**Psychological Interventions for Child and Adolescent PTSD: A Network Meta-Analysis**

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Short Title: Psychological interventions for pediatric PTSD

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**Key Points**

**Question:** How do psychological treatments compare in terms of alleviating pediatric PTSD?

**Findings:** Trauma-focused cognitive behavior therapies (TF-CBTs) are currently the most evaluated treatment category for pediatric PTSD (74% of included studies). Data for other interventions are emerging. At short-term, TF-CBTs, Eye Movement Desensitization and Reprocessing (EMDR), non-trauma-focused interventions, and multi-disciplinary treatments (MDTs) all significantly reduced pediatric PTSD relative to passive control conditions. TF-CBTs were associated with the largest short- and long-term reductions in pediatric PTSD. EMDR and MDTs had insufficient long-term data.

**Meaning:** TF-CBTs should be the first-line treatment recommendation for pediatric PTSD. While data for other treatment approaches is emerging with some promising findings, more data (including long-term data) are needed to draw firmer conclusions.

**Abstract**

**Importance:** Pediatric post-traumatic stress disorder (PTSD) is a common and debilitating mental disorder. Yet, a comprehensive network meta-analysis examining psychological interventions is lacking.

**Objective:** To synthesize all available evidence on psychological interventions for pediatric PTSD in a comprehensive network meta-analysis.

**Data Sources:** PsycINFO, MEDLINE, Web of Science, and PTSDpubs were searched from inception to January 2nd 2024 and 74 related systematic reviews were screened.

**Study Selection:** Two independent raters screened publications for eligibility. Inclusion criteria were: Randomized controlled trial (RCT) with ten or more patients per arm examining a psychological intervention for pediatric PTSD compared to a control group in children and adolescents (< 19 years) with full or subthreshold PTSD.

**Data Extraction and Synthesis:** PRISMA guidelines were followed to synthesize and present evidence. Two independent raters extracted data and assessed risk of bias with Cochrane criteria. Random effects network meta-analyses were run.

**Main Outcome and Measures: S**tandardized mean differences (Hedges’ *g*) in PTSD severity.

**Results:**In total, 70 RCTs (N = 5,528 patients) were included. Most RCTs (74%) examined trauma-focused cognitive behavior therapies (TF-CBTs). At treatment endpoint, TF-CBTs, EMDR, multi-disciplinary treatments (MDTs), and non-trauma-focused interventions were all associated with significantly larger reductions in pediatric PTSD than passive control conditions (*gs* ≥ 0.86, all *ps* < .001). TF-CBTs were associated with the largest short-term reductions in pediatric PTSD relative to both passive and active control conditions and across all sensitivity analyses. In a sensitivity analysis including only trials with parent involvement, TF-CBTs were associated with significantly larger reductions in pediatric PTSD than non-trauma-focused interventions (*g* = 0.35, *p* = .026). Results for mid-term (up to 5 months posttreatment) and long-term data (6-24 months posttreatment) were very similar.

**Conclusions and Relevance:** The present network meta-analysis is the most comprehensive summary of psychological treatments for pediatric PTSD to this date. Results confirm that TF-CBTs are associated with significant reductions in pediatric PTSD in the short-, mid-, and long-term. More long-term data are needed for EMDR, MDTs, and non-trauma-focused interventions. Results of TF-CBTs are encouraging and disseminating these results may help reduce common treatment barriers.

One to two-thirds of children and adolescents from the general population report exposure to at least one traumatic event.1-4 While most children and adolescents react resiliently to trauma, about one-fifth develop post-traumatic stress disorder (PTSD).4,5 Pediatric PTSD is a common, impairing,4 and often chronic6 mental disorder characterized by re-experiencing of trauma, avoidance of trauma-related stimuli, changes in cognitions and emotions, and hyperarousal.7 Given the high prevalence and disease burden of pediatric PTSD,8-10 the examination of efficacious treatments constitutes a public health priority.

International treatment guidelines recommend trauma-focused cognitive behavior therapies (TF-CBTs, e.g., prolonged exposure11) as first-line treatment for pediatric PTSD.12-17 Research on other psychological interventions such as eye movement desensitization and reprocessing (EMDR) or non-trauma-focused interventions is also emerging. In recent years, number of published RCTs has increased substantially. To inform clinical practice about the relative reductions in pediatric PTSD of all treatment approaches, a comprehensive network meta-analysis (NMA) is required.

NMAs integrate data from both direct (i.e., comparison of arms within RCT) and indirect comparisons (i.e., comparisons of arms across RCTs), which enables conclusions about relative effects of all interventions.18 Three NMAs of psychological interventions for pediatric PTSD have been published.19-21 However, four omissions in previous works need to be addressed. First, a comprehensive NMA is needed. Caro et al.21 only focused on pediatric PTSD relating to sexual abuse. Mavranezouli et al.20 analyzed follow-up data up to four months posttreatment and cannot discern long-term reductions in pediatric PTSD. Xiang et al.19 included data from 56 RCTs published until 2020, compared to 70 RCTs published until 2024 in the present work. Second, no previous NMA included a sensitivity analysis of high-quality evidence. Low quality evidence may bias results in quantitative synthesis.22 Third, no NMA has performed sensitivity analyses concerning delivery format (e.g., individual delivery only) and reductions in pediatric PTSD may differ by delivery format. Fourth, reductions in pediatric PTSD might also differ by age group (i.e., children vs. adolescents), and no NMA has yet performed an age-based sensitivity analysis. To enhance our understanding of the relative performance of psychological interventions for pediatric PTSD, the present work addresses these four omissions.

# Methods

We followed Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) 2015 guidelines.23 The systematic literature search, data extraction, and risk of bias assessment were carried out independently by at least two authors. Disagreements were discussed between at least three authors (THH/LW/AK/NM). To address missing data, we sent data requests to corresponding authors, with a reminder one month later. The objectives and methods of the present NMA were pre-registered in the PROSPERO database (ID: CRD42020206290). We defined the main research question (Population, Intervention, Comparison, Outcome, and Study; PICOS) as follows: In children and adolescents with full or subthreshold PTSD (P), how do psychological interventions (I), compared to passive control conditions, active control conditions, or amongst different categories of interventions (C), perform in terms of lowering PTSD symptom severity (O) in randomized controlled trials (S)?

