < 0.05$) occurred with no E + CR versus WL or EMDR versus E + CR differences. Pairwise comparisons for the SI-PTSD Re-experience subscale revealed reductions for the EMDR ($t = 8.9, p < 0.001$) and E + CR ($t = 6.3, p < 0.001$) groups alone.

On the SI-PTSD Avoidance subscale *post-hoc* end-point differences for EMDR versus WL ($p < 0.001$) and E + CR versus WL ($p < 0.05$) again emerged with no EMDR versus E + CR difference. Pairwise comparisons for the SI-PTSD Avoidance subscale showed a reduction for the EMDR ($t = 9.4$, $p < 0.001$) and E + CR ($t = 2.9, p < 0.05$) groups alone.

The SI-PTSD Arousal subscale produced *post-hoc* differences for EMDR versus WL ($p < 0.001$) and E + CR versus WL ($p < 0.05$) again with no EMDR versus E + CR differences. Pre–post pairwise SI-PTSD Arousal subscale comparisons produced significant reductions for the EMDR ($t = 8.1, p < 0.001$) and E + CR ($t = 4.9, p < 0.001$) groups alone.

Table 3. Analyses of variance of time (pre-treatment, post-treatment) × group (EMDR, E + CR, WL) for self-report measures with *post-hoc* Scheffe tests

Variable	Time (df 1,71)		Time × group (df 2,71)		Group (df 2,71)		Scheffe
	F	*p* <	*F*	*p* <	*F*	*p* <	
IOE Total	101.3	0.000	21.2	0.000	8.8	0.000	1–3***, 2–3*
IOE Intrusion	106.3	0.000	23.7	0.000	3.8	0.05	1–3*
IOE Avoidance	66.3	0.000	12.8	0.000	11.6	0.000	1–3***
SI-PTSD Total	90.7	0.000	18.0	0.000	9.8	0.000	1–3***, 2–3**
SI-PTSD Re-experience	94.8	0.000	18.0	0.000	3.5	0.000	1–3*
SI-PTSD Avoidance	53.0	0.000	17.8	0.000	8.9	0.000	1–3***, 2–3*
SI-PTSD Arousal	75.0	0.000	18.8	0.000	8.6	0.000	1–3***, 2–3*
HADS Anxiety	68.8	0.000	14.4	0.000	9.4	0.005	1–3**, 2–3*
HADS Depression	41.6	0.000	18.4	0.000	9.3	0.000	1–3***
Sheehan Total	48.4	0.000	9.8	0.000	7.9	0.001	1–3***

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.
Post-hoc Scheffe treatment group comparisons: 1 = EMDR, 2 = E + CR, 3 = WL.
Groups separated by a hyphen differ significantly from each other.

HADS

A similar pattern of results to that shown by IOE and SI-PTSD scores emerged for the HADS-Anxiety scores with significant time ($p < 0.001$), interaction ($p < 0.001$) and group effects ($p < 0.005$), and *post-hoc* difference between EMDR versus WL ($p < 0.001$) and E + CR versus WL ($p < 0.05$) alone. Here again, comparisons between EMDR versus E + CR were not significant. Similarly pre–post reductions on HADS-Anxiety occurred for EMDR ($t = 8.3, p < 0.001$), and E + CR ($t = 4.0, p < 0.001$) groups alone.

The HADS Depression scores produced significant time ($p < 0.001$), interaction ($p < 0.001$) and group ($p < 0.001$) effects with *post-hoc* Scheffe tests revealing end-point differences between EMDR versus WL ($p < 0.001$) alone. Pre–post pairwise comparisons on HADS Depression occurred for EMDR ($t = 8.0, p < 0.001$) and E + CR ($t = 2.8, p < 0.05$) groups alone.

Sheehan Disability Scale

Disruption to work, social life and family/home life caused by PTSD symptoms was reflected in the Sheehan Total scores which revealed significant time ($p < 0.001$), interaction ($p < 0.001$) and group ($p < 0.001$) effects. The only *post-hoc* Scheffe test to achieve significance was between EMDR versus WL ($p < 0.001$) with less disruption apparent in the EMDR group. No difference between EMDR and E + CR emerged. Pre–post pairwise comparisons revealed significant reductions in Sheehan Total scores for EMDR ($t = 7.1, p < 0.001$) and E + CR ($t = 3.1, p < 0.05$) groups.

