Eye movement desensitization and reprocessing for depression: a systematic review and meta-analysis

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ABSTRACT

Background: In recent years, eye movement desensitization and reprocessing (EMDR) has been applied to different psychiatric conditions beyond post-traumatic stress disorder (PTSD), and an increasing number of studies have evaluated its effect on depression. To date, no quantitative synthesis of the efficacy of EMDR on depression has been conducted.

Objective: To meta-analytically review the studies on EMDR for depression as the primary target for treatment.

Method: Studies with a controlled design evaluating the effect of EMDR on depression were searched on six electronic databases (PubMed, Embase, CINAHL, PsycINFO, Cochrane database, and Francine Shapiro Library) and then selected by two independent reviewers. A systematic review and meta-analysis was conducted.

Results: Eleven studies were included for qualitative synthesis. Nine studies were included in the meta-analysis, involving 373 participants. The overall effect size of EMDR for depressive symptoms is large (n = 9, Hedges’ g = −1.07; 95%CI [−1.66; −0.48]), with high heterogeneity (I² = 84%), and corresponds to a ‘number needed to treat’ of 1.8. At follow-up (range 3–6 months), the effect remains significant but moderate (n = 3, Hedges’ g = −0.62; 95%CI [−0.97; −0.28]; I² = 0%). The effect of EMDR compared with active controls is also moderate (n = 7, g = −0.68; 95%CI [−0.92; −0.43]; I² = 31%). No publication bias was found, although the results are limited by the small number and poor methodological quality of the included studies.

Conclusions: Review findings suggest that EMDR may be considered an effective treatment for improving symptoms of depression, with effects comparable to other active treatments. However, findings need to be interpreted in light of the limited number of the studies and their quality. Further research is required to understand the longer-term effects of EMDR in treating depression and preventing depression relapse.

Protocol registration: PROSPERO (CRD42018090086).

Desensibilización y reprocesamiento por movimientos oculares para la depresión: una revisión sistemática y meta-análisis

Antecedentes: En los últimos años, la desensibilización y reprocesamiento por movimientos oculares (EMDR) se ha aplicado a diferentes condiciones psiquiátricas más allá del trastorno de estrés postraumático (TEPT), y un número creciente de estudios han evaluado su efecto en la depresión. Hasta la fecha, no se ha realizado ninguna síntesis cuantitativa de la eficacia de la EMDR en la depresión.

Objetivo: Revisar meta-analíticamente los estudios de EMDR para la depresión como objetivo principal del tratamiento.

Método: Se buscaron estudios con un diseño controlado que evaluaran el efecto de la EMDR en la depresión en seis bases de datos electrónicas (PubMed, Embase, CINAHL, PsycINFO, base de datos Cochrane y Francine Shapiro Library) y luego fueron seleccionados por dos revisores independientes. Se realizó una revisión sistemática y un metaanálisis.

Resultados: Se incluyeron once estudios para la síntesis cualitativa. Se incluyeron nueve estudios en el metaanálisis, con 373 participantes. El tamaño del efecto global de la EMDR para los síntomas depresivos es grande (n = 9, g de Hedges = −1.07; IC del 95% [−1.66; −0.48]), con alta heterogeneidad (I² = 84%), y corresponde a un ‘número necesario a tratar’ de 1,8. En el seguimiento (rango 3-6 meses), el efecto sigue siendo significativo pero moderado (n = 3, g de Hedges = −0.62; IC del 95% [−0.97; −0.28]; I² = 0%). El efecto del EMDR en comparación con los controles activos también es moderado (n = 7, g = −0.68; IC del 95% [−0.92; −0.43]; I² = 0%). No se encontró ningún sesgo de publicación, aunque los

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Supplemental data for this article can be accessed here.

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resultados están limitados por el pequeño número y la pobre calidad metodológica de los estudios incluidos.

**Conclusiones:** Los resultados de la revisión sugieren que la EMDR puede considerarse un tratamiento eficaz para mejorar los síntomas de la depresión, con efectos comparables a los de otros tratamientos activos. Sin embargo, los hallazgos deben interpretarse a la luz del número limitado de los estudios y su calidad. Se requiere investigación adicional para comprender los efectos a largo plazo de la EMDR en el tratamiento de la depresión y la prevención de la recidiva de la depresión.