**Identification and Selection of Studies**

***Search Strategy***

For the timespan from inception to April 21st 2022, we relied on our previous literature search.24 We conducted a new search wave with identical search strategy on January 2nd 2024 covering literature published between April 21st 2022 and January 2nd 2024. Appendix A outlines the full search string. We performed all-field searches in PsycINFO, MEDLINE, Web of Science, and PTSDpubs with various search terms for PTSD (ptsd OR ptss OR post-traumatic stress OR posttraumatic stress) and treatment (trial\* OR treatment\* OR intervention\*). Consistent with our previous search, no restrictions were applied to languages or publication formats. We also screened 74 recently published related reviews (Appendix B) and the reference lists of included trials.

***Eligibility Criteria***

In line with our previous work,24 we included trials that met all of the following inclusion criteria: 1) RCT, 2) investigating a psychological intervention for pediatric PTSD compared to a control condition, 3) all participants had PTSD complaints (full or sub-threshold PTSD), 4) sample mean age < 19.0 years, and 5) outcome data reported for at least ten participants per arm.

**Quality Assessment**

Risk of bias was independently assessed by two authors (THH/NM) based on eight quality criteria reported by Cuijpers and colleagues.22 These eight criteria originated partly from the Cochrane Collaboration criteria25 and authoritative criteria for evidence-based psychological interventions.26 In the present study, RCTs were defined as high-quality trials (i.e., with low risk of bias) when fulfilling at least six of the eight quality criteria (for quality criteria and quality ratings per trial see Appendices C & D, respectively). Initial agreement between independent raters was good (91.35%).

**Data Extraction**

Trial characteristics (e.g., treatment delivery format), sample characteristics (e.g., mean age), and PTSD outcome data were extracted independently by at least two authors (THH/LW/AK/NM). When applicable, intent-to-treat (ITT) data were prioritized over completer data. When applicable, outcome data from clinician-based measures were prioritized over self-report measures.

***Categorization of Psychological Interventions and Control Conditions***

The present study compared four categories of psychological interventions based on the number of trials available: 1) TF-CBTs (i.e., any CBT-based intervention with a trauma focus, such as prolonged exposure11), 2) EMDR, 3) non-trauma-focused interventions (i.e., any intervention without a trauma focus), and 4) multi-disciplinary treatments (MDTs, i.e., treatments that combine techniques from at least two of the aforementioned categories such as the intensive multimodal group program27). Other trauma-focused interventions (i.e., interventions with a trauma focus but not based on CBT or EMDR principles, such as expressive supportive groups28) were planned as fifth category, but lacked evidence (kes < 4). In the present work, *k* denotes the number of RCTs, whereas *kes* denotes the number of direct comparisons. Control conditions were divided into passive control conditions (e.g., wait-list control) and active control conditions (e.g., treatment-as-usual, for all categorizations see, Appendix E).

***Categorization of Assessment Timepoints***

Consistent with previous research,29 we distinguished between three assessment periods: 1) *post-treatment* (i.e., short-term), 2) *mid-term*, which we defined as assessments of up to five months after treatment endpoint, and 3) *long-term*, which we defined as assessments longer than five months after treatment endpoint. When several assessments fell into the mid-term and long-term categories, the longest assessment was chosen, respectively.

**Outcomes**

The primary outcome of interest was the standardized mean differences (Hedges’ *g*)30 in PTSD severity between comparator groups.

**Statistical Analysis**

Random effects NMAs were conducted given that high heterogeneity in outcomes was expected.30 Level of statistical significance was set to p-values below 0.05 (two-sided) for all analyses, including Egger’s test. Analyses were performed in R (version 4.1.1)31 with the netmeta package.32 Effect sizes (Hedges’ *g*) were first calculated at the study-level33 and then pooled and compared between all comparison dyads in NMA.30 Following Cohen,34 *g* was interpreted as small (0.20), medium (0.50), and large effect (0.80). We only included intervention categories with minimally sufficient evidence (i.e., *kes* ≥ 4).35

For transitivity, we examined whether the distribution of various trial and sample characteristics was similar across comparison dyads and performed sensitivity analyses. We analyzed inconsistency between direct and indirect evidence globally36 and locally (i.e., per comparison dyad)23,37 with the net splitting method.38 We also inspected net heat plots.39 We performed inconsistency-corrected analyses when applicable. We calculated outlier-adjusted NMAs when (≥ 1) outliers were detected. Outliers were defined as effects ≥ 3.3 standard deviations above or below the pooled g.40 To examine potential small-study effects, we performed Egger’s test41 and inspected comparison-adjusted funnel plots42 (i.e., comparisons of interventions to passive and active control conditions only). We calculated the 𝐼2 and𝜏2 statistics as estimates of overall heterogeneity,43 and 𝑄het and 𝑄inc as estimates of heterogeneity within and between comparison dyads.44 We also calculated surface under the cumulative ranking (SUCRA; 50,000 resamples), allowing for a ranking by reductions in pediatric PTSD. To visualize distribution of available evidence, we build network graphs. In addition to the main NMAs (across all data), we performed four sensitivity NMAs: 1) only high-quality trials, 2) only trials delivering treatment(s) individually, 3) only trials involving parents/caregivers in treatment, and 4) only trials with sample mean age < 12 years (i.e., involving mainly children) as well as only trials with sample mean age ≥ 12 years (i.e., involving mainly adolescents).

# Results

**Study Selection Process**

The new search wave covered 8,845 electronic records with thirteen additional eligible RCTs. Thus, a total of 70 independent RCTs were eligible for the present purposes. Figure 1 details the study synthesis process.

