Cognitive Behavioral Therapy versus Eye Movement Desensitization and Reprocessing in Patients with Posttraumatic Stress Disorder: Systematic Review and Meta-analysis of Randomized Clinical Trials

Ali M. Khan  
*The University of Texas Rio Grande Valley*

Sabrina Dar

Rizwan A. Ahmed

Ramya Bachu

Mahwish Adnan

See next page for additional authors

Follow this and additional works at: https://scholarworks.utrgv.edu/som_pub

Part of the Medicine and Health Sciences Commons

Recommended Citation


This Article is brought to you for free and open access by the School of Medicine at ScholarWorks @ UTRGV. It has been accepted for inclusion in School of Medicine Publications and Presentations by an authorized administrator of ScholarWorks @ UTRGV. For more information, please contact justin.white@utrgv.edu, william.flores01@utrgv.edu.
Cognitive Behavioral Therapy versus Eye Movement Desensitization and Reprocessing in Patients with Post-traumatic Stress Disorder: Systematic Review and Meta-analysis of Randomized Clinical Trials

Ali M. Khan 1, Sabrina Dar 2, Rizwan Ahmed 3, Ramya Bachu 4, Mahwish Adnan 5, Vijaya Padma Kotapati 6


☐ Corresponding author: Vijaya Padma Kotapati, padmakotapati89@gmail.com
Disclosures can be found in Additional Information at the end of the article

Abstract

Background
Post-traumatic stress disorder (PTSD) is prevalent in children, adolescents and adults. It can occur alone or in comorbidity with other disorders. A broad range of psychotherapies such as cognitive behavioral therapy (CBT) and eye movement desensitization and reprocessing (EMDR) have been developed for the treatment of PTSD.

Aim
Through quantitative meta-analysis, we aimed to compare the efficacy of CBT and EMDR: (i) relieving the post-traumatic symptoms, and (ii) alleviating anxiety and depression, in patients with PTSD.

Methods
We systematically searched EMBASE, Medline and Cochrane central register of controlled trials (CENTRAL) for articles published between 1999 and December 2017. Randomized clinical trials (RCTs) that compare CBT and EMDR in PTSD patients were included for quantitative meta-analysis using RevMan Version 5.

Results
Fourteen studies out of 714 were finally eligible. Meta-analysis of 11 studies \( (n = 547) \) showed that EMDR is better than CBT in reducing post-traumatic symptoms \( [SDM (95\% CI) = -0.43 (-0.73 - -0.12), p = 0.006] \). However, meta-analysis of four studies \( (n = 186) \) at three-month follow-up revealed no statistically significant difference \( [SDM (95\% CI) = -0.21 (-0.50 - 0.08), p = 0.15] \). The EMDR was also better than CBT in reducing anxiety \( [SDM (95\% CI) = -0.71 (-1.21 - -0.21), p = 0.005] \). Unfortunately, there was no difference between CBT and EMDR in reducing depression \( [SDM (95\% CI) = -0.21 (-0.44 - 0.02), p = 0.08] \).
Conclusion

The results of this meta-analysis suggested that EMDR is better than CBT in reducing post-traumatic symptoms and anxiety. However, there was no difference reported in reducing depression. Large population randomized trials with longer follow-up are recommended to build conclusive evidence.

Introduction

The definition of post-traumatic stress disorder (PTSD) has evolved over time and available criteria differ in many ways. According to the diagnostic and statistical manual of mental disorders (DSM-V), a traumatic event is defined as the exposure to actual or threatened death, serious injury or sexual violation and leading to re-experiencing, avoidance, negative cognitions and mood, and arousal [1]. But the ICD-10 Diagnostic Criteria for Research (ICD-10-DCR) only nominates events that lead to the distress of individuals [2]. The main variance between those two criteria is, the number of symptoms and duration of persistence. In addition, the DSM-V criteria require symptom persistence for more than a month whereas ICD-10-DCR necessitates symptom persistence for more than six months. The PTSD can occur due to natural or human events; natural incidents include natural calamity, accidents, assault, terrorist attacks, and war, while the human events include sexual assault, sudden death, kidnapping, serious illness and disaster [3].