Treatment Outcome: Assessor-Rated Measures

Table 4 presents means and standard deviations for all three treatment groups pre- and post-treatment on the MADRS and HAM-A. CAPS assessments were not routinely collected on all control group subjects at end of WL period and therefore only the pre-treatment CAPS scores are presented for this group.

Table 5 illustrates the results of 2 × 3 ANOVAs, Time (pre-treatment, post-treatment) × Group (EMDR, E + CR, WL) for MADRS and HAM-A scores. Table 6 gives the results of 2 × 2 ANOVAs, Time (pre-treatment, post-treatment) × Group (EMDR, E + CR) for CAPS scores.

MADRS

With regard to MADRS scores a significant time ($p < 0.001$), interaction ($p < 0.001$) and group effect ($p < 0.001$) and group effect ($p < 0.001$) emerged with *post-hoc* Scheffe tests producing differences between EMDR versus WL ($p < 0.001$) and E + CR versus WL ($p < 0.001$). No difference between EMDR and E + CR existed. Pre–post pairwise comparisons showed significant reduction in depression scores for EMDR ($t = 8.8, p < 0.001$) and E + CR ($t = 4.6, p < 0.001$) but not WL ($t = 0.7, p = 0.5$).

Table 4. Means and (SDs) of assessor-rated measures by EMDR ($n = 27$), E + CR ($n = 21$) and WL ($n = 24$) groups at pre-, mid- and post-treatment

Variable	Pre-	Mid-	Post-
MADRS			
EMDR	26.4 (5.5)	20.8 (6.6)	9.3 (10.1)
E + CR	24.6 (7.8)	23.5 (8.1)	14.8 (9.2)
WL	27.7 (7.9)	—	26.4 (11.7)
HAM-A			
EMDR	26.2 (6.4)	19.6 (4.8)	9.1 (8.4)
E + CR	24.9 (8.0)	22.9 (8.7)	13.1 (9.0)
WL	26.7 (8.1)	—	23.3 (11.3)
CAPS-B (Re-exp). Freq			
EMDR	10.2 (2.8)	—	2.0 (2.8)
E + CR	10.0 (4.0)	—	3.2 (2.7)
WL	9.4 (3.9)	—	—
CAPS-B (Re-exp). Int.			
EMDR	10.6 (2.9)	—	2.0 (2.6)
E + CR	10.5 (3.7)	—	3.8 (3.4)
WL	9.7 (3.9)	—	—
CAPS-C (Avoid) Freq.			
EMDR	16.0 (3.7)	—	3.5 (5.2)
E + CR	15.9 (4.5)	—	6.8 (5.1)
WL	15.6 (4.7)	—	—
CAPS-C (Avoid) Int.			
EMDR	15.9 (3.9)	—	3.2 (4.5)
E + CR	15.7 (4.4)	—	6.3 (5.0)
WL	15.3 (4.2)	—	—
CAPS-D (Arousal) Freq.			
EMDR	17.0 (3.3)	—	5.0 (5.0)
E + CR	16.7 (3.4)	—	6.8 (4.4)
WL	16.9 (3.4)	—	—
CAPS-D (Arousal) Int.			
EMDR	15.8 (2.8)	—	4.9 (4.5)
E + CR	15.7 (3.0)	—	7.1 (4.6)
WL	15.8 (2.7)	—	—

Table 5. Analyses of variance of time (pre-treatment, post-treatment) × group (EMDR, E + CR, WL) for assessor-rated measures with *post-hoc* Scheffe tests

Variable	Time (df 1,71)		Time × group (df 2,71)		Group (df 2,71)		Scheffe
	F	$p <$	F	$p <$	F	$p <$	
MADRS	69.2	0.000	17.4	0.000	10.4	0.000	1.3***, 2–3**
HAM-A	94.5	0.000	13.6	0.000	7.3	0.001	1–3**, 2–3*

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.
Post-hoc Scheffe treatment group comparisons: 1 = EMDR, 2 = E + CR, 3 = WL.
Groups separated by a hyphen differ significantly from each other.