**Study Characteristics**

The 70 RCTs reported data of 5,528 participants (for trial characteristics and their references, see Appendices F & G, respectively). Apart from one dissertation,45 all RCTs were peer-reviewed. Only Dorsey et al.46 reported more than one RCT (i.e., four RCTs). In total, 41 RCTs (59% of trials) delivered interventions individually and 29 RCTs (41% of trials) involved parents/primary caregivers in treatments. Across trials, mean number of total sessions was 10 and total duration of treatments (i.e., total sessions times length) was 11 hours (*SD* = 6.5 hours). In total, 40 RCTs (57% of trials) assessed follow-up data (range = 1mo-24mo posttreatment). ITT PTSD data were reported in 44 RCTs (63% of trials). In total, 41 RCTs (59%) were conducted in high-income countries and the remaining 29 RCTs (41%) in low and middle-income countries. However, two RCTs conducted in high-income countries exclusively involved refugees originating from low-income countries.47,48 Across trials reporting this information (*k* = 52 or 74%), 90% of the participants met full diagnostic criteria of PTSD at baseline. Fifty-seven trials (81%) involved mixed gender samples, whereas nine RCTs (13%) included only females and four RCTs (6%) only males. Across all trials, 60% of participants identified as females. Average age across trials was 12.21 years (*SD* = 3.08). In terms of trauma history, 31 RCTs (44%) included a sample with varying trauma histories. In the other trials, only participants with a particular trauma history were included, such as sexual assault (*k* = 10, 14%) or parental death (*k* = 6, 9%).

**Network Meta-analyses of Short, Mid, and Long-term Outcomes**

***Assumptions***

Assumptions were mostly met. Apart from two analyses, no inconsistencies were observed. In the main NMA on mid-term outcomes, significant inconsistency (i.e., between direct and indirect evidence) was found for MDTs and a corrected analysis without MDTs was performed. In the sensitivity NMA on mid-term outcomes for treatments with individual delivery, significant inconsistencies were found for all comparisons (precluding correction) and results are thus not reported. The distribution of sample and methodological characteristics across comparison dyads is presented in Appendix H.

***Network Graphs***

Figure 2 shows the network graphs for the NMAs on short-, mid-, and long-term outcomes. Most available trials assessed TF-CBTs. Only TF-CBTs had enough accumulated evidence across all three assessment periods.

***Network Meta-analysis of Short-term Outcomes***

Table 1 provides all short-term results. At treatment endpoint, TF-CBTs, EMDR, MDTs, and non-trauma-focused interventions were all associated with significantly larger reductions in pediatric PTSD than passive control conditions, with *g*s ranging from 0.86 (*p* < .001) for non-trauma-focused interventions to 1.06 (*p* < .001) for TF-CBTs (see Appendix I for the corresponding forest plot). Compared to active control conditions, only TF-CBTs (*g* = 0.55, *p* < .001) and MDTs (*g* = 0.43, *p* = .013) were associated with significantly larger reductions in PTSD (Appendix J). Differences in effect sizes between treatment categories were not significant, with few or no direct comparisons for most comparison dyads. Heterogeneity was large within and between comparison dyads (𝜏2 = 0.14, 𝐼2 = 68.9%; 𝑄total = 196.06, *df* = 61, *p* < .001; 𝑄ℎ𝑒𝑡 = 173.76, *df* = 50, *p* < .001; 𝑄𝑖𝑛𝑐 = 21.40, *df* = 11, *p* = .030). No significant inconsistencies were detected in the net splitting method (Appendices K & L). No evidence for small-study effects was found (Appendix M). Two outliers49,50 investigating TF-CBTs were detected. Outlier-adjusted analysis produced similar results (Appendix N).

**Sensitivity Analyses for Short-term Outcomes**

In high-quality trials only, the results for comparisons to passive control conditions were similar, with effect sizes being large and ranging from 0.80 (*p* < .001) for non-trauma-focused interventions to 1.05 (*p* < .001) for TF-CBTs. Only TF-CBTs (*g* = 0.53, *p* < .001) and EMDR (*g* = 0.43, *p* = .047) were associated with larger short-term reductions in pediatric PTSD than active control conditions. In the sensitivity analysis concerning trials with individual treatment delivery, results were similar to the main analysis with most favorable outcomes for TF-CBTs. In the sensitivity analysis concerning only trials with parent/caregiver involvement, results were similar for the comparison to passive control conditions, with TF-CBT, MDTs, and non-trauma-focused interventions being associated with significantly larger reductions in PTSD. Compared to active control conditions, however, only TF-CBTs (*g* = 0.42, *p* < .001) were associated with significant reductions in PTSD. Moreover, TF-CBTs with parent/caregiver involvement were associated with larger reductions in PTSD than non-trauma-focused interventions with caregiver involvement (*g* = 0.35, *p* = .026). In the sensitivity analysis of samples with mean age < 12 (mostly children), results were very similar, with TF-CBTs, EMDR, and non-trauma-focused interventions being associated with significantly larger reductions in PTSD relative to passive controls (*gs* ≥ 0.78, *ps* ≤ .004). Yet, only TF-CBTs were associated with significantly larger reductions compared to active controls (*g* = 0.55, *p* < .001). In the sensitivity analysis of samples with mean age ≥ 12 (mostly adolescents), results were also very similar, with TF-CBTs, EMDR, and MDTs being associated with significantly larger reductions in PTSD than in passive control conditions (*gs* ≥ 0.93, *ps* < .001). Only TF-CBTs (*g* = 0.53, *p* < .001) and MDTs (*g* = 0.46, *p* = .042) were associated with significantly larger reductions in PTSD than active controls.