Few studies have reported a comparison of occurrence of traumatic events among different countries. A comparison of 16 countries found Netherlands, Colombia and the USA had the highest rates of trauma exposure while the lowest rates of exposure were found in Italy, Romania and Spain [4]. However, not all people who exposed to trauma develop PTSD. Moreover, the risk of developing PTSD varies among different sections of the population. Population sections that are at a higher risk of developing PTSD are females, those lacking social support, economically marginalized, and the younger at time of exposure [5]. A survey of participants aged between 15 and 54 years in the United States found more than 60% of males and more than half of the females had experienced a traumatic event [6].

In the United States, the prevalence of PTSD has been estimated to be 8.3% [7]. Differences in prevalence of PTSD have documented in intentional and non-intentional trauma. Exposure to an intentional traumatic event increased the prevalence of PTSD over time while exposure to non-intentional events led to a decline in PTSD prevalence over time. In about 60% of individuals, traumatic symptoms resolve over time without any intervention. In case those patients developed PTSD, therapeutic options include psychotherapies and pharmacotherapies. Available psychotherapies are prolonged exposure, cognitive behaviour therapy (CBT) and eye movement desensitization and reprocessing (EMDR), while available pharmacotherapies are selective serotonin reuptake inhibitors (SSRI) [8].

The effectiveness of CBT in treating PTSD has been documented in many studies [9, 10]. In addition, the CBT has shown to be effective at reducing PTSD scores in PTSD associated with other conditions such as depression and anxiety. Similarly, the EMDR is one of the best remedies of PTSD as per World Health Organization (WHO) and there is a mounting number of studies reporting the effectiveness of EMDR in treating PTSD [11, 12]. EMDR has proved to be an effective treatment for reducing negative emotions and arousal. Additionally, the recent trials have established that EMDR has an effective role in reducing anxiety and depression in
PTSD patients [5, 13].

Several recent meta-analyses have compared the efficacy of CBT and EMDR among children, adolescents and adults. A meta-analysis of 11 trials found that EMDR was slightly better than CBT in decreasing post-traumatic symptoms [14]. While another meta-analysis reported that EMDR and CBT were efficacious in reducing post-traumatic symptoms and depression but the reduction in depression was not statistically significant [15]. In contrast, the study by Seidler and Wagner did not find either EMDR or CBT to be superior at reducing post-traumatic symptoms [11]. Due to the contradictory results, we aimed to conduct an updated systematic review and meta-analysis to compare the efficacy of EMDR versus PTSD in reducing post-traumatic symptoms, anxiety, and depression.

**Materials And Methods**

**Methods**

This systematic review and meta-analysis is carried out in accordance with guidelines issued by Preferred Reporting for Systematic Reviews and Meta-analyses (PRISMA).

**Literature search**

Our systematic searching was limited to articles published between 1999 and December 2017. The process of identifying relevant articles began by searching for EMBASE, Medline and Cochrane Central Register of Controlled Trials. A manual search of the references list of included articles was conducted to identify any articles not retrieved by the database searches.

**Inclusion and exclusion criteria**

Only studies that met the following criteria were included in this meta-analysis: (1) study participants were children, adolescents or adults; (2) studies published in the English language; (3) studies that reported comparative results from randomized controlled trials of CBT and EMDR groups; (4) studies that reported a diagnosis of PTSD in accordance to DSM-V or DSM-IV or DSM-III; (4) studies that reported adequate data for calculation of design effect. The exclusion criteria were: (1) studies reporting treatment methodologies focused on conditions other than PTSD, such as depression, bipolar disorder, behavioral problems, substance abuse, psychosis, suicidal ideation, and substance dependence; (2) studies reporting other types of psychotherapies such as psychodynamic therapy, hypnotherapy, self-help, and biofeedback.

**Search**

The key terms used in the searching process met the guidelines of Medical Subject Heading Terms. The key words were: post-traumatic stress disorder, "PTSD", eye movement desensitization and reprocessing, "EMDR", Cognitive Behavioral Therapy, "CBT". The Boolean connector AND was used to form different combinations of the keyword, see Table 1.
### TABLE 1: Number of articles retrieved.


