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# Preliminary efficacy of eye movement desensitization and reprocessing for children aged 1.5–8 years with PTSD: a multiple baseline experimental design (N = 19)

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## ABSTRACT

**Background:** Trauma exposure is common in (pre) school-aged children and around one-fifth of exposed children meet the criteria for post-traumatic stress disorder (PTSD). These symptoms can cause severe impairment to a child's functioning and, if left untreated, have negative long-term consequences. Therefore, there is an urgent need for effective treatment to reduce the acute and long-term effects of trauma. However, currently, there are no established empirically validated treatments for PTSD in young children.

**Objective:** To assess the efficacy of eye movement desensitization and reprocessing (EMDR) therapy for improving PTSD symptoms, behavioural and emotional problems in young children aged 1.5–8 years, and parenting stress in their parents.

**Method:** A non-concurrent, multiple baseline experimental design was combined with standardized measures across 19 mostly chronically trauma-exposed children fulfilling DSM-5 PTSD diagnosis. Primary outcomes included effects on the severity of PTSD symptoms and the rate of diagnostic remission from PTSD. Secondary outcomes included emotional and behavioural problems and parenting stress at each assessment point (baseline, pre-treatment, post-treatment, and three-month follow-up). Participants received six 1-hour EMDR sessions.

**Results:** At post-treatment 79% of the children no longer met the diagnostic criteria for PTSD. Further, a significant decline in the severity of PTSD symptoms, emotional and behavioural problems in children was found post-treatment (all effect sizes > 1.20), as well as a significant reduction of parenting stress in their parents (Cohen's *d* effect size 0.45). All gains were maintained at the three-month follow-up, including a 79% loss of PTSD diagnosis. There was no dropout (0%) and no adverse events were reported.

**Conclusions:** The findings provide preliminary evidence of the safety, feasibility, and efficacy of six sessions of EMDR therapy for reducing paediatric PTSD and comorbidity in young children aged 1.5–8 years and, at the same time, decreasing parenting stress. Further trials are warranted.

**Trial Registration:** International Clinical Trial Registry Platform (before National Trial Register, trial search/who/int: identifier: NL8426, EMDR for young children with PTSD).

## Desensibilización y procesamiento por movimientos oculares para niños de 1,5 a 8 años con TEPT: un diseño experimental de líneas de base múltiples (N = 19)

**Antecedentes:** La exposición a traumas es común en niños en edad (pre) escolar y alrededor de una quinta parte de los niños expuestos cumplen los criterios para el trastorno de estrés posttraumático (TEPT). Estos síntomas pueden afectar gravemente al funcionamiento del niño y, si no se tratan, tienen consecuencias negativas a largo plazo. Por lo tanto, existe una necesidad urgente de un tratamiento eficaz para reducir los efectos agudos y a largo plazo del trauma. Sin embargo, actualmente no existen tratamientos establecidos y validados empíricamente para el TEPT en niños pequeños.

**Objetivo:** Evaluar la eficacia de la terapia de desensibilización y procesamiento por movimientos Oculares (EMDR) para mejorar los síntomas de TEPT, los problemas conductuales y emocionales en niños pequeños de 1,5 a 8 años, y el estrés parental en sus padres.

**Método:** Se utilizó un diseño experimental no concurrente de líneas de base múltiples

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## KEYWORDS




Post-traumatic stress disorder (PTSD); eye movement desensitization and reprocessing (EMDR); multiple baseline experimental design; SCED series; young children; parents

## PALABRAS CLAVE

Trastorno de estrés posttraumático (TEPT); desensibilización y procesamiento por movimientos oculares (EMDR); diseño experimental de líneas de base múltiples; serie SCED; niños pequeños; padres

## HIGHLIGHTS

- A six-session EMDR therapy is effective in reducing the rate of PTSD diagnoses (79%) and severity of PTSD symptoms in children aged 1.5–8 years exposed to heterogeneous and multiple traumas.
- The findings also show a significant reduction in emotional and behavioural problems as well as parenting stress.
- The absence of dropout and adverse events suggest feasibility and acceptability of EMDR therapy for children aged 1.5–8 years with PTSD and their parents.