**Registro del protocolo:** PROSPERO (CRD42018090086).

### 1. Introducción

La depresión es widespread en el mundo con una prevalencia que rages between 2.6% (among males in the Western Pacific Region) and 5.9% (among females in the African Regions), with a peak in late adulthood and a higher rate for women than for men (World Health Organization, 2017). This disease impacts on people’s quality of life and functioning. In this regard, in 2017 the World Health Organization identified depression as one of the major causes of reduced life years due to mortality and disability (James et al., 2018). According to the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5), depression assumes clinical relevance when it leads to significant distress or impairment in social, occupational, or other important areas of functioning and meets the diagnostic criteria for an episode of major depressive disorder (American Psychiatric Association, 2013).

El tratamiento de la depresión ha evolucionado en los últimos años y existen diversas opciones terapéuticas que combinan farmacología y psicoterapia (National Institute for Health and Care Excellence, 2009, 2018). Sin embargo, menos de la tercera parte de los tratados (Johnston, Powell, Anderson, Szabo, & Cline, 2019) demuestra un positivo respuesta a la terapia (i.e. reduction in depressive symptoms) y, aunque la introducción de la terapia cognitivo-conductual (CBT) ha permitido un doble de la respuesta de los pacientes (Hofmann et al., 2014), la recuperación a los 1 y 2 años permanece alta al 29% y 54%, respectivamente (Vittengl, Clark, Dunn, & Jarrett, 2007).

### 2. Introducción a la EMDR

Entre los principales factores de riesgo para la depresión, eventos traumáticos desempeñan un papel crucial. Esto parece especialmente evidente cuando se considera que los pacientes psiquiátricos muestran una prevalencia de eventos traumáticos de 89.9% en comparación con 50% para la población general (Schalinski et al., 2016). La relación causal entre eventos traumáticos y el desarrollo de la depresión es compleja y aún no se ha completado. Sin embargo, el impacto de los eventos traumáticos se ve mediado por un individuo’s epigenetic, immunological, endocrine (Caldji et al., 1998; Huot, Plotsky, Lenox, & McNamara, 2002; Ladd et al., 2000; Liu, 1997; Meaney et al., 1996; Plotsky & Meaney, 1993), neurobiological (Andersen et al., 2008; Davey, Yücel, & Allen, 2008; Ernst, Pine, & Hardin, 2006) y psicológicas modificaciones (Alldao, Nolen-Hoeksema, & Schweizer, 2010a; Courtney, Kushwaha, & Johnson, 2008; Crow, Cross, Powers, & Bradley, 2014; Maciejewski & Mazure, 2006; Wright, Crawford, & Del Castillo, 2009). Exposición a eventos adversos durante el desarrollo y la vejez no es solo un factor significativo en la depresión, sino que también influye en el curso, la evolución, y la respuesta a los tratamientos. Además, esta exposición ha sido identificada como uno de los principales factores en la recuperación, la persistencia, y la resistencia al tratamiento de la depresión (Nanni, Uher, & Danese, 2012; Nelson, Klumparendt, Doeblier, & Ehring, 2017). Además, se ha demostrado que la exposición aumenta la sensibilidad del trastorno al tratamiento de la terapia, lo que en estos casos es más efectivo que la terapia farmacológica (Nemeroff et al., 2003). Relying on these...
findings, some authors proposed considering trauma-associated depression as a particular subtype, which would require a different approach compared to the traditional one proposed by the guidelines (Minelli et al., 2019; Nanni et al., 2012; Nelson et al., 2017; Paterniti, Sterner, Caldwell, & Bisserbe, 2017).

Eye movement desensitization and reprocessing (EMDR) is a first-choice therapy in post-traumatic stress disorder (PTSD) and is based on the adaptive information processing (AIP) model proposed by Shapiro (Shapiro, 2018). Such a model proposes the influence of dysfunctional memories that have not been completely processed underlying various psychiatric disorders (such as PTSD, mood disorders, chronic pain, and drug addiction). These memories could be triggered by internal or external stimuli, thus assuming an intrusive nature and accompanying appearance of PTSD symptoms and other disorders (Hase et al., 2018). According to Barry and collaborators (Barry, Naus & Rehm, 2006), dysfunctional memories are characterized by a lack of ‘memory awareness’ as a consequence of their incomplete processing. EMDR therapy targets this lack of awareness by reprocessing such pathogenic memories with the use of alternate bilateral stimulations (e.g. eye movements), thus enabling their transformation and integration into already existing semantic links (Hase, Balmaceda, Ostacoli, Liebermann, & Hofmann, 2017; Solomon & Shapiro, 2008).