***Network Meta-analyses of Mid and Long-term Outcomes***

Table 2 provides all results. For non-trauma-focused interventions, too few direct comparisons were available. At mid-term (up to 5 months posttreatment), TF-CBTs, EMDR, and MDTs were associated with significantly larger reductions in PTSD than passive control conditions, with *gs* being moderate-to-large and ranging from 0.59 (*p* = .039) for MDTs to 0.95 (*p* < .001) for EMDR (Appendix O). Compared to active control conditions, only EMDR (*g* = 0.52, *p* = .032) and TF-CBTs (*g* = 0.45, *p* = .002) were associated with significant pooled *gs* (Appendix P). Heterogeneity in this main analysis concerning mid-term outcomes was large within and between comparison dyads (𝜏2 = 0.15, 𝐼2 = 66.4%; 𝑄total = 68.49, *df* = 23, *p* < .001; 𝑄ℎ𝑒𝑡 = 49.40, *df* = 16, *p* < .001; 𝑄𝑖𝑛𝑐 = 19.85, df = 7, *p* = .006). There was no evidence for small-study effects (Appendix Q). Significant inconsistency was detected for MDTs (Appendices R & S). Results remained similar to those of the main analysis in a re-analysis excluding MDTs (Appendix T).

 In the long-term (6-to-24 months posttreatment), only TF-CBTs and non-trauma-focused interventions had sufficient evidence. Compared to passive control conditions, both TF-CBTs (*g* = 0.76, *p* = .002) and non-trauma-focused interventions (*g* = 0.71, *p* = .014) were associated with significantly larger reductions in PTSD (Appendix U). Both TF-CBTs (*g* = 0.55, *p* < .001) and non-trauma-focused interventions (*g* = 0.50, *p* = .016) were associated with significantly larger reductions than active control conditions (Appendix V). Heterogeneity was large within and between comparison dyads (𝜏2 = 0.11, 𝐼2 = 67.6%; 𝑄total = 46.30, *df* = 15, *p* < .001; 𝑄ℎ𝑒𝑡 = 32.33, *df* = 10, *p* < .001; 𝑄𝑖𝑛𝑐 = 14.02, df = 5, *p* = .016). No inconsistencies (Appendices W & X) and no evidence for small-study effects (Appendix Y) were found.

**Sensitivity Analyses for Mid- and Long-term Outcomes**

At mid-term, sensitivity analysis on high-quality trials could be conducted with TF-CBTs and EMDR only. EMDR (*g* = 1.15, *p* < .001) and TF-CBTs (*g* = 1.06, *p* < .001) were associated with large effect sizes compared to passive control conditions. Compared to active control conditions, however, only TF-CBTs (*g* = 0.33, *p* = .029) were associated with significantly larger reductions in PTSD. The sensitivity analysis concerning trials with individual treatment delivery only was infeasible given detected inconsistency for all intervention categories. The sensitivity analysis of trials with parent/caregiver involvement produced similar results to the main analysis. Yet, TF-CBTs were associated with significantly larger reductions in PTSD relative to MDTs (*g* = 0.67, *p* = .042). The sensitivity analysis of trials with mean age below 12 was infeasible due to lacking evidence. The sensitivity analysis of trials with mean age ≥ 12 (mainly adolescents) produced similar results to the main analysis. TF-CBT (*g* = 0.76, *p* < .001) and MDTs (*g* = 0.70, *p* = .034) were both associated with significantly larger reductions in PTSD than passive controls. Yet, only TF-CBTs (*g* = 0.54, *p* < .001) were associated with significantly larger reductions when compared to active controls.

At long-term, only TF-CBTs and non-trauma-focused interventions had sufficient data. Passive control conditions were also lacking. Compared to active control conditions in high-quality trials, only TF-CBTs were associated with significantly larger reductions in PTSD (*g* = 0.53, *p* < .001). Sensitivity analysis concerning trials with individual treatment delivery only produced similar results to the main analysis. Sensitivity analysis concerning trials with parent/caregiver involvement was infeasible (kes < 4). The sensitivity analysis of trials with mean age ≥ 12 was infeasible due to lacking evidence. The sensitivity analysis of trials with mean age < 12 (mainly involving children) produced similar results to the main analysis, with only TF-CBT (but not non-trauma-focused interventions) being associated with significantly larger reductions in PTSD compared to active controls (*g* = 0.54, *p* = .003).

***Ranking of Intervention Categories***

Table 3 shows SUCRA rankings. TF-CBTs were the highest-ranking category of interventions at all timepoints and all analyses, except at mid-term when it was second to EMDR.

**Discussion**

The present work synthesized data from 70 RCTs. TF-CBTs are currently the most evaluated treatment category for PTSD in children and adolescents. TF-CBTs were associated with highest reductions in pediatric PTSD relative to control conditions in the short- and long-term, followed by (in this order) EMDR, MDTs, and non-trauma-focused interventions. This supports recommendations of international treatment guidelines for pediatric PTSD, including the International Society for Traumatic Stress Studies16 and the National Institute of Clinical Excellence.15 Our review confirms and extends previous NMAs19-21 and pairwise meta-analyses.24,51,52 TF-CBTs were associated with significant reductions in pediatric PTSD relative to passive and active comparators, across assessment periods, and when restricting analyses to trials with high-quality, trials examining individually delivered interventions, trials examining interventions with parent/caregiver involvement, and trials examining samples involving mainly children or adolescents. These results are important for the training of therapist and implementation in clinical practice and might help in reducing treatment barriers.

 Our review also reveals remaining gaps in the literature. While short and mid-term data for EMDR showed that EMDR is associated with significant reductions in pediatric PTSD, our review highlights the lack of long-term follow-ups. The present results therefore support some international treatment guidelines15,17 that list EMDR as second-line treatment recommendation. Data for MDTs and non-trauma-focused interventions are emerging. However, more data (including long-term data) are needed to robustly investigate the (relative) reductions in pediatric PTSD of these two categories. For the time being, about three quarters of the available data concern TF-CBTs, which means that treatment effects of TF-CBTs could be estimated most robustly. There was some evidence for TF-CBTs being associated with significantly larger reductions in pediatric PTSD than non-trauma-focused interventions. Yet, more data is needed to draw firmer conclusions.