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combinado con medidas estandarizadas en 19 niños, en su mayoría expuestos crónicamente a traumas, que cumplían con el diagnóstico de TEPT del DSM-5. Los resultados primarios incluyeron efectos sobre la gravedad de los síntomas de TEPT y la tasa de remisión diagnóstica del TEPT. Los resultados secundarios incluyeron problemas emocionales y conductuales y estrés parental en cada punto de evaluación (nivel basal, pretratamiento, posttratamiento y seguimiento a los tres meses). Los participantes recibieron seis sesiones de EMDR de una hora de duración.

**Resultados:** Tras el tratamiento, el 79% de los niños ya no cumplían los criterios diagnósticos del TEPT. Además, tras el tratamiento se observó una disminución significativa de la gravedad de los síntomas de TEPT y de los problemas emocionales y de conducta en los niños (todos los tamaños del efecto  $> 1,20$ ), así como una reducción significativa del estrés parental en sus padres (tamaño del efecto de la  $d$  de Cohen: 0,45). Todas las mejoras se mantuvieron en el seguimiento a los tres meses, incluida la pérdida del 79% del diagnóstico de TEPT. No hubo abandonos (0%) y no se notificaron acontecimientos adversos.

**Conclusiones:** Los hallazgos proporcionan evidencia preliminar de la seguridad, factibilidad y eficacia de seis sesiones de terapia EMDR para reducir el TEPT pediátrico y la comorbilidad en niños pequeños de 1,5 a 8 años y, al mismo tiempo, disminuir el estrés parental. Se justifica la realización de ensayos adicionales.

## 1. Introduction

Although the prevalence of trauma exposure in pre-school-aged children specifically is unclear due to extensive variability in trauma definitions and methodology, it is widely acknowledged that trauma exposure in this age group is common (Woolgar et al., 2022). Consequences of trauma exposure in young children can disrupt developmental processes and increase the risk of developmental delay in various areas (physical, emotional, social, cognitive, biological, and neurological). In addition, the child's trauma may impact the family system more widely, for instance, by increasing parenting stress and the risk for developing parental PTSD (Afzal et al., 2023; Wilcoxon et al., 2021).

Young children aged six years and younger exhibit developmentally specific manifestations of PTSD, such as traumatic play and nightmares that may not directly relate to the traumatic event. They may also develop non-specific symptoms, including separation anxiety, regression (loss of previously acquired skills), and new fears (Scheeringa & Zeanah, 2001). As a result, their symptoms are often not recognized as post-traumatic stress disorder, leading to under-diagnosis. However, since PTSD with more age-appropriate diagnostic criteria is included in the DSM-5, the identification of young children with PTSD has improved (Gigengack et al., 2015). A recent systematic review and meta-analysis showed even a higher PTSD prevalence of 21.5% in young children (up to 6 years of age; Woolgar et al., 2022) following trauma exposure, compared to older children (16%; Alisic et al., 2014). Prospective longitudinal studies showed that PTSD during early childhood, if left untreated, may follow a chronic and unremitting course. To reduce the acute and long-term effects of trauma and PTSD, the provision of appropriate and timely intervention is needed (Meiser-Stedman et al., 2017).