Recently, a specific EMDR therapy protocol for the treatment of depressive disorders (DeprEND®) has been published (Hofmann et al., 2016). Research findings have shown that EMDR could contribute to a significant reduction of depressive symptoms associated with PTSD when compared to waitlist/usual care or non-trauma-focused CBT. However, these findings are supported by very low-quality evidence (Bisson, Roberts, Andrew, Cooper, & Lewis, 2013; Cuijpers, van Veen, Sijbrandij, Yoder, & Cristea, 2020).

Moreover, in recent years EMDR has been applied to the treatment of psychiatric disorders beyond PTSD, such as depression, although it is not currently recommended by the guidelines (Cuijpers et al., 2020; Valiente-Gómez et al., 2017). Therefore, it is essential to determine whether EMDR is an evidence-based treatment for depression.

Previous reviews addressing this topic have been published (Carletto et al., 2017; Malandrone, Carletto, Hase, Hofmann, & Ostacoli, 2019; Wood & Ricketts, 2013), suggesting the potentiality of EMDR for depression but also highlighting the paucity of methodologically sound studies conducted until then. As other studies have been conducted in recent years, including some randomized controlled trials (RCTs), the present systematic review and meta-analysis aims to update and add a quantitative analysis on the efficacy of EMDR for the treatment of depression.

2. Methods

2.1. Protocol registration

The review protocol was registered in the PROSPERO repository (CRD42018090086). The original protocol recorded on PROSPERO has undergone some variations. In particular, the search has been updated and the meta-analysis focused on depression considered as a primary diagnosis and outcome.

The systematic review and meta-analysis was carried out following the PRISMA statement and the PRISMA checklist (Moher, Liberati, Tetzlaff, & Altman, 2010) and it was drafted following the Cochrane Handbook Guidelines (Higgins et al., 2019).

2.2. Search strategy for identification of studies

Searches were conducted in the following databases on 30 September 2020: PubMed, Embase, CINAHL, PsycINFO and the Cochrane Central Register of Controlled Trials. Moreover, we performed a search with the keyword ‘depress’ in the Francine Shapiro Library, which is an online compendium of conference presentations, scholarly articles, and other important grey literature related to EMDR. From selected studies, cross-references were checked manually (see Supplementary Material S1 for details of the search strategy).

2.3. Eligibility criteria

2.3.1. Design

We included studies with a controlled trial design, either randomized or not. No year or language restrictions were applied.

2.3.2. Population

Trials included patients of any age with depression as a primary diagnosis and primary outcome of the study. Depression is defined as either major depressive disorder or depressive symptoms (above or below a predefined cut-off on the questionnaires employed in each study). There was no restriction by concurrent organic disease.

2.3.3. Intervention and comparison

We included studies that evaluated EMDR intervention alone or in addition to another treatment in comparison with no intervention, waiting list, treatment as usual, or other types of intervention (e.g. antidepressant medication, CBT, psychodynamic therapy).

2.3.4. Outcome

We included studies with depression as a primary outcome. Studies were supposed to include quantitative data on depressive scores, as measured by standardized
psychometric scales, before and after the intervention/s. Finally, in order to be included in the meta-analysis, studies also had to provide enough data to calculate effect sizes.

2.4. Data collection and analysis

2.4.1. Study selection and appraisal

Two authors (S.C. and F.M.) independently conducted standardized assessments to determine study eligibility according to the inclusion criteria. They screened the abstracts and then retrieved and analysed the full texts for all material deemed relevant. Any disagreement was discussed with a third author (L.O.) before agreement was reached.

2.4.2. Data extraction

Data from the selected studies were inserted into a standard template by two independent researchers (S.C. and F.M.). Extracted data covered publication year, publication type, language, study design, population, primary diagnosis, sample size (for both experimental and control groups), duration and type of intervention, duration and type of comparator, depression measure and length of follow-up. Article authors were contacted via email for missing information.

2.4.3. Risk of bias in individual studies

The internal validity of the RCTs was assessed using Version 2 of the Cochrane risk-of-bias tool for randomized trials (RoB 2) (Sterne et al., 2019), which consists of five domains (randomization process, deviations from intended interventions, missing outcome data, measurement of the outcome, selection of the reported result) and a categorization of the overall risk of bias. Risk of bias of controlled studies was assessed using the MINORS scale (Slim et al., 2003; Zeng et al., 2015). For all included studies, quality was also assessed using the platinum standard (PS) (Hertlein & Ricci, 2004), which was specifically designed to evaluate effectiveness in EMDR research. Assessment of the risk of bias was made by two independent coders (S.C. and F.M.) and any disagreements were discussed and resolved with a third reviewer (L.O.).