HAM-A

A significant time ($p < 0.001$), interaction ($p < 0.001$) and group ($p < 0.001$) effect existed in relation to HAM-A scores with *post-hoc* Scheffe tests showing differences between EMDR versus WL ($p < 0.001$) and E + CR versus WL ($p < 0.05$), but no difference between EMDR and E + CR. Pre–post pairwise comparisons indicated

Table 6. Analyses of variance of time (pre-treatment, post-treatment) × group (EMDR, E + CR) for assessor-rated measures

Variable	Time (df 1,71)		Time × Group (df 1,72)		Group (df 1,72)	
	F	*p* <	*F*	*p* <	*F*	*p* <
CAPS-B (Re-exp). Freq	179.6	0.000	1.5	n.s.	0.4	n.s.
CAPS-B (Re-exp). Int.	184.5	0.000	3.9	n.s.	1.2	n.s.
CAPS-C (Avoid) Freq.	147.8	0.000	4.3	0.05	1.7	n.s.
CAPS-C (Avoid) Int.	178.4	0.000	4.5	0.05	1.5	n.s.
CAPS-D (Arousal) Freq.	251.4	0.000	2.7	n.s.	0.5	n.s.
CAPS-D (Arousal) Int.	217.1	0.000	2.8	n.s.	1.2	n.s.
CAPS Soc. Functioning	75.4	0.000	10.0	0.05	1.7	n.s.

significant reductions in anxiety scores for EMDR ($t = 8.9, p < 0.001$) and E + CR ($t = 5.7, p < 0.001$) but not WL ($t = 1.9, p = 0.06$).

CAPS

Significant changes across time occurred for both EMDR and E + CR groups with regard to both a reduction in the frequency and intensity of re-experiencing/intrusive symptoms, avoidance and hyperarousal (all $p < 0.001$). Only three interaction effects all ($p < 0.05$) occurred in relation to the frequency of avoidance symptoms, the intensity of re-experiencing/intrusive symptoms and social functioning. There were no between group differences for EMDR versus E + CR in relation to re-experiencing/intrusion, avoidance and hyperarousal. For both EMDR and E + CR pre–post pairwise comparisons revealed significant reductions in all of these PTSD symptom measures (all $p < 0.001$).

On the basis of the above, EMDR is consistently superior to WL on all the aforementioned outcome measures. A slightly different pattern of results exists whereby E + CR is superior to WL only on a subset of outcome measures. Despite this, no significant differences between EMDR versus E + CR emerged. Effect sizes (ES) were therefore calculated by subtracting the mean of the post-treatment control group from the post-treatment experimental groups and then dividing by the standard deviation of the control group at post-treatment (Glass, McGraw, & Smith, 1981). On all outcome measures, including each of the subscales the ES pre–post change was greater for the EMDR than for the E + CR group. For example, on IOE Total (2.1 vs. 1.2), SI-PTSD Total (1.8 vs. 1.2), HADS anxiety (1.4 vs. 1.0), HADS depression (1.6 vs. 0.8), Sheehan Total (1.9 vs. 0.9), MADRS (1.5 vs. 1.0), and HAM-A (1.3 vs. 0.9) for EMDR versus E + CR groups respectively.

Treatment Outcome: Clinical Significance

The foregoing results are described entirely in terms of the statistical significance of change in treatment. It has been argued (Jacobson & Ravenstorf, 1988; Jacobson & Truax, 1991) that statistically significant results may nonetheless have little clinical significance. Jacobson and colleagues argued for further analysis of outcome data in terms of the clinical significance of change and suggested criteria for assessment. Lindsay, Gamsu, McLaughlin, Hood and Espie (1987) stated that the most stringent of these is to assess whether a patient's outcome response falls outside the range of the dysfunctional population by two standard deviations from the pre-treatment mean of that population in the direction of functionality. Tables 7a and 7b illustrate the number of patients achieving these criteria at the end of the treatment period. Table 7a illustrates significant differences on all measures that compare EMDR versus E + CR versus WL with the majority of WL patients failing to show clinically significant change. Comparison between EMDR versus E + CR indicates no differences in the proportion of patients achieving clinically significant change on measures of PTSD symptomatology such as the IOE Total, IOE Intrusion, IOE Avoidance, SI-PTSD Total, SI-PTSD Re-experiencing, SI-PTSD Avoidance and SI-PTSD Arousal. On many of these measures approximately 60% of the EMDR and 50% of the E + CR groups achieved clinically significant change in comparison with less than 10% of the WL group. Thus EMDR and E + CR appear equally clinically effective on measures of self-rated PTSD symptomatology in comparison with WL.