Practice guidelines for PTSD in children aged 8–18 years recommend trauma-focused psychotherapies as a first-line approach, primarily Cognitive Behavioural Therapy (CBT) and eye movement desensitization and reprocessing (EMDR; ISTSS, 2018; NICE, 2018). However, guidelines with recommendations for traumatized young children are currently lacking. Treating trauma in young children is challenging and requires a developmentally appropriate approach, emphasizing simplified or non-verbal communication and active caregiver involvement (Scheeringa et al., 2011). The field of trauma treatment for this target group is continually evolving, with ongoing efforts to refine protocols and adapt interventions to better suit their developmental needs. To date, only a few trials have investigated trauma treatment for preschool children with PTSD (McGuire et al., 2021; Smith et al., 2019). Regarding TF-CBT, there are studies demonstrating that developmentally tailored CBT is effective in reducing PTSD and comorbid symptoms in children aged 3–8 years, with large effect sizes and treatment gains being maintained at follow-up (range 3–6 months). Treatment consisted of 12 sessions of 60–90 min each (Hitchcock et al., 2022; Salloum et al., 2016; Scheeringa et al., 2011). Attrition during treatment in these studies ranged from 0% to 56%, suggesting that dropout during trauma treatment could be a problem.

The other evidence-based intervention for paediatric PTSD is EMDR therapy. This method is designed to reduce the disturbance related to unprocessed memories, consisting of eight fixed procedural steps (i.e. phases): History taking and treatment planning, preparation, assessment, desensitization, installation, body scan, closure, and re-evaluation (De Jongh et al., 2024). For the treatment of children and adolescents aged 4–18, an age-modified standard protocol is available with adaptations to different stages of development

(Beer & de Roos, 2017; Tinker & Wilson, 1999). This protocol puts low demands on verbal and cognitive capacities and, therefore, seems particularly well-suited to reduce paediatric PTSD in young children. Protocol adaptations concern the number of elements in the assessment phase for assessing a specific memory, visual support during the assessment (like a drawing and scales to measure distress and validity of cognitions), and the simplified wording of the questions. The younger the child, the more significant the parent's role. For an overview of the age-appropriate modifications, see Tinker and Wilson (1999) and Beer and de Roos (2017).

To adapt EMDR for children aged 0–4, modifications to the standard protocol have been developed. Lovett (1999, 2015) introduced EMDR storytelling in which a child's memory is activated by a narrative written by their parent(s) with the child's perspective central to the story. When there is suboptimal activation, specific trauma-related stimuli can be added to the story, such as pictures, sounds, smells, sensations (by touching involved body parts), or body positions related to the traumatic event. The phases of the storytelling method are less distinct compared to the standard protocol due to the integration of several phases (De Roos & Beer 2017; Struik et al., *in press*). When applying the EMDR storytelling method, the following phases can be distinguished: (1) History taking. (2) Preparation: writing the story. (3) Integrated reprocessing phase: activation, desensitization, installation, body scan, positive closure. (4) Reevaluation.

For EMDR, 10 randomized controlled trials (RCTs) investigating its efficacy for children aged 4–18 years have been published (Matthijssen et al., 2020). Although children between 4 and 8 years old were included in some RCTs (De Roos et al., 2011; Meentken et al., 2020) or in a non-controlled EMDR study (Hensel, 2009, age range 1.9–18 years), data analysis was only conducted for the total sample and not for young children separately. A non-controlled study with a pre-school sample only assessed the effect of EMDR-based group therapy for 10 traumatized refugee preschoolers aged 4–6 years and found a reduction in PTSD symptoms post-intervention and at three-month follow-up (Lempertz et al., 2020). This study had important limitations, such as the absence of a control group, lack of a diagnostic interview, and lack of independent assessors. A more rigorous study using a single-case experimental design (SCED) evaluated the effect of six 1-hour EMDR sessions for children aged 4–8 years with a DSM-5 diagnosis of PTSD (Olivier et al., 2022). Results post-treatment showed diagnostic remission of PTSD (85.7%) and decreased severity of PTSD symptoms as well as emotional and behavioural problems. All gains were maintained at 3-month follow-up. Although these results are promising, this study did

not focus on children younger than four years – an age group where evidence-based trauma treatment is urgently needed. Also, measures for parenting stress were not included. Studies have shown that parents of traumatized children tend to exhibit higher levels of stress, anxiety, and emotional difficulties, which can affect their parenting behaviours and overall family dynamics. High levels of stress in parents may diminish their capacity to provide the emotional support needed for the effective recovery of their child, thereby affecting the overall success of the treatment (Barroso et al., 2018). Since EMDR for young children is a dyadic approach with intensive parental involvement, we were interested in measuring its effect on parenting stress.