<table>
<thead>
<tr>
<th>Key term</th>
<th>Number of articles in MEDLINE</th>
<th>Number of articles in EMBASE</th>
<th>Number of articles in Cochrane CENTRAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-traumatic stress disorder AND EMDR and reprocessing AND CBT</td>
<td>35</td>
<td>29</td>
<td>2</td>
</tr>
<tr>
<td>PTSD AND EMDR AND CBT</td>
<td>36</td>
<td>46</td>
<td>8</td>
</tr>
<tr>
<td>PTSD AND eye movement desensitisation and reprocessing AND CBT</td>
<td>35</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>PTSD AND eye movement desensitisation and reprocessing AND Cognitive Behavioral Therapy</td>
<td>110</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Post-traumatic stress disorder AND eye movement desensitisation and reprocessing AND Cognitive Behavioral Therapy</td>
<td>106</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Post-traumatic stress disorder AND eye movement desensitisation and reprocessing AND CBT</td>
<td>34</td>
<td>20</td>
<td>2</td>
</tr>
</tbody>
</table>

### Study selection

All articles identified from all the databases were imported into one Endnote library where all duplicates were removed. The unique study titles and abstracts were screened through two independent reviewers, to check if they met inclusion criteria. Studies that met the inclusion criteria were fully reviewed by a third contributor "Ramya Bachu", to check if they reported the required data. Studies that did not report the required data were excluded.

### Data extraction

Data extraction was carried out by two reviewers "Ali Khan" and "Padma Kotapati". A third author "Ramya Bachu" compared the data to identify any inconsistencies. Any discrepancies were resolved through consultation among all authors, which ensured accurate data extraction process. For each included article, the means, standard deviations and p values of pre-treatment, post-treatment and follow-up were extracted. Post-traumatic symptoms were measured using the PTSD reaction index (PTSD-RI), children’s response to trauma index (CRTI), child report of post-traumatic symptoms (CROPS), clinician-administered PTSD scale child/adolescent version (CAPS-CA), clinician-administered PTSD scale (CAPS), and structured interview for PTSD (SI-PTSD). Anxiety was measured using hospital anxiety and depression scale (HADS), multidimensional anxiety scale for children (MASC), state-trait anxiety inventory (STAI), and revised children’s anxiety and depression scale (RCADS-C). Depression was measured using the Beck depression index (BDI). Other extracted variables were: age, gender, CBT variants, treatment fidelity, comorbidity, co-interventions, study duration, year of publication, and methodological characteristics useful in assessing study bias.
Results

Literature search

The number of articles found in each database through using of various key terms is shown in Table 1. Of all screened papers, 14 articles were finally eligible for meta-analysis. The flow diagram of studies’ selection is shown in Figure 1.

FIGURE 1: Selection of studies.