Table 7a. Number and (%) of patients in each group who do or do not achieve clinically significant change at end-point comparing (a) EMDR versus E + CR and (b) EMDR versus E + CR versus WL

Variable	EMDR ($n = 27$)		E + CR ($n = 21$)		χ^2 (df = 1)	$p <$	WL ($n = 24$)		χ^2 (df = 1)	$p <$
	Yes	No	Yes	No			Yes	No		
IOE total	17 (63)	10 (37)	9 (43)	12 (57)	1.9	n.s.	1 (4)	23 (96)	19.1	0.000
IOE Intrusion	18 (67)	9 (33)	10 (48)	11 (52)	1.8	n.s.	2 (8)	22 (92)	18.2	0.000
IOE Avoidance	19 (70)	8 (30)	10 (48)	11 (52)	2.6	n.s.	2 (8)	22 (92)	20.2	0.000
SI-PTSD total	18 (67)	9 (33)	11 (52)	9 (48)	1.0	n.s.	1 (4)	23 (96)	21.8	0.000
SI-PTSD Re-experience	22 (81)	5 (19)	12 (60)	8 (40)	2.6	n.s.	8 (33)	16 (67)	12.2	0.05
SI-PTSD Avoidance	20 (74)	7 (26)	12 (60)	8 (40)	1.0	n.s.	6 (25)	18 (75)	12.8	0.05
SI-PTSD Arousal	16 (59)	11 (41)	7 (35)	13 (65)	2.7	n.s.	1 (4)	23 (96)	17.3	0.000
HADS Anxiety	13 (48)	14 (52)	7 (33)	14 (67)	1.1	n.s.	3 (13)	24 (87)	7.5	0.05
HADS Depression	22 (81)	5 (19)	9 (43)	12 (57)	7.7	0.05	4 (17)	20 (83)	21.8	0.000
Sheehan Disability	19 (70)	8 (30)	8 (38)	13 (62)	5.0	0.05	2 (8)	22 (92)	20.4	0.000
MADRS	21 (78)	6 (22)	11 (52)	10 (48)	3.4	n.s.	4 (17)	20 (83)	19.0	0.000
HAM-A	22 (82)	5 (18)	13 (62)	8 (38)	2.3	n.s.	5 (21)	19 (79)	19.4	0.000

Table 7b. Number and (%) of patients in each group (EMDR versus E + CR) who do or do not achieve clinically significant change at end-point

Variable	EMDR ($n = 25$)		E + CR ($n = 19$)		χ^2(df = 1)	$p <$
	Yes	No	Yes	No		
CAPS-B (Re-exp). Freq	23 (92)	2 (8)	18 (95)	1 (5)	0.1	n.s.
CAPS-B (Re-exp). Int.	23 (92)	2 (8)	14 (74)	5 (26)	2.7	n.s.
CAPS-C (Avoid) Freq.	22 (88)	3 (12)	12 (63)	7 (37)	3.8	n.s.
CAPS-C (Avoid) Int.	22 (88)	3 (12)	15 (79)	4 (21)	0.7	n.s.
CAPS-D (Arousal) Freq.	18 (72)	7 (28)	11 (58)	8 (42)	1.0	n.s.
CAPS-D (Arousal) Int.	16 (64)	9 (36)	8 (42)	11 (58)	2.1	n.s.

Table 7b similarly illustrates no differences between EMDR versus E + CR groups as regards the proportion of patients achieving clinically significant change as measured by the assessor-rated CAPS score. In relation to the EMDR group on the various CAPS subscales between approximately 60 and 90% indicated substantial clinical improvement in comparison

to approximately 45 to 90% of E + CR patients. Thus on both self-report and assessor-rated PTSD measures significant clinical gains are achieved at end of the treatment period for both EMDR and E + CR groups.

In relation to measures of anxiety, both the self-report HADS Anxiety and the assessor-rated HAM-A produced significant differences in the proportions of patients achieving clinical change when comparisons are made between EMDR versus E + CR versus WL. However, this is largely due to approximately 85% of WL patients failing to show any clinically significant change on such measures whereas 62% of E + CR and 82% of EMDR patients achieve such status on the HAM-A, although fewer appear to do so on the HADS-Anxiety (48 and 33% for EMDR and E + CR groups respectively). Nevertheless no differences between the two active treatment groups were apparent on these anxiety measures at treatment outcome.