The primary goal of this study was to evaluate the feasibility and efficacy of EMDR for children aged 1.5–4 years with PTSD and to extend the empirical evidence base of EMDR for children aged 4+ to 8 years with PTSD. We expected a significant decrease in the proportion of participants meeting the diagnostic criteria for PTSD and in the severity of PTSD symptoms for the total sample and the subgroups separately (1.5 to years and 4+ to 8 years). In addition, we expected a decrease in the child's comorbid emotional and behavioural problems and parenting stress.

## 2. Method

### 2.1. Study design

A non-concurrent randomized multiple baseline single-case experimental design (SCED) was combined with a repeated measures design to answer the research questions. A SCED is a strong and informative scientific research design for determining treatment effects at an individual level, rather than effects for the average person in a group like in an RCT (Dallery & Raiff, 2014; Davidson et al., 2021; Kratochwill & Levin, 2014). Therefore, it is an ideal experimental strategy for the first evaluation of treatment for a specific group to understand the effects of therapy more thoroughly. A significant advantage of a SCED is the ability to use idiosyncratic measurements, which are explicitly tailored to the individual. This allows the selection of items or variables most relevant to each person's unique situation or problem. The Single-Case Reporting Guideline in Behavioural Interventions was applied in this article (SCRIBE; Tate et al., 2016). In this guideline, a set of 26 items is described to guide and structure the reporting of SCED research.

After informed written consent and pre-baseline assessment, the waiting time for EMDR therapy (baseline phase) was determined. The length of the baseline phase was randomized (<https://www.randomizer.org>, range 10–38 days) and varied between participants to

control for threats to internal validity, i.e. spontaneous recovery and fluctuations over time (Kratochwill & Levin, 2014). This way, each participant functioned as its own control. These measurements were continued during the intervention phase (seven weeks of EMDR, intake included) till the post-treatment assessment (two weeks afterwards to include the effect of the last EMDR session) and lasted at least 63 days. Additionally, parents provided daily measurements on 14 consecutive days before the 3-month follow-up (follow-up phase). In addition, well-validated standardized measures were filled out online by the parents at four time points: start of the baseline phase (T0), before the start of the EMDR therapy (T1), two weeks post-treatment (T2), and three months after treatment (T3). The therapists and participants were blind to assessment outcomes. The clinical diagnostic interview was carried out at T0, T2, and T3 by independent assessors (trained psychologists). Parents of participants received financial compensation of 25 euros for completing all measures. The study was approved by the Medical Ethical Committee of the University of Amsterdam (NL 69997.018.19) and registered in the International Clinical Trial Registry Platform (before National Trial Register, trial search/who/int: identifier: NL8426, EMDR for young children with PTSD).

## 2.2. Participants

All participants were recruited between February 2020 and August 2022 at one of the eight outpatient clinics of MOC 't Kabouterhuis, a specialized multidisciplinary mental health care centre for children aged 0–7 years, and the children's hospital of the Amsterdam University Medical Center, both located in Amsterdam, the Netherlands. Inclusion criteria were children: (1) aged 1.5–8 years, (2) having experienced one or multiple traumatic events and a primary DSM-5 diagnosis of PTSD, assessed with the Diagnostic Infant and Preschool Assessment (DIPA) at baseline, (3) currently not receiving another form of psychological trauma treatment, (4) with parents having a smartphone to install the app for the diary measurements, and (5) with parents being able to read and communicate in the Dutch language. Exclusion criteria included (1) ongoing exposure to a severe threat to the child's safety and (2) having started medication within 1 month of trial assessment or medication not being stabilized yet.