**Limitations**

Five limitations should be noted. First, the categories of non-trauma-focused interventions, MDTs, and other trauma-focused interventions are heterogenous with regards to theoretical foundations. However, there is no solid ground for further sub-categorization given the low number of available RCTs. As more RCTs accumulate, more homogenous categorizations will become feasible. Second, we found evidence for inconsistency in the NMA regarding mid-term outcomes. However, results remained similar in a consistency-corrected re-analysis. Third, our age group sensitivity analyses provide approximations of the reduction in PTSD for children and for adolescents, as the categorization was based on sample mean age. An individual patient data meta-analysis would allow for a solid differentiation of children and adolescents, which was beyond the scope of the present work. Fourth, while the distinction between passive and active control conditions is a strength of the present work, active control condition such as treatment-as-usual can comprise very different elements, depending on the context. Future research might be able to disentangle this heterogenous comparator group. Fifth, relatively low rates of reported ITT data are concerning and trialists are encouraged to report ITT data.

**Conclusions**

 There is robust evidence indicating that psychological treatments, and in particular TF-CBTs, are associated with significant reductions in pediatric PTSD. A large evidence base for TF-CBTs supports reductions in PTSD relative to both passive and active controls at short, mid, and long-term. A comparably thin evidence base indicates that EMDR is associated with significant reductions in PTSD relative to both passive and active controls in the short- and mid-term. Data for MDTs and non-trauma-focused interventions are emerging. More high-quality data (including long-term data) are needed to draw firmer conclusions regarding the relative performance of psychological treatments for pediatric PTSD.

**Statements**

**Author Contributions:** THH and NM had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.
Concept and design: THH and NM.
Acquisition, analysis, or interpretation of data: All authors.
Drafting of the manuscript: THH and RM.
Critical review of the manuscript for important intellectual content: All authors.
Statistical analysis: THH, MJ, LW, JM.
Obtained funding: Not applicable (no funding).
Administrative, technical, or material support: THH.
Supervision: THH and NM.

**Conflict of Interest Disclosures:**

THH, MJ, LW, AK, PS and NM declare no competing interests. JM is funded by the National Institute for Health and Care Research (NIHR) Maudsley Biomedical Research Centre at South London and Maudsley NHS Foundation Trust and King’s College London. The views expressed are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health and Social Care. RM occasionally receives payment (from universities and private training providers) for training therapists in the delivery of cognitive therapy for PTSD for children and adolescents; is a co-investigator or chief investigator on four National Institute for Health and Care Research (NIHR)-funded or Medical Research Council-funded clinical trials of psychological therapies, particularly cognitive therapy for PTSD in children and young people; and was the chair of a steering committee for a trial addressing the online treatment of PTSD in adults. RM institution (University of East Anglia) has received payment through the following research grants: “Addressing the trauma-related distress of young people in care: a randomised feasibility trial across social-care and mental health services” (NIHR RfPB NIHR200586); “Internet-delivered Cognitive Therapy (iCT) for young people with Post Traumatic Stress Disorder (PTSD)” (MRC DPFS MR/P017355/1); “Supporting services to deliver trauma-focused cognitive behavioural therapy for care-experienced young people: a pilot implementation study”, NIHR Applied Research Collaboration West; “Cognitive Behavioural Therapy for the treatment of post-traumatic stress disorder (PTSD) in youth exposed to multiple traumatic stressors: a phase II randomised controlled trial” (NIHR CDF-2015-08-073). RM institution part owns the intellectual property for an online guided self-help version of cognitive therapy for PTSD for children and young people as a result of RM involvement in one of these trials.