As regards depression, only 17% of the WL group indicated substantial clinical change, and significant differences between all three groups emerged on the self-report HADS Depression and the assessor-rated MADRS. However with reference to the two measures of depression it is only on one of these measures that significant differences between EMDR and E + CR occurred. On the HADS Depression scale 81% of EMDR patients in comparison with 43% of E + CR patients achieved clinically significant reduction in symptoms ($p < 0.05$). On the MADRS 78% of EMDR patients and 52% of E + CR patients achieved this status (n.s.). The only other measure that differentiated between the EMDR and E + CR groups was the Sheehan Disability Scale with 70 versus 38% respectively, having achieved clinically significant change.

Treatment Response Rapidity

In order to assess whether EMDR, in comparison to E + CR, produced significant treatment gains with fewer appointments and clinical improvement at an earlier stage, a second set of analyses comprising a series of 2 × 2 ANOVAs, Time (pre-treatment, mid-treatment) × Group (EMDR, E + CR) with time as the repeated measure were undertaken. All of the aforementioned self-report and assessor-rated measures were examined. Significant time effects were produced on many of the measures with modest interaction effects on fewer measures. There were no group effects on any of the measures and no differences between EMDR and E + CR at mid-point. However, the mean number of treatment sessions did differ by group, with the EMDR group receiving a mean of 4.2 (SD = 2.5) sessions in comparison to mean 6.4 (SD = 3.2) for the E + CR group ($t = 2.7$, df 46, $p < 0.05$).

Follow-Up Results

EMDR and E + CR patients were re-assessed, on average at 15 months follow-up. Of the 27 EMDR completers, five failed to attend, and 22 attended. Of the 21 E + CR completers four failed to attend, and 17 attended. Follow-up results are presented here for the 22 EMDR and 17 E + CR follow-ups. Table 8 illustrates the proportion of follow-up patients who maintain clinically significant levels of change. Comparison between EMDR and E + CR groups indicates no difference in the proportion of patients maintaining levels of clinically significant change on all measures for PTSD symptomatology, anxiety, and social functioning. The initial clinically significant advantage of EMDR over E + CR at end-point on the HADS Depression and Sheehan Disability Scale appears to have disappeared at follow-up. At follow-up the only apparent difference between EMDR and E + CR groups was in respect to MADRS scores with 73% of EMDR versus 35% of E + CR groups achieving clinically significant change. Overall it appears that end-point treatment gains appear to have been relatively well maintained at follow-up for both groups, on virtually all measures.

Presentation of follow-up results in the above manner may however provide an over-optimistic picture of long-term treatment gains. It has been argued that by reporting treatment maintenance gains only in relation to follow-up attendees the issue of patients requiring subsequent treatment between the end of the study period and the designated follow-up is not adequately addressed (Power *et al.*, 1990; Sharp *et al.*, 1996). To circumvent this difficulty collation of 'unobtrusive measures' at follow-up has been recommended (Bellack & Hersen, 1984). Table 9 illustrates the number of EMDR and E + CR patients who received psychological or psychiatric referral or psychotropic medication during the follow-up period. There was no difference between groups in the proportion of patients who received subsequent treatment ($\chi^2 = 1.10$, df = 1, $p = 0.26$). Given the confounding influence of post-study treatment on status at follow-up, Table 10 also presents clinically significant results for those who are treatment free post-study.

Table 8. Number and (%) of follow-up patients who do or do not achieve clinically significant change for EMDR and E + CR treatment groups

Number of follow-up attenders	EMDR ($n = 22$)		E + CR ($n = 17$)		χ^2 (df=1)	$p <$
	Yes	No	Yes	No		
IOE Total	10 (45)	12 (55)	6 (35)	11 (65)	0.4	n.s.
IOE Intrusion	13 (59)	9 (41)	9 (53)	8 (47)	0.1	n.s.
IOE Avoidance	11 (50)	11 (50)	6 (35)	11 (65)	0.8	n.s.
SI-PTSD Total	12 (57)	9 (43)	7 (41)	10 (41)	1.0	n.s.
SI-PTSD Re-experience	17 (81)	4 (19)	9 (53)	8 (47)	3.4	n.s.
SI-PTSD Avoidance	15 (71)	6 (29)	8 (47)	9 (53)	2.3	n.s.
SI-PTSD Arousal	12 (57)	9 (43)	5 (29)	12 (71)	2.9	n.s.
HADS Anxiety	10 (46)	12 (54)	5 (29)	12 (71)	1.0	n.s.
HADS Depression	16 (73)	6 (27)	9 (53)	8 (47)	1.6	n.s.
Sheehan Disability	15 (68)	7 (32)	7 (44)	9 (56)	2.3	n.s.
MADRS	16 (73)	6 (27)	6 (35)	11 (65)	5.5	0.05
H AM-A	18 (82)	4 (18)	11 (65)	6 (35)	1.5	n.s.