In February 2020, the first participant was just included (only baseline assessment, no treatment) when COVID-19 led to a lockdown. Due hereto the study was necessarily put on hold for half a year (study standstill, March–September 2020), as a result of which the first participant could not continue the study procedure. Therefore, this study report included 19 children after the restart of the study in September 2020. See [Figure 1](#) for the participant flow of enrolment.

## 2.3. Measures

### 2.3.1. Primary outcome measures

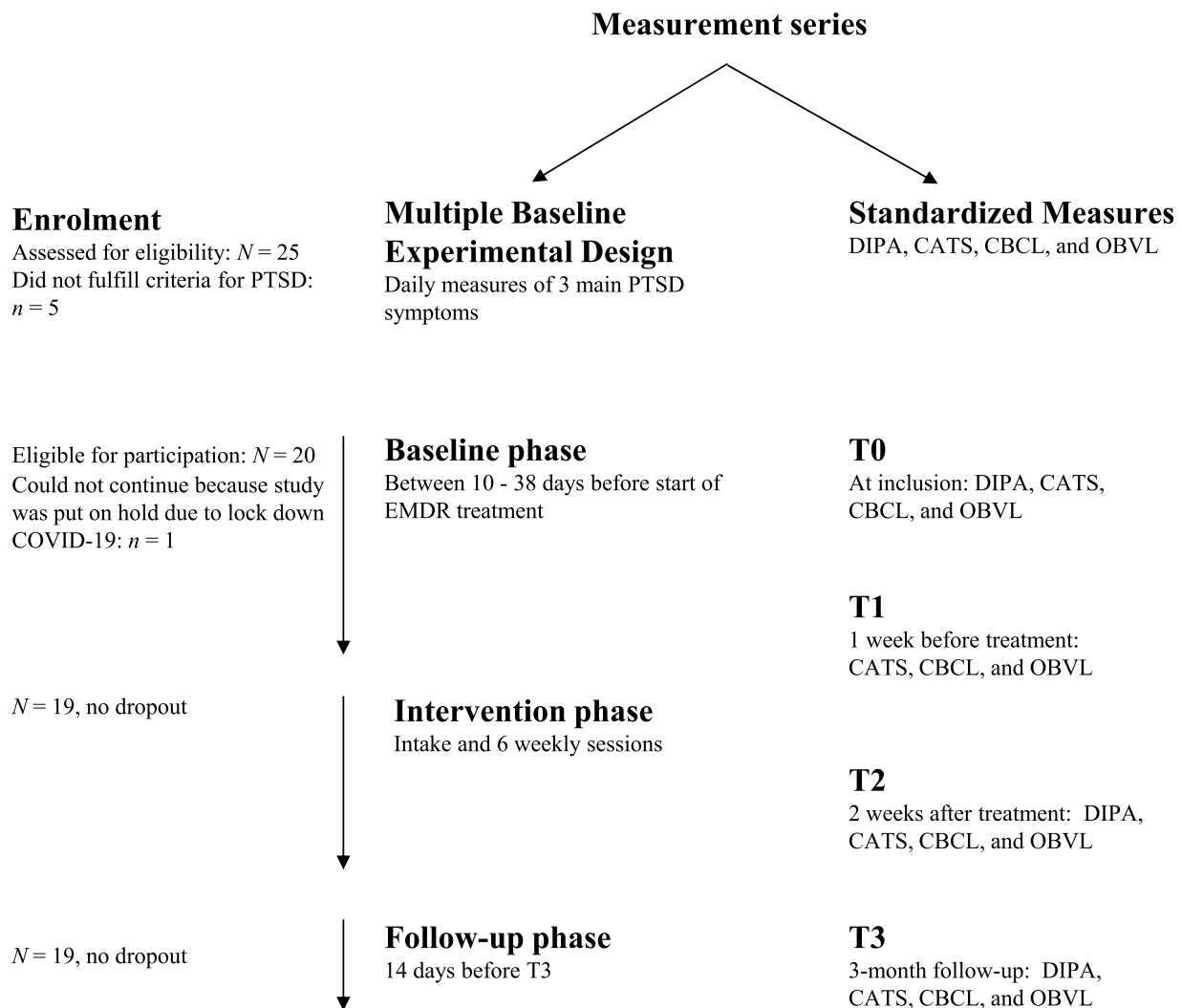
PTSD diagnosis was assessed by using the PTSD module of the Diagnostic Infant and Preschool Assessment (DIPA, Lindauer, 2024; Scheeringa, 2004). This is a semi-structured diagnostic interview for caregivers and focuses on psychiatric disorders in young children based on the DSM-5 criteria. The DIPA includes questions about age-specific expressions of symptoms of PTSD, associated symptoms of regression (like loss of speech or toileting skills), separation anxiety and development of new fears not directly related to the traumatic event. Prior Dutch research has shown adequate internal consistency, interrater reliability, and concurrent and divergent validity for the DIPA module PTSD (Gigengack et al., 2020).