Baseline characters

The characteristics of included studies are shown in Table 2. The variants of CBT used were Imaginal Exposure (IE), Trauma Treatment Protocol (TTP), Prolonged exposure (PE), Trauma-Focused Cognitive Behavioral Therapy (TF-CBT), Stress Inoculation Training with Prolonged Exposure (SITPE), Exposure plus cognitive restructuring (E + CR), and brief eclectic psychotherapy. Some patients had comorbidities in two studies by van den Berg (2015) and de Roos (2017). Nine studies used “intent to treat” to minimize the impact of participants who dropped out. Eight studies used treatment fidelity to ensure adherence to the treatment protocol.
<table>
<thead>
<tr>
<th>Study</th>
<th>Variants of CBT</th>
<th>Trauma type</th>
<th>Clinician-rated measures</th>
<th>Self-rated measures</th>
<th>Mean age (years)</th>
<th>Males/Females</th>
<th>Months post</th>
<th>Intention-to-treat (ITT) analysis</th>
<th>Treatment fidelity check</th>
<th>Comorbidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arabia et al., 2011 [13]</td>
<td>Imaginal Exposure</td>
<td>N/A</td>
<td>IES-R, STAI, BDI</td>
<td></td>
<td>63.48</td>
<td>28/14</td>
<td>6</td>
<td>Yes</td>
<td>Yes</td>
<td>Not reported</td>
</tr>
<tr>
<td>De Roos et al., 2011 [16]</td>
<td>Imaginal Exposure</td>
<td>N/A</td>
<td>PTSD-RI, CROPS, PROPS, BDS, MASC, CBCL</td>
<td></td>
<td>10.1</td>
<td>29/23</td>
<td>3</td>
<td>Yes</td>
<td>No</td>
<td>Not reported</td>
</tr>
<tr>
<td>Devilly et al., 1999 [17]</td>
<td>Trauma Treatment Protocol</td>
<td>Mixed</td>
<td>STAI-Y2, BDI, SCL-90-R, SUD, PPD, CMS, IES, PSS-SR, CEQ, DEV5-T</td>
<td></td>
<td>37.96</td>
<td>8/15</td>
<td>3</td>
<td>No</td>
<td>Yes</td>
<td>Not reported</td>
</tr>
<tr>
<td>Ironson et al., 2002 [18]</td>
<td>Prolonged Exposure</td>
<td>Mixed</td>
<td>PSS-SR, BDI, DES, SUD</td>
<td></td>
<td>5/17</td>
<td>3</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Not reported</td>
</tr>
<tr>
<td>Jaberghaderi et al., 2004 [19]</td>
<td>Trauma Focused-CBT</td>
<td>Sexual assault</td>
<td>CROPS, PROPS</td>
<td></td>
<td>12.5</td>
<td>0/14</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Not reported</td>
</tr>
<tr>
<td>Dishle et al., 2015 [3]</td>
<td>Stress Inoculation Training and Prolonged Exposure</td>
<td>Mixed</td>
<td>CAPS-CA</td>
<td></td>
<td>12.9</td>
<td>18/30</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Not reported</td>
</tr>
<tr>
<td>Lee et al., 2002 [20]</td>
<td>Stress Inoculation</td>
<td>Mixed</td>
<td>SI-PTSD, MMPI-K, IES, BDI</td>
<td></td>
<td>34.0</td>
<td>13/11</td>
<td>3</td>
<td>No</td>
<td>Yes</td>
<td>Not reported</td>
</tr>
<tr>
<td>Power et al., 2002 [21]</td>
<td>Exposure + Cognitive Restructuring</td>
<td>Mixed</td>
<td>CAPS, MADRS, HAM-A</td>
<td></td>
<td>40.9</td>
<td>42/30</td>
<td>15</td>
<td>No</td>
<td>No</td>
<td>Not reported</td>
</tr>
<tr>
<td>De Roos et al., 2017 [22]</td>
<td>Prolonged Exposure</td>
<td>Mixed</td>
<td>ADIS-C/P</td>
<td></td>
<td>13.06</td>
<td>44/59</td>
<td>12</td>
<td>Yes</td>
<td>Yes</td>
<td>Anxiety disorders</td>
</tr>
<tr>
<td>Rothbaum et al., 2005 [12]</td>
<td>Prolonged Exposure</td>
<td>Sexual assault</td>
<td>CAPS, SLESQ, SCID non-patient version</td>
<td></td>
<td>33.8</td>
<td>0/90</td>
<td>6</td>
<td>Yes</td>
<td>No</td>
<td>Not reported</td>
</tr>
<tr>
<td>Taylor et al., 2003 [23]</td>
<td>Exposure</td>
<td>Mixed</td>
<td>CAPS</td>
<td></td>
<td>37</td>
<td>15/45</td>
<td>3</td>
<td>Yes</td>
<td>No</td>
<td>Not reported</td>
</tr>
<tr>
<td>Nijdam et al., 2012 [24]</td>
<td>Brief eclectic psychotherapy</td>
<td>N/A</td>
<td>IES-R, SI-PTSD, SCID-I, HADS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Not reported</td>
</tr>
<tr>
<td>Capezzani et al., 2013 [25]</td>
<td>Brief eclectic psychotherapy</td>
<td>N/A</td>
<td>CAPS</td>
<td>BDI, STAI-Y, QPF-R, IES-R</td>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td>No</td>
<td>Not reported</td>
</tr>
<tr>
<td>Van den Berg et al., 2015</td>
<td>Prolonged Exposure</td>
<td>Mixed</td>
<td>CAPS</td>
<td>PSS-SR, PTCI</td>
<td>41.2</td>
<td>84/71</td>
<td>6</td>
<td>Yes</td>
<td>Yes</td>
<td>Psychotic disorder</td>
</tr>
</tbody>
</table>

**TABLE 2: Characteristics of included studies.**

N/A: Not applicable; PTSD: Post-traumatic stress disorder; CAPS: Clinician-administered PTSD Scale; PTSD-RI: PTSD-reaction index.
Quality assessment

All studies were assessed for risk of bias through the Cochrane tool. The risk of bias was defined as low, medium, high, and unclear. All studies reported random sequence allocation. There was a high risk of bias in four studies regarding blinding of the outcome. Only four studies reported allocation concealment. Detailed risk of bias assessment is shown in Table 3.