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**Table 1.** Short-termoutcomes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *Reference group Psych. interv.* | *kes (N)* | *SMD* | *[95% CI]* | *p* | *I2 (τ2)* |
|  | ***Main analysis (i.e., across all data, irrespective of trial quality and trauma history)*** |  |
| relative to PCC | TF-CBTs | 18 (1,145) | **1.06** | **[0.86 – 1.26]** | **< .001** | 68.9\*\*\*(0.14) |
| EMDR | 7 (297) | **0.86** | **[0.54 – 1.18]** | **< .001** |
| non-TF | 1 (40) | **0.88** | **[0.53 – 1.23]** | **< .001** |
| MDTs | 4 (270) | **0.95** | **[0.62 – 1.28]** | **< .001** |
|  | ACC | 1 (22) | **0.52** | **[0.24 – 0.79]** | **< .001** |
| relative to ACC | TF-CBTs | 21 (2,048) | **0.55** | **[0.36 – 0.74]** | **< .001** |
| EMDR | 0 (0) | 0.35 | [-0.04 – 0.73] | .078 |
| non-TF | 0 (0) | **0.36** | **[0.01 – 0.72]** | **.042** |
| MDTs | 4 (146) | **0.43** | **[0.09 – 0.77]** | **.013** |
| relative to EMDR | TF-CBTs | 3 (185) | 0.20 | [-0.14 – 0.55] | .240 |
| non-TF | 0 (0) | 0.02 | [-0.43 – 0.47] | .933 |
| MDTs | 0 (0) | 0.09 | [-0.36 – 0.53] | .704 |
| relative to non-TF | TF-CBTs | 9 (631) | 0.19 | [-0.11 – 0.48] | .224 |
| MDTs | 0 (0) | 0.07 | [-0.38 – 0.51] | .767 |
| relative to MDTs | TF-CBTs | 2 (72) | 0.12 | [-0.21 – 0.45] | .485 |
|  | ***Sensitivity analysis: high quality trialsa only*** |  |
| relative to PCC | TF-CBTs | 10 (882) | **1.05** | **[0.83 – 1.28]** | **< .001** | 67.8\*\*\*(0.10) |
| EMDR | 3 (145) | **0.95** | **[0.57 – 1.34]** | **< .001** |
| non-TF |  0 (0) | **0.80** | **[0.37 – 1.23]** | **< .001** |
| MDTs | 3 (218) | **0.91** | **[0.54 – 1.28]** | **< .001** |
|  | ACC | 0 (0) | **0.53** | **[0.23 – 0.82]** | **< .001** |
| relative to ACC | TF-CBTs | 13 (1,792) | **0.53** | **[0.33 – 0.72]** | **< .001** |
| EMDR | 0 (0) | **0.43** | **[0.01 – 0.85]** | **.047** |
| non-TF | 0 (0) | 0.28 | [-0.14 – 0.69] | .189 |
| MDTs | 1 (46) | 0.38 | [-0.03 – 0.80] | .070 |
| relative to EMDR | TF-CBTs | 3 (185) | 0.10 | [-0.28 – 0.48] | .602 |
| non-TF | 0 (0) | -0.15 | [-0.67 – 0.37] | .567 |
| MDTs | 0 (0) | -0.04 | [-0.56 – 0.47] | .869 |
| relative to non-TF | TF-CBTs | 5 (322) | 0.25 | [-0.11 – 0.61] | .171 |
| MDTs | 0 (0) | 0.11 | [-0.42 – 0.64] | .687 |
| relative to MDTs | TF-CBTs | 1 (50) | 0.14 | [-0.25 – 0.53] | .469 |
|  | ***Sensitivity analysis: individual treatment delivery only*** |  |
| relative to PCC | TF-CBTs | 10 (563) | **1.07** | **[0.79 – 1.35]** | **< .001** | 63.0\*\*\*(0.12) |
| EMDR | 4 (150) | **1.02** | **[0.62 – 1.41]** | **< .001** |
| non-TF | 1 (40) | **0.88** | **[0.49 – 1.27]** | **< .001** |
|  | ACC | 0 (0) | **0.42** | **[0.03 – 0.82]** | **.033** |
| relative to ACC | TF-CBTs | 10 (766) | **0.65** | **[0.37 – 0.92]** | **< .001** |
| EMDR | 0 (0) | **0.59** | **[0.11 – 1.07]** | **.016** |
| non-TF | 0 (0) | **0.46** | **[0.06 – 0.86]** | **.024** |
| Relative to EMDR | TF-CBTs | 3 (185) | 0.06 | [-0.34 – 0.45] | .778 |
|  | non-TF | 0 (0) | -0.13 | [-0.62 – 0.35] | .590 |
| relative to non-TF | TF-CBTs | 9 (631) | 0.19 | [-0.10 – 0.48] | .196 |
| ***Sensitivity analysis: treatments with parent involvement only*** |
| relative to PCC | TF-CBTs | 5 (364) | **1.07** | **[0.76 – 1.38]** | **< .001** | 55.5\*\*\*(0.07) |
| non-TF | 0 (0) | **0.72** | **[0.28 – 1.16]** | **.001** |
| MDTs | 3 (188) | **0.94** | **[0.59 – 1.29]** | **< .001** |
| ACC | 0 (0) | **0.65** | **[0.28 – 1.02]** | **< .001** |  |
| relative to ACC | TF-CBTs | 9 (852) | **0.42** | **[0.19 – 0.66]** | **< .001** |  |
| non-TF | 0 (0) | 0.07 | [-0.32 – 0.46] | .719 |  |
| MDTs | 2 (56) | 0.29 | [-0.11– 0.69] | .159 |  |
| relative to non-TF | TF-CBTs | 5 (476) | **0.35** | **[0.04 – 0.66]** | **.026** |  |
|  | MDTs | 0 (0) | 0.22 | [-0.26 – 0.70] | .378 |  |
| relative to MDTs | TF-CBTs | 2 (72) | 0.14 | [-0.23 – 0.50] | .465 |  |
| ***Sensitivity analysis: samples with mean age < 12 (i.e., mostly children)*** |
| relative to PCC | TF-CBTs | 4 (252) | **1.08** | **[0.66 – 1.49]** | **< .001** | 69.2\*\*\*(0.12) |
| EMDR | 3 (89) | **0.86** | **[0.35 – 1.36]** | **< .001** |
| non-TF | 0 (0) | **0.78** | **[0.24 – 1.32]** | **.004** |
| ACC | 0 (0) | **0.52** | **[0.03 – 1.01]** | **.037** |  |
| relative to ACC | TF-CBTs | 10 (1,104) | **0.55** | **[0.29 – 0.81]** | **< .001** |  |
| EMDR | 0 (0) | 0.34 | [-0.29 – 0.96] | .290 |  |
| non-TF | 0 (0) | 0.26 | [-0.17 – 0.69] | .236 |  |
| relative to EMDR | TF-CBTs | 1 (52) | 0.22 | [-0.35 – 0.78] | .451 |
|  | non-TF | 0 (0) | -0.08 | [-0.74 – 0.58] | .823 |
| relative to non-TF | TF-CBTs | 6 (507) | 0.29 | [-0.05 – 0.63] | .094 |
| ***Sensitivity analysis: samples with mean age ≥ 12 (i.e., mostly*** ***adolescents)*** |
| relative to PCC | TF-CBTs | 13 (854) | **1.09** | **[0.82 – 1.37]** | **< .001** | 73.6\*\*\*(0.19) |
| EMDR | 3 (147) | **0.93** | **[0.42 – 1.45]** | **< .001** |
| MDTs | 1 (82) | **1.02** | **[0.53 – 1.52]** | **< .001** |
| ACC | 1 (22) | **0.56** | **[0.18 – 0.95]** | **.004** |  |
| relative to ACC | TF-CBTs | 11 (944) | **0.53** | **[0.24 – 0.82]** | **< .001** |  |
| EMDR | 0 (0) | 0.37 | [-0.22 – 0.96] | .222 |  |
| MDTs | 4 (146) | **0.46** | **[0.02 – 0.90]** | **.042** |  |
| relative to EMDR | TF-CBTs | 2 (133) | 0.16 | [-0.36 – 0.68] | .550 |  |
|  | MDTs | 0 (0) | 0.09 | [-0.59 – 0.77] | .791 |  |
| relative to MDTs | TF-CBTs | 2 (72) | 0.07 | [-0.39 – 0.53] | .773 |  |