2.4.4. Summary measures

For each study, the mean change from baseline (post-score – baseline score) was computed. Because the included studies used different scales for measuring depression, effect sizes were computed as the standardized mean difference based on Hedges’ g method (Hedges & Olkin, 1985). Moreover, as the correlation coefficient between the post- and baseline scores is needed for computing the standard error, the value of 0.7 was assigned, as suggested by Rosenthal (1991).

The DerSimonian and Laird random-effects model was used to pool estimates across studies (DerSimonian & Laird, 1986). Average effect size and 95% confidence interval (95%CI) were computed using the Jackson method. The number needed to treat (NNT) was calculated with the formulae provided by Kraemer and Kupfer (2006). To estimate heterogeneity between studies, Cochran’s Q test and the Higgins I² statistic were used. Similarly, subgroup analyses were carried out using random-effects models by considering the risk of bias. The extent to which different treatment doses affect the effect size was examined by applying a univariate meta-regression. To identify influential studies that resulted in variation, a sensitivity analysis was carried out using GOSH (graphical display of study heterogeneity) plots, which fit the same meta-analysis model for all the possible study combinations and look for specific patterns by performing clustering with k-means, DBSCAN (density-based spatial clustering of applications with noise) and Gaussian mixed models (Olkin, Dahabreh, & Trikalinos, 2012).

Publication bias was examined by visual inspection of funnel plots and using Egger’s test (Egger, Smith, Schneider, & Minder, 1997). Analyses were carried out using R version 3.6.1 (R Development Core Team, 2019).

3. Results

3.1. Study selection and study characteristics

The PRISMA flowchart describing the selection process, including reasons for exclusion, is presented in Figure 1. The search retrieved 11 studies: 10 articles on adult patients and one on adolescents (Table 1). Meta-analysis included 9 studies, as two studies (Lei & Zhen-Ying, 2007; Tang et al., 2015) was excluded due to there being no usable data for calculating the effect sizes.

The meta-analysis involved 373 participants, with 177 allocated to EMDR treatment and 196 controls. Ten studies were published in journals and one was a PhD dissertation thesis. All except one were in English. The first published study dates back to 2007 and the last in 2020. Regarding the study design, eight studies were RCTs and three were controlled studies (CS). None of the studies included patients with a PTSD diagnosis. The presence of traumatic experiences was considered as an inclusion criterion in only one of the studies (Minelli et al., 2019), whereas in the other studies it was assessed among other variables. Concerning the use of medication, one study considered it to be an exclusion criterion, one study reported no information, and nine studies chose to keep stable or not exclude the use of antidepressants. In five studies, the efficacy of EMDR was investigated as an add-on to other
psychotherapies, medications, or psychoeducation, and six studies compared EMDR as a stand-alone treatment. When EMDR was investigated as a stand-alone treatment, two studies compared EMDR with a waiting list/no treatment control group, whereas four studies compared EMDR with an active control. Among the latter, all studies compared EMDR with CBT. The average amount of EMDR therapy administered is 16.97 hours (SD = 16.53) and the average amount of control treatment is 19.08 hours (SD = 15.94). Although six studies planned a follow-up evaluation, only four studies provided data for including in the meta-analysis.

3.2. Risk of bias within studies

The risk of bias for each study is reported in Table 2 and Figure S2. Eight RCTs were assessed with RoB 2. The quality of the included studies was not optimal: the overall risk of bias was rated as low in only 22.2% of the studies. The major issues identified were related to deviation from the intended intervention, in particular the lack of intention-to-treat analysis and inadequate reporting of allocation concealment.

The three controlled studies showed a high risk of bias, mainly related to missing methodological information. Quality assessment according to the PS is reported in Supplementary Material S3. The total PS score for each study ranged from 6.5 to 11.5 (maximum of 13), with a mean of 8.73 (SD = 1.63). Almost all studies were judged to have clearly defined target symptoms, reliable and valid measures and used a control or comparison group. Moreover, almost all studies reported the level of therapist(s) training and applied a manualized, replicable, specific EMDR treatment. The lowest PS scores are mainly related to not reporting information regarding the assessors’ training, effect size and level of treatment adherence. Finally, in only two studies was the treatment length 11 or more sessions, which is considered the threshold to achieve an effect according to the PS guidelines (Hertlein & Ricci, 2004). Overall, the PS scores were largely consistent with the judgement of risk of bias provided by RoB 2/MINORS.