<table>
<thead>
<tr>
<th>Domain</th>
<th>Allocation concealment</th>
<th>Blinding of outcome assessment</th>
<th>Incomplete outcome data</th>
<th>Selective reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study</td>
<td>Judgment</td>
<td>Support for judgment</td>
<td>Judgment</td>
<td>Support for judgment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Judgment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Support for judgment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Support for judgment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Support for judgment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Support for judgment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Support for judgment</td>
</tr>
<tr>
<td>Arabia et al., 2011 [13]</td>
<td>Unclear</td>
<td>Not reported</td>
<td>Unclear</td>
<td>Not reported</td>
</tr>
<tr>
<td>De Roos et al., 2011 [16]</td>
<td>Unclear</td>
<td>Not reported</td>
<td>Low risk</td>
<td>Assessor was blinded to treatment conditions</td>
</tr>
<tr>
<td>Devilly and Spence, 1999 [17]</td>
<td>Unclear</td>
<td>Not reported</td>
<td>Unclear</td>
<td>Not reported</td>
</tr>
</tbody>
</table>

Crite: Children's response to trauma index; CROPS: Child report of post-traumatic symptoms; PROPS: Parent report of post-traumatic stress symptoms; CAPS-CA: Clinician-administered PTSD scale child/adolescent version; SI-PTSD: Structured interview for PTSD; HADS: Hospital anxiety and depression scale; MASC: Multidimensional anxiety scale for children; STAI: State-trait anxiety inventory; RCADS-C: Revised children's anxiety and depression scale; BDS: Backward digit span; CBCL: Child behavior checklist; STAI-Y2: State-Trait Anxiety Inventory-Y2 Trait Form; SUD: Substance use disorder; CMS: The Mississippi Scale for Civilian PTSD; PSS-SR: PTSD symptom scale self-report version; CEQ: Combat experiences questionnaire; DEVS-T: Distress evaluation scale for treatment; DES: Dissociative experiences scale; CRIES 13: Children's revised impact of event scale; RCADS: Revised child anxiety and depression scale; IOE: Impact of events scale; HADS: Hospital anxiety and depression score; CRTI: Children's response to trauma inventory; C-PTCI: Children's post-traumatic cognitions inventory; RCADS-C/P: Revised children's anxiety and depression scale-child/parent version; SDO-A/P: Strengths and difficulties questionnaire; CSI-C/P: Coping strategies inventory-Child/Parent; DES II: Dissociative experiences scale-II; OPF-R: The psychophysiological questionnaire-brief version; SCL-90 = R: Symptom checklist-90-Revised; SLESQ: Stressful life events screening questionnaire; SCID: Structured clinical interview for DSM-5; ADIS-C/P: Anxiety disorder interview schedule for DSM-IV: Child and parent interview schedule; MADRS: Montgomery Åsberg depression rating scale; MMPI-K: Minnesota multiphasic personality inventory-K scale; TF-CBT: Trauma-focused cognitive behavioral therapy; HAM-A: Hamilton anxiety rating scale; CAPS-CA: Clinician-administered PTSD scale based upon DSM-5; PPD: Postpartum depression.
<table>
<thead>
<tr>
<th>Study</th>
<th>Blinding of Assessors</th>
<th>Blinding of Treatment Conditions</th>
<th>Dropouts</th>
<th>Measures Reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ironson et al., 2002 [18]</td>
<td>Unclear</td>
<td>High risk</td>
<td>Three participants in PE dropped out and there was no drop out in EMDR</td>
<td>Low risk</td>
</tr>
<tr>
<td>Jaberghaderi et al., 2004 [19]</td>
<td>Unclear</td>
<td>Low risk</td>
<td>One participant in EMDR and one participant in CBT dropped out. This was a low drop out</td>
<td>Low risk</td>
</tr>
<tr>
<td>Diehle et al., 2015 [3]</td>
<td>Low risk</td>
<td>Low risk</td>
<td>12 participants lost to follow up. ITT and imputation were used to handle missing observations</td>
<td>Low risk</td>
</tr>
<tr>
<td>Lee et al., 2002 [20]</td>
<td>Unclear</td>
<td>High risk</td>
<td>One participant from SITPE and one participant from EMDR dropped out. This was a minimal drop out</td>
<td>Low risk</td>
</tr>
<tr>
<td>Power et al., 2002 [21]</td>
<td>Low risk</td>
<td>Medium risk</td>
<td>12 participants in EMDR dropped out, 16 in E+CR and five in WL. Impact of dropped participants not clear</td>
<td>Low risk</td>
</tr>
<tr>
<td>De Roos et al., 2017 [22]</td>
<td>Low risk</td>
<td>Low risk</td>
<td>Independent assessors were blinded to treatment</td>
<td>Low risk</td>
</tr>
<tr>
<td>Rothbaum et al., 2005 [12]</td>
<td>Unclear</td>
<td>Low risk</td>
<td>12 participants dropped out of the study. PE = 3, EMDR = 5, WAIT = 4. ITT did not provide different results.</td>
<td>Low risk</td>
</tr>
<tr>
<td>Taylor et al., 2003 [23]</td>
<td>Unclear</td>
<td>Low risk</td>
<td>Five patients in EMDR and seven patients in PE dropped out.</td>
<td>Not reported</td>
</tr>
<tr>
<td>Nijdam et al., 2012 [24]</td>
<td>Low risk</td>
<td>Low risk</td>
<td>20 participants in EMDR and 25 participants in brief eclectic therapy</td>
<td>Not reported</td>
</tr>
</tbody>
</table>
Meta-analysis of post-traumatic symptoms post-treatment