Table 9. Number and (%) of patients attending follow-up receiving post-study psychological, psychiatric, psychotropic treatment

Nos of follow-up attenders	EMDR ($n = 22$)	E + CR ($n = 17$)	χ^2, p(df = 1)
Nos with psychological/psychiatric referral/psychotropic medication	8 (36)	9 (53)	—
Nos with *no* post-study treatment	14 (64)	8 (37)	1.1 (n.s.)

Comparison between EMDR and E + CR again indicates no difference in the proportion of patients maintaining levels of clinically significant change without subsequent treatment during the follow-up period. Overall, the proportion of patients achieving clinically significant change in each group is considerably reduced due to the exclusion of patients who received intervening treatment and those who failed to attend. A consistent pattern is observable, however, in that for both EMDR and E + CR groups, on measures of PTSD symptomatology, anxiety, depression and social functioning, only about 25–50% of patients maintain treatment gains without additional post-study intervention. It therefore appears that, in this study, regardless of the type of treatment offered, the majority of patients, on most measures, do not achieve clinically significant long-term follow-up gains without additional psychological, psychiatric, or psychotropic treatment.

In addition, the PTSD patient group under study exhibited high levels of patient-generated GP consultations with an average, over the 6 months prior to treatment of 8.0 (SD 7.4) appointments for

Table 10. Number and (%) of patients with no subsequent post-study treatment who achieve clinically significant change at follow-up assessment ('Yes') versus those who do not achieve post-study clinically significant change and/or have post-study treatment ('No')

Variable	EMDR ($n = 22$)		E + CR ($n = 17$)		χ^2 (df = 1)	$p <$
	Yes	No	Yes	No		
IOE total	7 (32)	15 (68)	4 (23)	13 (77)	0.3	n.s.
IOE Intrusion	9 (41)	13 (59)	5 (29)	12 (71)	0.6	n.s.
IOE Avoidance	7 (32)	15 (68)	4 (23)	13 (77)	0.3	n.s.
SI-PTSD Total	9 (43)	12 (57)	5 (29)	12 (71)	0.7	n.s.
SI-PTSD Re-experience	12 (57)	9 (43)	5 (29)	12 (71)	2.9	n.s.
SI-PTSD Avoidance	10 (48)	11 (52)	5 (29)	12 (71)	1.3	n.s.
SI-PTSD Arousal	8 (38)	13 (62)	3 (18)	14 (82)	1.9	n.s.
HADS Anxiety	7 (32)	15 (68)	3 (18)	14 (82)	0.05	n.s.
HADS Depression	12 (55)	10 (45)	5 (29)	12 (71)	2.5	n.s.
Sheehan Disability	11 (50)	11 (50)	4 (23)	13 (77)	2.4	n.s.
MADRS	11 (50)	11 (50)	4 (23)	13 (77)	2.8	n.s.
HAM-A	12 (55)	10 (45)	7 (41)	10 (59)	0.7	n.s.

the EMDR group and 5.8 (SD 3.2) for the E + CR group. No significant differences existed in the frequency of patient-generated GP consultations between groups either in the 6 months prior to treatment or in the 6 months post-treatment, with the frequency of consultations in the 6 months post-treatment remaining high at an average of 5.0 (SD 4.4) for the EMDR group and 4.8 (SD 4.2) for the E + CR group. However, comparison of the patient-generated GP attendance rate for the two 6-month periods (pre versus post) did indicate a reduction for the EMDR group alone ($p < 0.05$).

DISCUSSION

The present study attempted to compare EMDR with its nearest rival, exposure plus cognitive restructuring. In so doing a range of self-report and assessor-rated measures were utilized to cover the range of PTSD symptomatology and possible co-morbid features of anxiety and depression. Analysis of the data attempted to cover the issue of change over treatment time and degree of clinically significant change at end of the treatment phase and at follow-up.