3.3. Synthesis of results

The forest plot of the overall effect of EMDR is reported in Figure 2. EMDR results in a large significant effect on depressive symptoms (n = 9, Hedges’ g = −1.07; 95%CI [−1.66, −0.48]), with high heterogeneity (I² = 84%). The effect size corresponds to an NNT of 1.8. Exclusion of one outlier
| Study | Type | Language | Design | Population | Primary diagnosis measure | Depression measure | Medications | Comparison | BMDR sessions | Control sessions | Follow-up | Main results |
|-------|------|----------|--------|------------|---------------------------|-------------------|-------------|------------|---------------|----------------|-----------|-------------|
| Behnammoohdaram et al. (2015) | Published article | English | RCT | Patients with myocardial infarction | BDI (>17) | BDI | No | EMDR (n = 30 vs. TAU (n = 30) Group CBT+individual BMDR (n = 16) vs. group CBT + individual assertiveness training (n = 17) vs. group CBT alone (n = 16) | 3 (45-90 min per session) 3 (90 min) | 3 | 6 and 12 weeks | EMDR+TAU |
| Dominguez et al. (2014) | Published article | English | RCT | Patients with depressive disorder | DSM-5 | DASS-21 depressive scale | Yes | EMDR+TAU > TAU (45–90 minutes) | 6/8 (1 hour weekly) 5.6 (SD = 2.4) individual and 7.6 (SD = 4.5) group + 4.6 (SD = 2.4) | No intervention | No | Post-treatment Group CBT + EMDR = group CBT + assertiveness training = group CBT alone Follow-up Group CBT+EMDR > group CBT + assertiveness training Group CBT+EMDR > group CBT alone | EMDR+TAU |
| Gauther (2016) | Published article | English | RCT | Patients with MDD | DSM-IV-TR | BDI-II | No (exclusion criteria) | EMDR+TAU (n = 14) vs. TAU (n = 16) | 8.5 of BDI (60 min) | No intervention | No | EMDR+TAU > TAU |
| Hase et al. (2015) | Published article | English | CS | Adult in-patients with mild-to-moderate depressive episode | SCL-90-R depression scale (ICD-10) | SCL-90-R; BDI | 9 in BMDR and 10 in control group were on antidepressant medication at time of admission | EMDR+TAU versus TAU (psychoeducational group, n = 16) | 4.48 of CBT + 2.31 of EMDR | 4 | 3 months but no data | CBT+EMDR+CBT |
| Hase et al. (2018) | Published article | English | RCT | Patients with depression | BDI-II (>12) (ICD-10) F32.x and F33.x | SCL-90-R; BDI-III | Yes | EMDR+TAU versus TAU (psychoeducational group, n = 16) | 42.11 CBT | No | EMDR+TAU > TAU |
| Hofmann et al. (2014) | Published article | English | CS | Patients with unipolar primary depression MDD or another depressive disorder such as dysthymia or adjustment disorder with depressed mood | SCID-6; BDII | BDII | Yes | EMDR+TAU (n = 21) vs. | No | CBT+EMDR+CBT |
| Hogan et al. (2009) | Dissertation thesis | English | RCT | Patients with depression | SCL-90-R | BDII | No (exclusion criteria) | EMDR+TAU > TAU (n = 15) | No | EMDR+TAU > TAU |
| Lei & Zhen-Ying (2007) | Published article | Chinese | RCT | Patients with depression | HDRS-17; CGI-3; CCMD-3 | HDRS | Yes | Sertraline (n = 32) vs. | 6 | Only medication | No | Sertraline + EMDR = sertraline |
| Mindli et al. (2019) | Published article | English | RCT | In-patients with TRD with at least three traumatic experiences. | SCID-I | BDII; MADRS | Yes | EMDR (n = 12) vs. TFCBT (n = 10) | 24 | 3 months | Post-treatment EMDR = TFCBT Follow-up EMDR-TFCBT = CBT |
| Ostacoli et al. (2018) | Published article | English | RCT | Patients with recurrent depressive episodes | MINI-Plus; BDII (scores >13) | BDII | Yes | EMDR+TAU (n = 40) vs. TFCBT (n = 42) | 14.6 | 6 months | EMDR+TAU > TAU |
| Tang et al. (2015) | Published article | English | CS | Taiwanese adolescents who experienced Typhoon Morakot diagnosed with MDD and suicide risk | Mandarin-Chinese version of the CES-D | CES-D | Yes | EMDR+TAU (n = 40) vs. TAU-pyschoeducation (n = 42) | 4 (60, 40, 40, 40 minutes) | Weekly group psychoeducation session | No | EMDR+TAU |