The three idiosyncratic main PTSD symptoms were determined based on the highest scoring regarding frequency and intensity in the DIPA interview PTSD module. If there were more than three symptoms with equally high severity scores, the parents were consulted to determine which symptoms were most impairing. The selected symptoms were measured with a numeric rating scale (NRS) ranging from 0 (not present) to 10 (severely present). Parents received daily reminders on their phones to fulfil the measurements.

PTSD symptoms were also measured using the Dutch translation of the Child and Adolescent Trauma Screener for young children (CATS; Kooij & Lindauer, 2019), which is based on the DSM-5 criteria for PTSD. The questionnaire has 16 items rated on a 4-point Likert scale (i.e. 'never', 'once in a while', 'half the time', and 'almost always'). A score of 11 or lower means a normal score, a score of 12–14 means a subclinical score (i.e. that a child has a heightened level of PTSD-related symptoms), and a score of 15 or higher indicates a clinical score (i.e. that a child has a heightened chance of having PTSD). In a previous study examining the psychometric properties of the CATS, a good to excellent reliability with  $\alpha$  ranging between .88 and .94 was described (Sachser et al., 2017).

### 2.3.2. Secondary outcome measures

Child emotional and behavioural problems were measured using the Child Behaviour Checklist (CBCL) for ages 1.5–5 years (100 items; Achenbach & Rescorla, 2000) or 6–18 years (113 items; Achenbach & Rescorla, 2001). Response categories range from 0 to 2, with higher scores indicating more problems. There are two broadband scales of internalizing and externalizing behaviours, as well as an overall total score. Norm-referenced total scores were used in the analyses. Adequate psychometric properties have been described in prior studies, with  $\alpha$  ranging between .94 - and .96 for total



**Figure 1.** Flow diagram of participant recruitment and trial progress. DIPA: Diagnostic Infant and Preschool Assessment, CATS: Child Adolescent Trauma Screener, CBCL: Child Behaviour Checklist, OBVL: Opvoedbelastingsvragenlijst.

problems, and .87 to .92 for internalizing and externalizing behaviours (Achenbach et al., 2008).

Parenting stress was measured using the Parenting Stress Questionnaire, a Dutch self-report measure (OBVL, Vermulst et al., 2015). The OBVL has 34 items, answered on a 4-point Likert scale (1 = doesn't apply, 2 = applies a little, 3 = applies fairly, and 4 = applies completely). The questionnaire is divided into five subscales: problems in the parent-child relationship, problems with parenting, depressed moods, role limitation and health complaints. In this study, the norm-referenced total score (of which a higher score reflects more parenting stress) was used in analyses. Prior research showed good reliability, with  $\alpha$  ranging between .89 and .91 (Veerman et al., 2014).