Pooling 11 studies in a meta-analysis, the EMDR was better than CBT in reducing post-traumatic symptoms [SDM (95% CI) = -0.43 (-0.73 – -0.12)]. The results were statistically significant (p = 0.006); however, the studies included in this quantitative meta-analysis had a high level of heterogeneity (I² = 62%) mentioned in Figure 2. Also, a funnel plot of publication bias did not show any asymmetry and no bias among included studies mentioned in Figure 3.


EMDR: Eye movement desensitization and reprocessing; CBT: Cognitive behavioral therapy.
Meta-analysis of PTSD symptoms at three months follow-up

At three months follow-up, the meta-analysis of four studies showed that EMDR was not better than CBT in reducing post-traumatic symptoms \(\text{SDM (95% CI)} = -0.21 (-0.50 - 0.08), p = 0.15\) mentioned in Figure 4. Also, a funnel plot of publication bias of this meta-analysis did not show any asymmetry and no bias among included studies in Figure 5.

**FIGURE 4:** Meta-analysis of PTSD symptoms at three months follow-up.

FIGURE 5: Funnel plot of meta-analysis of PTSD symptoms at three months follow-up.

PTSD: Post-traumatic stress disorder.

Meta-analysis of anxiety post-treatment

The meta-analysis of five studies including 239 patients revealed that EMDR is better than CBT in reducing anxiety symptoms [SDM (95% CI) = -0.71 (-1.21 – -0.21)]. The result was statistically significant (p = 0.005) but there was marked heterogeneity between included studies (I² = 70%) in Figure 6. Of note, there was no evidence of publication bias in the included studies in Figure 7.


EMDR: Eye movement desensitization and reprocessing; CBT: Cognitive behavioral therapy.
Meta-analysis of depression post-treatment

The meta-analysis of depression symptoms was based on eight studies. The meta-analysis showed that EMDR was not better than CBT in reducing depression [SDM (95% CI) = -0.21 (-0.44 – 0.02), p = 0.08]. Also, the included studies had a high incidence of heterogeneity (I² = 70%). These results are shown in Figure 8. Of note, there was no evidence of publication bias in the included studies in Figure 9.


EMDR: Eye movement desensitization and reprocessing; CBT: Cognitive behavioral therapy.
Meta-analysis of depression at three months follow-up

Meta-analysis of three studies at three months follow-up showed that EMDR was not superior to CBT in reducing depression symptoms [SDM (95% CI) = 0.04 (-0.38 – 0.46), p = 0.86]. Also, the included studies had a high incidence of heterogeneity (I² = 58%) in Figure 10. No evidence of publication as shown in the funnel plot in Figure 11.

**FIGURE 9:** Funnel plot of meta-analysis of depression post-treatment.

**FIGURE 10:** Meta-analysis of depression at three months follow-up.

EMDR: Eye movement desensitization and reprocessing; CBT: Cognitive behavioral therapy.
Discussion

The objectives of this meta-analysis were to compare the efficacy of EMDR and CBT in alleviating post-traumatic symptoms, anxiety and depression. The key result of this meta-analysis is, participants treated with EMDR had better alleviation of post-traumatic symptoms as compared to participants treated with CBT ($p = 0.006$). However, the superiority of EMDR at three months follow-up was not evident. The EMDR also had a statistically significant superiority over CBT ($p = 0.005$) in alleviating anxiety. Although EMDR was observed to be better than CBT in reducing depression, this difference was not statistically significant.