BDI-II = Beck Depression Inventory, Version II; CBT = cognitive behavioural therapy; CCMD-3 = Chinese Classification of Mental Disorders, Version 3; CES-D = Center for Epidemiological Studies Depression Scale; CGI = Clinical Global Impression Scale; CT = controlled study; DASS-21 = Depression Anxiety Stress Scale, 21 items; DSM-IV and –5 = Diagnostic and Statistical Manual of Mental Disorders (Editions IV and 5); EMDR = eye movement desensitization and reprocessing; HDRS = Hamilton Depression Rating Scale; ICD-10 = International Classification of Diseases, 10th Edition; MADRS = Montgomery–Asberg Depression Rating Scale; MDD = major depressive disorder; MINI-Plus = Mini International Neuropsychiatric Interview-Plus; ND = not defined/not reported; RCT = randomized controlled trial; SCID-I = Structured Clinical Interview for DSM-IV Axis I Disorders; SCL-90-R = Symptom Checklist 90-Revised; SD = standard deviation; TAU = treatment as usual; TFCBT = trauma-focused cognitive behavioural therapy; TRD = treatment-resistant depression; WL = waiting list.
### Table 2. Risk of bias.

| RCT            | Study                  | Randomization process | Deviations from intended interventions | Missing outcome data | Measurement of the outcome | Selection of the reported result | RoB 2 overall bias |
|----------------|------------------------|-----------------------|----------------------------------------|---------------------|-----------------------------|----------------------------------|--------------------|
| Behnammoghadam et al. (2015) | Low                    | Low                   | Low                                    | Some concerns       | High                         | High                             | High               |
| Dominguez et al. (2020)          | Low                    | Low                   | Low                                    | Low                 | Low                         | Low                              | Low               |
| Hase et al. (2016)               | Some concerns          | Some concerns         | Low                                    | Low                 | Some concerns               | Some concerns                    | Some concerns      |
| Hogan et al. (2021)              | High                   | Some concerns         | Low                                    | Low                 | Some concerns               | High                             | High               |
| Liu & Zhen-Ying (2007)           | Some concerns          | High                  | Low                                    | Low                 | High                         | Same concerns                    | Same concerns      |
| Gauhar (2016)                    | Some concerns          | High                  | High                                    | Some concerns       | High                         | Same concerns                    | High               |
| Minelli et al. (2019)            | Some concerns          | Some concerns         | Low                                    | Low                 | Low                         | Some concerns                    | Some concerns      |
| Ostacoli et al. (2018)           | Low                    | Low                   | Low                                    | Low                 | Low                         | Low                              | Low               |

Randomized controlled trials (RCTs) were evaluated with the Cochrane risk-of-bias tool for randomized trials (RoB 2). The proposed judgement about the risk of bias arising from each domain is generated by an algorithm and is expressed as low, high or some concerns. Controlled studies were evaluated using the MINORS scale, with items scored as: 0, not reported; 1, reported but inadequate; 2, reported and adequate. The global ideal score is 16 for non-comparative studies and 24 for comparative studies. Low risk of bias was considered for studies fulfilling all the MINORS criteria with a score of 2; ‘some concerns’ was rated when studies were judged to raise some concerns in at least one domain but judged not to be at high risk of bias for any domain; and high risk of bias was applied to all other studies.
resulted in a smaller but still moderately significant effect size for post-treatment ($n = 8; g = -0.75; 95\% CI [-0.99, -0.50], NNT = 2.5$; forest plot S5), with low heterogeneity ($I^2 = 2\%$). At follow-up, the effect is still significant ($n = 3; g = -0.62; 95\%CI [-0.97, -0.28];$ forest plot S6) with no heterogeneity ($I^2 = 0\%$). As can be seen in Figure 3, low-quality studies showed a higher effect size than those of high quality. Considering only the latter, EMDR showed a moderate effect ($n = 2; g = -0.75; 95\% CI [-1.13, -0.37]) with no heterogeneity ($I^2 = 0\%;$ Figure 3). The effect of EMDR was compared with an active control group in seven studies, showing a moderate effect ($n = 7; g = -0.68; 95\%CI [-0.92, -0.43];$ forest plot S7) with no heterogeneity ($I^2 = 0\%$). In three studies, EMDR was compared to CBT, resulting in a still significant moderate effect size ($n = 3; g = -0.68; 95\%CI [-1.03, -0.33];$ forest plot S8) with no heterogeneity ($I^2 = 0\%$). In four studies, EMDR was an add-on to

![Figure 2](image-url) **Figure 2.** Overall effect of EMDR for depression: forest plot.