## 2.4. Procedure

### 2.4.1. Treatment

In this study, both the Dutch translation of the EMDR standard protocol for children and adolescents (De Roos et al., 2020) and EMDR storytelling (for

children < 4 years; Lovett, 2015) were used. For participants aged 4+ to 8 years who were exposed to traumatic events in the preverbal phase, a combination of EMDR storytelling and the standard protocol was applied to optimize activation and desensitization of the traumatic memories/information. For children under four, tapping on body parts (such as feet, legs, or hands) or using buzzers was selected as the working memory task. When applying the standard protocol to children aged 4–8 years, eye movements guided by the therapist or a light bar could also be used. During the intake session, a case conceptualization and treatment plan were developed, followed by a maximum of six weekly EMDR sessions of 60 min. If all traumatic memories from the case conceptualization could be retrieved without emotional disturbance and both the parent and the therapist agreed that there has been clinically significant symptom reduction, the participant could be classified as an early completer. In this study, parents were present in the room during the treatment sessions to support their child and as an informant, observer or co-therapist.

EMDR therapy was delivered by nine registered mental health professionals, who specialized in infant mental health. They completed at least an EMDR Europe-accredited level I training for children and adolescents. They received monthly supervision sessions (1.5 h each) from a certified EMDR Europe child and adolescent consultant (CdeR), using video recordings of the sessions. Therapists reported their EMDR sessions through session reports with the consultant after each session to optimize treatment adherence. Upon request, additional supervision could be provided via telephone and e-mail.

## 2.5. Statistical analyses

### 2.5.1. Power analysis

To have power at the group level, a simulation study was performed using a Shiny app (<https://architecta.shinyapps.io/SingleCaseDesignsv02/>) developed by Bouwmeester (2021), also see Bouwmeester and Jongerling (2020). The results showed that assuming a large effect size ( $d > 1$ ), power would approach .80 with 10 or more participants. Given our research question to investigate the effect separately for the age groups 1.5–4 years and 4+ to 8 years, a total number of 20 participants was decided.

### 2.5.2. Daily measurements

All analyses of the daily measures were performed using the same Shiny app developed by Bouwmeester (2021). To examine whether children's PTSD symptoms decreased, for each participant's symptom, two non-overlap effect sizes were evaluated: the Percentage Extending the Median (PEM; Ma, 2006) and Kendall's TAU U (Parker et al., 2011).

Because the assumptions of parametric tests are often not met in SCEDs, non-parametric randomization tests were performed to evaluate the effect of the EMDR therapy (Bulté & Onghena, 2009). For every individual separately, it was evaluated whether (1) the baseline observations differed from the intervention observations and (2) the baseline observations differed from the follow-up observations. The dependent variable was the average score of the three PTSD symptoms on the NRS scale. The main test statistic of the non-parametric randomization tests was the mean difference between phases. Moreover – in a more exploratory way – for every individual, the difference in standard deviation between phases was evaluated. In the randomization tests, scores were randomly assigned to either the first or the second phase. Next, the test statistic – the difference in means or the difference in standard deviation – was calculated for the two randomly formed phases. This was repeated 1000 times. Finally, the  $p$ -value was defined as the proportion of randomly formed test statistics that was as extreme or more extreme than the observed test

statistic. To evaluate the effect of the intervention on a group level, we combined the  $p$ -values of the individual randomization tests by using Edgington's additive method (Onghena & Edgington, 2005). The  $p$ -value on the group level was therefore defined as the probability of a sum of  $k$   $p$ -values, in which  $k$  is the number of  $p$ -values, using the assumption that  $p$ -values are uniformly distributed between 0 and 1 under the null hypothesis. Group effects were evaluated for the total group of 19 children (1.5–8 years), and separately for the group of 10 young children (1.5–4 years) and the group of 9 older children (4+ to 8 years). A detailed description of this procedure can be found in Onghena and Edgington (2005).