*Note*. ACC = active control conditions (e.g. = treatment-as-usual); EMDR = eye movement desensitization and reprocessing; kes = number of direct comparisons for the given comparison; MDTs = multidisciplinary treatments; N = total number of participants; non-TF = non-trauma-focused psychological interventions; PCC = passive control conditions (e.g. = waitlist); Psych. interv. = psychological interventions; SMD = standardized mean differences (i.e. = Hedges’ g); TF-CBTs = trauma-focused cognitive behaviour therapies. **Bold** print highlights statistical significance of findings. A positive (negative) SMD indicates superior (inferior) reductions in pediatric PTSD of the given psychological intervention relative to the given reference group.
aMeeting at least six of eight trial quality criteria (Cuijpers et al., 2010).
\*\*\* p < .001, \*\* p < .01, \* p < .05, corresponding to the respective Q-statistic as a measure of heterogeneity in outcomes.

**Table 2.** Mid-term (top) and long-term (bottom) outcomes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *Reference group Psych. interv.* | *kes (N)* | *SMD* | *[95% CI]* | *p* | *I2 (τ2)* |
| ***Mid-term data (i.e., ≤ 5 months follow-up) - main analysis*** |
| relative to PCC | TF-CBTs | 9 (389) | **0.87** | **[0.58 – 1.17]** | **< .001** | 66.4\*\*\*(0.15) |
| EMDR | 2 (86) | **0.95** | **[0.48 – 1.41]** | **< .001** |
| MDTs | 1 (52) | **0.59** | **[0.03 – 1.15]** | **.039** |
|  | ACC | 2 (74) | **0.42** | **[0.06 – 0.79]** | **.024** |
| relative to ACC | TF-CBTs | 9 (813) | **0.45** | **[0.17 – 0.73]** | **.002** |
| EMDR | 1 (74) | **0.52** | **[0.04 – 1.00]** | **.032** |
| MDTs | 3 (79) | 0.17 | [-0.36 – 0.69] | .535 |
| relative to EMDR | TF-CBTs | 2 (125) | -0.07 | [-0.51 – 0.37] | .753 |
| MDTs | 0 (0) | -0.35 | [-1.02 – 0.31] | .298 |
| relative to MDTs | TF-CBTs | 1 (20) | 0.28 | [-0.26 – 0.83] | .309 |
| ***Sensitivity analysis: high quality trialsa only*** |
| relative to PCC | TF-CBTs | 4 (223) | **1.06** | **[0.64 – 1.49]** | **< .001** | 71.9\*\*\*(0.14) |
|  | EMDR | 1 (23) | **1.15** | **[0.56 – 1.75]** | **< .001** |
| ACC | 1 (52) | **0.73** | **[0.24 – 1.21]** | **.004** |
| relative to ACC | TF-CBTs | 7 (781) | **0.33** | **[0.03 – 0.63]** | **.029** |
| EMDR | 1 (74) | 0.43 | [-0.08 – 0.94] | .102 |
| relative to EMDR | TF-CBTs | 2 (125) | -0.09 | [-0.58 – 0.39] | .702 |
| ***Sensitivity analysis: treatments with parent involvement only*** |
| relative to PCC | TF-CBTs | 3 (128) | **1.09** | **[0.56 – 1.63]** | **< .001** | 71.1\*\*\*(0.14) |
|  | MDTs | 1 (52) | 0.43 | [-0.25 – 1.10] | .216 |
|  | ACC | 0 (0) | **0.73** | **[0.11 – 1.35]** | **.021** |
| relative to ACC | TF-CBTs | 5 (619) | 0.37 | [-0.02 – 0.75] | .060 |  |
|  | MDTs | 2 (43) | -0.30 | [-0.95 – 0.34] | .357 |  |
| relative to MDTs | TF-CBTs | 1 (20) | **0.67** | **[0.02 – 1.32]** | **.042** |  |
| ***Sensitivity analysis: samples with mean age ≥ 12 (i.e., mostly adolescents)*** |
| relative to PCC | TF-CBTs | 6 (252) | **0.76** | **[0.43 – 1.09]** | **< .001** | 44.9\*(0.07) |
| MDTs | 0 (0) | **0.70** | **[0.05 – 1.34]** | **.034** |
| ACC | 2 (74) | 0.22 | [-0.18 – 0.61] | .282 |
| relative to ACC | TF-CBTs | 7 (492) | **0.54** | **[0.26 – 0.83]** | **< .001** |
| MDTs | 3 (79) | 0.48 | [-0.05 – 1.01] | .076 |
| relative to MDTs | TF-CBTs | 1 (20) | 0.06 | [-0.52 – 0.64] | .831 |
| ***Long-term data (i.e., 6-24 months follow-up) - main analysis*** |
| relative to PCC | TF-CBTs | 3 (118) | **0.76** | **[0.27 – 1.26]** | **.002** | 67.6\*\*\*(0.11) |
| non-TF | 1 (40) | **0.71** | **[0.15 – 1.27]** | **.014** |
|  | ACC | 1 (51) | 0.21 | [-0.31 – 0.73] | .431 |
| relative to ACC | TF-CBTs | 9 (920) | **0.55** | **[0.30 – 0.81]** | **< .001** |
| non-TF | 1 (45) | **0.50** | **[0.09 – 0.93]** | **.016** |
| relative to non-TF | TF-CBTs | 5 (343) | 0.06 | [-0.29 – 0.40] | .754 |
| ***Sensitivity analysis: high quality trialsa only*** |
| relative to ACC | TF-CBTs | 8 (887) | **0.53** | **[0.27 – 0.80]** | **< .001** | 70.7\*\*\*(0.11) |
| non-TF | 1 (45) | 0.46 | [-0.03 – 0.95] | .065 |
| relative to non-TF | TF-CBTs | 3 (151) | 0.07 | [-0.37 – 0.52] |  .744 |
| ***Sensitivity analysis: individual treatment delivery only*** |
| relative to PCC | TF-CBT | 3 (118) | **0.78** | **[0.34 – 1.22]** | **< .001** | 46.2(0.07) |
| non-TF | 1 (40) | **0.64** | **[0.13 – 1.15]** | **.014** |
| ACC | 1 (51) | 0.17 | [-0.33 – 0.67] | .503 |
| relative to ACC | TF-CBT | 5 (280) | **0.61** | **[0.28 – 0.94]** | **< .001** |
| non-TF | 0 (0) | **0.47** | **[0.01 – 0.92]** | **.043** |
| relative to non-TF | TF-CBT | 5 (343) | 0.14 | [-0.18 – 0.46] | .384 |
| ***Sensitivity analysis: samples with mean age < 12 (i.e., mostly children)*** |
| relative to PCC | TF-CBTs | 1 (26) | 1.00 | [-0.11 – 2.11] | .077 | 78.5 |
|  | non-TF | 0 (0) | 0.83 | [-0.37 – 2.03] | .176 | \*\*\* |
|  | ACC | 0 (0) | 0.46 | [-0.71 – 1.63] | .441 | (0.15) |
| relative to ACC | TF-CBTs | 5 (673) | **0.54** | **[0.18 – 0.90]** | **.003** |  |
|  | non-TF | 1 (45) | 0.37 | [-0.16 – 0.91] | .173 |  |
| relative to non-TF | TF-CBTs | 3 (266) | 0.17 | [-0.29 – 0.63] | .472 |  |