![Figure 3](image-url) **Figure 3.** Overall effect with risk of bias: forest plot.
another treatment, showing a moderate effect ($g = -0.68$; 95%CI [-1.02, -0.33]) with no heterogeneity ($I^2 = 0\%$). The forest plot is reported in Supplementary Material S9. A dose–response effect on EMDR effect size at post-treatment was not observed ($n = 7$, $\beta = 0.0003$; $p = 0.4231$).

3.4. Risk of bias across studies

Neither visual inspection of funnel plots nor Egger’s test showed any evidence of publication bias (Figure 4 Figure 5).

4. Discussion

The aim of this systematic review and meta-analysis was to update the state of the art and add a quantitative analysis on EMDR therapy for depression as the primary target for treatment.

To our knowledge, this is the first meta-analysis on this topic. Although EMDR is typically associated with the treatment of PTSD, the AIP model (Shapiro, 2001) opens up the possibility to treat other mental health conditions with a trauma-focused approach (Hase et al., 2017).

The results from the nine studies included in the present meta-analysis show that EMDR has a large effect, although high heterogeneity was found and only two studies present a low risk of bias. The statistical effect also reflects clinical significance, as one-third of people with depression benefit from EMDR therapy. In the limited number of studies where follow-up data was available positive effect of EMDR treatment were maintained but with a smaller effect. It should be noted that this latter finding is based on only three studies, so future studies are needed. The effect was moderate even when EMDR is compared with active controls and when compared directly with CBT. These results are strengthened by the absence of heterogeneity, therefore EMDR could be considered as an effective trauma-focused treatment for depression. The effectiveness of EMDR appeared not to be related to the treatment dose received. This is in line with previous studies, which showed no psychotherapy dose–response relationship for depression (Barth et al., 2013; Stulz, Lutz, Kopta, Minami, & Saunders, 2013). Furthermore, it is important to consider the limited range of EMDR sessions in the studies conducted so far. The effect sizes obtained in this meta-analysis are similar or superior to other meta-analyses evaluating the effects of CBT and other psychotherapies for depression (Cuijpers, Huibers, Daniel Ebert, Koole, & Andersson, 2013; Cuijpers, Van Straten, Andersson, & Van Oppen, 2008) that are currently recommended as effective treatments for depression in the clinical guidelines (National Institute for Health and Care Excellence, 2018; Parikh et al., 2009). This finding is in line with evidence showing that different types of psychotherapies have comparable effects (Barth et al., 2013; Cuijpers, Quero, Dowrick, & Arroll, 2019; Cuijpers et al., 2008). However, our meta-analysis included only 9 studies, compared to more than 100 studies in other meta-analyses, thus highlighting the need for high-quality studies to further evaluate the effect of EMDR for depression.

4.1. Strengths and limitations of the studies

In general, the studies have several limitations. As expected from studies in a field that is still in its infancy, several methodological limitations were found, such as small sample size, high risk of bias, and high heterogeneity. Less than half of the studies evaluated the long-term effect of EMDR on depression. Treatment fidelity was independently checked and considered as adequate in only three studies.

The studies also have some strengths. In most articles, the outcome evaluation criteria were well explained and the assessment tools were all validated. Furthermore, in recent years an increasing number of RCTs addressing the effectiveness of EMDR in treating depression as a primary outcome have been published, along with an increase in their methodological quality. A manualized treatment protocol was applied in the great majority of studies and data on the competence of the therapists were provided in all but one of the studies.

4.2. Strengths and limitations of this review

To our knowledge, this is the first meta-analysis on the effectiveness of EMDR in the treatment of depression as a primary outcome, going beyond previous research that evaluated its effect as an associated symptom in patients with PTSD (Bisson et al., 2013; Cuijpers et al., 2020). Moreover, the Francine Shapiro...
Library was consulted to retrieve grey literature, thus conducting a comprehensive review as suggested in the Cochrane handbook (Higgins et al., 2019). This meta-analysis does have some limitations. First of all, the number of included studies is small, indicating that the interest in research on the application of EMDR for depression is still in its infancy. Secondly, the majority of the studies were characterized by low methodological quality and only a few studies examined long-term effects, thus limiting interpretation of the results of this meta-analysis. Finally, another limitation was represented by the impossibility of retrieving data for two studies, which therefore were not included in our quantitative synthesis.