With regard to PTSD symptomatology an interesting pattern of results emerged. EMDR and E + CR were both effective in comparison to WL on IOE Total, and on SI-PTSD Total, Avoidance and Arousal scores. EMDR alone was effective in comparison to WL on IOE Intrusion and Avoidance and on SI-PTSD Re-experience. Furthermore on CAPS Re-experience, Avoidance and Arousal scores both EMDR and E + CR groups showed equally significant treatment gains. On all of the above measures there was no significant difference between experimental groups although ESs for EMDR were consistently superior to that of E + CR. Thus the superiority of EMDR over E + CR, on measure of PTSD symptomatology, was primarily shown in relation to WL comparisons with less discernible differences occurring when direct comparisons between experimental groups were undertaken. In relation to PTSD, it has previously been noted by Vaughan *et al*. (1994) that lack of demonstrable superiority of any one treatment over another may be due to small sample sizes in

each condition, for example, number of subjects per treatment 12 to 13 (Jensen, 1994); 11 to 13 (Vaughan *et al*., 1994). However the present study had treatment completer cell sizes of 21 to 27 which is at least equivalent to those of Marks *et al*. (1998) who had treatment completer cell sizes of 18 to 20 when comparing the efficacy of prolonged exposure versus cognitive restructuring versus prolonged exposure plus cognitive restructuring versus relaxation in the treatment of PTSD. In addition Foa *et al*. (1991) reported significant differences between stress inoculation training versus prolonged exposure versus prolonged exposure versus supportive counselling versus waiting list in the treatment of PTSD with cell sizes of 10 to 14. One might therefore argue that in the present study, the failure to find consistent differences between EMDR versus E + CR on measures of PTSD symptomatology is unlikely to be attributable to inadequate cell size.

In relation to the remaining treatment outcome measures it was only at the end of the treatment phase, on measures of clinically significant change, that differences between EMDR versus E + CR emerged and here only on measures of self-reported depression and social functioning. Imaginal and *in vivo* exposure for PTSD has been shown to lead to concurrent reductions in depression (Richards *et al*., 1994) and EMDR has also been associated with alleviation of depressive symptoms (Vaughan *et al*., 1994). Given the speculative nature regarding the theoretical basis of EMDR it is difficult to explain why EMDR might be superior to E + CR in reducing depression scores. In the present study the majority of patients were receiving concurrent medication, invariably antidepressants, but the extent of prescription between groups did not differ. However, the study used a large number of treatment outcome measures thus increasing the chance of significant between-group differences occurring randomly. It is with this caveat that results must be interpreted, additionally noting the lack of significant differences between EMDR and E + CR groups at follow-up on measures of self-reported depression and social functioning. Indeed, the only difference on measures of clinically significant change at follow-up, in favour of EMDR over E + CR, appeared in relation to assessor-rated levels of depression.

Since Shapiro's (1989) early claims of a 100% success rate with a single EMDR treatment session, there has been little agreement on the 'appropriate' number of sessions with some authors offering between five and seven (Boudewyns & Hyer, 1996). While the present study offered a maximum of 10 treatment sessions the average number received for EMDR was 4.2 and 6.4 for E + CR. This significant difference in the number of treatment sessions might be taken as an argument for the enhanced cost-effectiveness of EMDR over exposure-based treatments. However, it should also be noted that E + CR was successfully practised with fewer sessions than the 10 sessions offered by Marks *et al*. (1998) or the 14 to 16 sessions utilized by Keane *et al*. (1989). The present study therefore suggests that EMDR requires considerably more treatment sessions than initially suggested and that exposure-based treatments may be effective with considerably fewer sessions than routinely expected. Unfortunately in the present study there were no pre-determined and standardized criteria by which treatment sessions were terminated following a 'successful' response. Rather the decision not to offer further treatment following a positive outcome was based on the clinical judgement of the respective therapists. Thus arguments in favour of superior cost-effectiveness of any one treatment over another should be regarded cautiously.