These findings have similarities and differences with the findings of other meta-analyses comparing EMDR and CBT. A meta-analysis by Moreno-Alcazar et al. found that EMDR was better than CBT in reducing post-traumatic symptoms among children and adolescents ($p = 0.013$) [27]. However, the difference detected by Moreno-Alcazar et al., $d = -0.49$, was higher than the difference between EMDR and CBT regarding reducing post-traumatic symptoms detected in the current meta-analysis. Similarly, a study by Chen et al. showed that EMDR was better than CBT in alleviating post-traumatic symptoms ($p = 0.05$) [28]. The difference found by Chen et al. was exactly the same as the difference determined in the current analysis, but the current analysis had stronger evidence of statistical significance. Also, the current analysis had lower heterogeneity ($I^2 = 62\%$) as compared to a meta-analysis by Chen et al. ($I^2 = 70\%$). In the current analysis, EMDR was found to be better than CBT post-treatment; however, the study by Seidler and Wagner did not detect any superiority [11]. This difference could probably be attributed to the inclusion of more randomized trials in our recent meta-analysis compared to their study conducted in 2006. Nevertheless, at three months follow-up, the findings of the current meta-analysis were consistent with the findings of Seidler and Wagner.

The results of the meta-analysis by Lee and Ho (2012) and Davidson and Parker (2001) found inconsistent results with the current meta-analysis on the efficacy of EMDR and CBT [29, 30]. Their meta-analysis did not find a significant difference between EMDR and CBT ($p = 0.085$) in alleviating post-traumatic symptoms while the current meta-analysis found a statistically significant difference. It is noteworthy mentioning that the Davidson and Parker (2001), Seidler and Wagner (2006), and Lee and Ho (2012) only included studies that have been published up to 2006. While our study aimed to investigate studies published before and after 2006, which will remain an important advantage of our meta-analysis compared to previous studies [30,11,29].
Our meta-analysis declared no difference between CBT and EMDR post-treatment in alleviating depression, which is incompatible with the findings of Seidler and Wagner (2001) who found that EMDR was better than CBT in reducing depression symptoms. Of note, the meta-analysis by Seidler and Wagner included seven studies while the current analysis meta-analyzed eight studies. Additionally, in agreement with the findings of Seidler and Wagner (2001), the meta-analysis by Ho and Lee (2012) found that the EMDR was better than TF-CBT in alleviating depression. In contrast, the concept that no difference between EMDR and CBT in alleviating depression was consistent with the findings of Moreno-Alcazar et al. (2012) who did not find a statistically significant difference.

Regarding reducing anxiety, the current meta-analysis reported that EMDR was better than CBT in alleviating anxiety, which is consistent with the findings of Moreno-Alcazar et al. (2017) who also found a statistically significant difference.

When translating the findings of this meta-analysis into clinical practice, there are several limitations that need to be considered. For instance, there are few numbers of included participants in the analyzed randomized trials. We also searched only three major databases; however, we considered the manual searching to cover more articles. The subgroup meta-analysis of post-traumatic symptoms and depression at three months follow-up, comprised a few number of analyzed studies. Our inferences must be interpreted cautiously due to the presence of bias in more than one domain of included trials. We also did not conduct meta-regression of various variables such as age and sex due to a small number of included studies. Future large-scale randomized trials are warranted with longer follow-up periods and adherence to well-designed protocols.

**Conclusions**

The results of this meta-analysis suggested that EMDR is better than CBT in reducing post-traumatic symptoms and anxiety. However, there was no difference reported in reducing depression. Large population randomized trials with longer follow-up are recommended to build conclusive evidence.

**Additional Information**

**Disclosures**

**Human subjects:** All authors have confirmed that this study did not involve human participants or tissue. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

**References**

Incident trauma: a multicenter randomized clinical trial

Comparison of eye movement desensitization and reprocessing therapy, cognitive behavioral restructuring versus waiting list in the treatment of posttraumatic stress disorder following single-incident trauma: a multicenter randomized clinical trial.