4.3. Implications for clinical practice and research

The results of this study can inform clinical practice by considering EMDR effective at reducing depression, thus adding an additional therapeutic option for clinicians treating this disorder. The increase of therapeutic strategies for depression is of particular importance as it allows better personalization to be provided according to patients’ preferences. In fact, studies have shown that receiving a preferred treatment is associated with stronger therapeutic alliance, lower dropout rates, and positive treatment outcomes (Lindhiem, Bennett, Trentacosta, & McLean, 2014; Swift, Callahan, Cooper, & Parkin, 2018; Windle et al., 2020). It is also essential to routinely evaluate the presence of adverse childhood experiences and traumatic events in people with depression in order to identify if trauma-focused psychotherapies such as EMDR could be more effective for patients with a history of maltreatment. Previous studies have shown that exposure to childhood maltreatment predicts a poorer response to drug treatment (Nanni et al., 2012; Williams, Debattista, Duchemin, Schatzberg, & Nemeroff, 2016) and a better response to psychotherapy (Nemeroff et al., 2003) in patients with depression. Therefore, trauma-focused therapies could represent a valid option for patients with depression, who are less likely to respond to usual treatments and may require specific interventions focused on their maltreatment history. It may also be useful to consider whether different types of adverse childhood experiences play a role in predicting the outcome of treatment, in line with findings supporting a significant association of childhood maltreatment, especially emotional abuse and neglect, with depression (Humphreys et al., 2020; Mandelli, Petrelli, & Serretti, 2015; Nelson et al., 2017).

Among EMDR clinicians, evaluation of the type and sequence of treatment targets (e.g. current episode trigger; event(s) that gave rise to the series of recurring depressive episodes; belief system related to attachment history events) could be useful for improving therapeutic outcomes. More studies should also consider adopting the DepEnd” protocol (Hofmann et al., 2016) as an EMDR intervention specific for depression, or at least report a more specific description of the intervention offered to patients, in line with current checklists such as the template for intervention description and replication (Hofmann et al., 2014). As effect sizes could be inflated by the inclusion of low-quality studies, further studies with better methodological quality are needed to obtain more reliable effect estimates. Future studies should include longer-term follow-up (i.e. after 1 and 2 years). This would make it possible to investigate whether EMDR could be effective not only for reducing depressive symptoms but also preventing relapses, particularly in comparison with other interventions already recommended by clinical guidelines. Although treatment duration was not identified as a potential moderator of intervention efficacy either in this study or in previous reviews on CBT (Barth et al., 2013; Santoff et al., 2019), further studies should try to identify the ideal number of sessions to achieve a successful outcome. As emotional dysregulation is a common clinical feature in patients with depression (Aldao et al., 2010a; Sloan et al., 2017), and previous research has found that this association is mediated by the exposition to traumatic events (Christ et al., 2019), it would be interesting for future research to explore the impact of EMDR on emotional regulation. Furthermore, no study has been conducted so far to evaluate the neurobiological effects of EMDR in depression.

To date, there is preliminary evidence on the effects of EMDR therapy on adolescents with depression (Bae, Kim, & Park, 2008; Paauw, De Roos, Tummers, De Jongh, & Dingemans, 2019). Previous reviews have shown encouraging, although limited, results on the effectiveness of EMDR in reducing depressive symptoms secondary to PTSD in children and adolescents (Manzoni et al., 2021; Moreno-Alcázar et al., 2017). Future controlled studies are needed to further evaluate the effects of EMDR for depression as a primary target of the treatment among children and adolescents. Future studies should analyse possible adverse effects and rates of attrition from EMDR treatment, as these aspects are essential to inform clinical practice. Finally, it would be interesting to investigate the impact on the economic and social costs of treating depression with EMDR compared to other psychotherapies or pharmacotherapy.

5. Conclusion

The findings from this review suggest EMDR can be considered as an effective trauma-focused treatment for reducing symptoms of depression, although several methodological weaknesses were found in the
included studies. Further studies are required in order to replicate these findings, improve methodological quality, and evaluate longer-term effects.

**Data availability**

The data that support the findings of this study are openly available in the GitHub repository at [https://github.com/berkeley3/Eye-movement-desensitization-and-reprocessing-for-depression](https://github.com/berkeley3/Eye-movement-desensitization-and-reprocessing-for-depression).

**Data transparency statement**

The authors declare that there are no previously published or in press works stemming from this same dataset.

**Disclosure statement**

M.H., A.H. and L.O. are EMDR supervisors. M.H. and A.H. are EMDR trainers. S.C., M.H., A.H. and L.O. have been invited speakers at national and international EMDR conferences and S. C., M.H. A.H. and L.O. are the authors of four of the included studies. F.M., P.B., F.O. and N.C. declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

**Ethic statement**

No institutional review board approval and informed consent were obtained as the study did not involve participants.

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