Many studies have noted the high attrition rate in PTSD studies, the exception being inpatient programmes (e.g. Boudewyns *et al*., 1990). The Marks *et al*. (1998) study had a large number of PTSD-diagnosed patients incorporated in a randomized controlled trial. In this study 109 patients met entry criteria, of whom 22 refused treatment and 10 dropped out, leaving a completers sample of 77 distributed between four treatment groups. Of the 77 completers, 25 failed to complete 9 months follow-up, many of whom were characterized by high levels of depression at trial entry (Marks *et al*., 1998). In the present study there was a significantly larger proportion of EMDR and E + CR patients who dropped out during treatment in comparison to WL controls. The only feature that distinguished drop-outs from completers was a higher frequency score on the CAPS-C Avoidance subscale for those who failed to complete treatment. It may therefore be that those with high levels of avoidance of stimuli associated with the trauma are less likely to tolerate treatment approaches, whether EMDR or E + CR, that entail some degree of confrontation with the traumatic image or situation. High drop-out rates are a major problem of exposure-based therapies, especially those that adopt sustained exposure techniques. EMDR may be preferred by patients since exposure comes in short bursts rather than being sustained.

Although the present study consisted of a relatively large sample of PTSD patients treated in

a randomly controlled trial, the study also had a high drop-out rate with 33 out of 105 patients (30.4%) failing to complete the initial treatment phase. Thus, exposure-based outpatient treatments for a heterogeneous group of PTSD patients with a wide variety of traumas may be less well tolerated than suggested by some of the earlier studies that incorporated arguably more homogeneous groups such as inpatient Vietnam veterans.

Marcus *et al*. (1997) argued that EMDR was more effective than standard care (which included a variety of psychotherapies, psychotropics and group treatments) for the treatment of PTSD and concomitant anxiety and depression symptoms. On the basis of such results these authors suggested that EMDR might be effective for other anxiety disorders and depression. However the present study suggests that the alleviation of concomitant anxiety and depressive symptoms in PTSD is not unique to EMDR but can also be achieved by E + CR. Foa *et al*. (1991) have also illustrated reduction in anxiety and depression scores in PTSD rape victims when treated by stress inoculation training, prolonged exposure, supportive counselling, or simply assessed and placed on a waiting list. Foa *et al*. (1991) interpret such findings as suggesting that 'mere contact with a therapist is sufficient to ameliorate non-specific distress' (p. 722). Whilst we would concur with such sentiments it is noteworthy that in our research there were no marked changes in the presenting profile of WL patients as regards anxiety and depression. An alternative explanation might be that effectively treating PTSD symptoms leads to a concurrent reduction in anxiety and depression scores over and above that due to mere therapist contact and assessment alone.

When considering the findings of the present study a number of methodological inadequacies should be borne in mind. Not all assessments were carried out by 'blind' assessors. However, assessment at entry, end-point and follow-up were conducted by 'blind' assessors. Only the mid-point assessment was completed unblind. A considerable proportion of patients were on concurrent psychotropic medication although this was equally true for EMDR, E + CR and WL groups, the latter of which failed to show any substantial improvement. Thus improvements achieved by the EMDR and E + CR groups are unlikely to be attributed solely to pharmacological treatment. Unfortunately, the study did not employ any biochemical assessments of levels of prescribed psychotropics and it is therefore not possible to assess whether psychotropic compliance affected the results. Pre-determined standardized criteria of withdrawal due to treatment efficacy prior to the maximum of 10 therapy sessions was not adhered to. Rather, withdrawal due to treatment efficacy, prior to the maximum of 10 sessions was determined on a practical basis when therapist and patient were both of the opinion that further treatment gains were unlikely. There was no formalized assessment of patient compliance with between session exposure homework requirements. Of the two therapists, one was more experienced in EMDR than the other. Notwithstanding such limitations, the present research has attempted to improve upon the many methodological inadequacies associated with many previous studies in this field.

The use of strict criteria for follow-up clinical significance, namely no prescribed psychotropics and/or referral to psychology or psychiatry, served to reduce the apparent effectiveness of both treatments. However, it has been argued that this is preferable to the procedure wherein post-study treatments are not given sufficient attention (Sharp & Power, 1997). Follow-up results were also affected by lack of information available for patients who defaulted on follow-up appointments. The question of maintenance of treatment gains is of considerable clinical relevance given the high level of co-morbidity among PTSD patients, the current dearth of studies with long-term follow-up data and the apparent heavy demands on primary care resources both prior to and following treatment. The considerable treatment gains, initially achieved, appear to be well-maintained at long-term follow-up, but a substantial proportion of patients only maintain this level of clinical improvement if additional psychological, psychiatric and/or psychotropic treatment is available. For many of the patients presenting with PTSD a high level of health service usage arises following the trauma and appears to continue after treatment. In summary, the present study suggests that both EMDR and E + CR are effective in the treatment of PTSD, albeit with fewer EMDR treatment sessions.

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