*Note*. ACC = active control conditions (e.g. = treatment-as-usual); EMDR = eye movement desensitization and reprocessing; kes = number of direct comparisons for the given comparison; MDTs = multidisciplinary treatments; N = total number of participants; non-TF = non-trauma-focused psychological interventions; PCC = passive control conditions (e.g. = waitlist); Psych. interv. = psychological interventions; SMD = standardized mean differences (i.e. = Hedges’ g); TF-CBTs = trauma-focused cognitive behaviour therapies. **Bold** print highlights statistical significance of findings. A positive (negative) SMD indicates superior (inferior) reductions in pediatric PTSD of the given psychological intervention relative to the given reference group.
***a***Meeting at least six of eight trial quality criteria (Cuijpers et al., 2010).
\*\*\* p < .001, \*\* p < .01, \* p < .05, corresponding to the respective Q-statistic as a measure of heterogeneity in outcomes.

**Table 3.** Rankings of psychological interventions for pediatric PTSD

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | SUCRA@short-term - all data (main analysis) | SUCRA@short-term- outlier-adjusted  | SUCRA@short-term- high-quality trials only | SUCRA@short-term- individual delivery of treatments only | SUCRA@short-term- treatments with caregiver involvement only | SUCRA@short-term- samples with mean age < 12 (mostly children)  | SUCRA@short-term- samples with mean age ≥ 12 (mostly adolescents) | SUCRA@mid-term - all data (main analysis) | SUCRA@mid-term- MDTs deleted due to inconsistency | SUCRA@mid-term- high-quality trials only | SUCRA@mid-term- treatments with caregiver involvement only | SUCRA@mid-term- samples with mean age ≥ 12 (mostly adolescents) | SUCRA@long-term- all data (main analysis) | SUCRA@long-term- high-quality trials only | SUCRA@long-term- individual delivery of treatments only | SUCRA@long-term- samples with mean age < 12 (mostly children) |
| TF-CBTs | 0.90 | 0.89 | 0.87 | 0.88 | 0.94 | 0.87 | 0.83 | 0.81 | 0.80 | 0.77 | 0.98 | 0.86 | 0.87 | 0.81 | 0.93 | 0.91 |
| EMDR | 0.58 | 0.61 | 0.71 | 0.77 | NA | 0.69 | 0.64 | 0.87 | 0.86 | 0.87 | NA | NA | NA | NA | NA | NA |
| MDTs | 0.70 | 0.72 | 0.66 | NA | 0.74 | NA | 0.74 | 0.50 | NAa | NA | 0.36 | 0.78 | NA | NA | NA | NA |
| Non-TF | 0.60 | 0.57 | 0.52 | 0.60 | 0.46 | 0.60 | NA | NA | NA | NA | NA | NA | 0.79 | 0.67 | 0.73 | 0.68 |
| ACC | 0.21 | 0.21 | 0.23 | 0.25 | 0.36 | 0.34 | 0.28 | 0.32 | 0.34 | 0.36 | 0.62 | 0.31 | 0.26 | 0.02b | 0.25 | 0.29 |
| PCC | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.04 | 0.05 | 0.07 | NA | 0.09 | 0.12 |

*Note*. ACC = active control conditions (e.g. = treatment-as-usual); @long-term = long-term data (i.e., assessments 6-24 months after treatment endpoint); @mid-term = mid-term data (i.e., assessments ≤ 5 months after treatment endpoint); @short-term = short-term data (i.e., assessments at treatment endpoint); EMDR = eye movement desensitization and reprocessing; high-quality trials only = sensitivity-analysis exclusively involving high-quality trials (i.e., trials fulfilling at least six of eight quality criteria); MDTs = multi-disciplinary treatments; NA = not applicable given insufficient accumulated evidence (i.e., kes < 4); Non-TF = non-trauma-focused psychological interventions (i.e., psychological interventions without a trauma focus); PCC = passive control conditions (i.e., waitlist); SUCRA = surface under the cumulative ranking (i.e., reductions in pediatric PTSD ranked by means of surface under the cumulative ranking with 50,000 resamples); TF-CBTs = trauma-focused cognitive behaviour therapies.
aExcluded from this analysis given that significant inconsistency was detected. bReference group for this analysis given insufficient number of direct comparisons (k < 4) for PCC.