### 2.5.3. Non-daily standardized measures

To examine if participants on the individual level showed improvement on the CATS, a reliable change index (RCI) was calculated (Jacobson & Truax, 1991). This measure indicates whether a child's change in PTSD symptoms is both reliable as well as large enough to be regarded as statistically relevant (while taking measurement error into account). For each participant, RCIs were calculated by subtracting the child's post-treatment score (at T2) or follow-up score (at T3) from the pre-baseline score (at T0) and dividing by the standard error of difference (Sdiff) of the CATS with the formula  $RCI = (T1 - T2) / Sdiff$  and  $Sdiff = \sqrt{2 * SEM^2}$ . RCIs larger than 1.96 are considered statistically significant (at the 0.05 level).

To analyse the data of the CATS, CBCL, and OBVL at the group level, multilevel analyses (mixed effects models) were carried out (Snijders & Bosker, 2011). Models consisted of repeated measurements of time (level one) that were nested in parents (level two). In separate multilevel analyses, the (sub)scales of interest were entered as the dependent variable. Dummy variables were created for each measurement occasion, T1, T2 and T3, and entered into the multilevel models as predictors. The estimates of T1, T2, and T3 could then be interpreted relative to T0. The betas could be interpreted as effect size Cohen's  $d$ . Values are interpreted as follows: Between .2 and .49 as small, between .5 and .79 as medium, between .8 and 1.19 as large, and 1.20 and up as very large. SPSS version 28 (IBM Corp, Armonk, NY) was used to analyse the data.

## 3. Results

### 3.1. Baseline characteristics

Baseline characteristics of the participating children and their parents are reported in Table 1. Our sample consisted of nine girls and ten boys, with a mean age of 4 years (range 18–94 months), with all biological parents. Table 2 provides information about the type, frequency, and duration of trauma. Participating

children developed PTSD mainly tied to chronic and/or heterogeneous types of trauma (63% medical trauma, 16% domestic violence, 10.5% road traffic accident, 10.5% other). The medical traumatic events experienced by the participants were life-threatening and included invasive procedures related to heart defects, collapsed lungs, brain tumours, and choking incidents.

### 3.2. Treatment completion and retention

All 19 participants completed the treatment, and all parents completed the daily diaries, and the four assessments. There was no dropout in treatment (0% dropout) as well in assessment (0% dropout) and no adverse events were reported. Only Participant 12 was an early completer in four sessions. All other participants completed EMDR in six sessions.

### 3.3. Treatment effects

#### 3.3.1. Daily measures

##### 3.3.1.1. Three main PTSD symptoms. Visual analysis.

For each child, Appendix 1 contains a figure depicting

the course of his/her three main symptoms over the baseline, intervention, and follow-up phase (see Figure 2 for an example). Visual inspection suggested that, in general, parents of most children reported a decrease in the selected PTSD (related) symptoms over time. Remarkably, most children showed high variation in the expression of their symptoms. Table 3 shows the results of the visual analyses, including the PEM and TAU values for each symptom per participant in

**Table 1.** Sample characteristics at T0.

	Children aged 1.5–4 years (n = 10)		Children aged 4+ to 8 years (n = 9)		Total sample (N = 19)	
<b>Children</b>						
Gender (n, %)						
Girls	5	50	4	44.4	9	47.4
Boys	5	50	5	55.6	10	52.6
Age in months						
M	28.4	68.89			47.58	
SD	9.74	16.14			24.38	
Range	18–46	48–94			18–94	
Ethnic background (n, %)						
European	5	50	7	77.8	12	63.2
Other	5	50	2	22.2	7	36.8
Medication (n, %)						
Yes	2	20	1	11.1	3	15.8
None	8	80	8	88.9	16	84.2
Prior (mental) health care (n, %)						
Speech therapy	4	40	2	22.2	6	31.6
Physiotherapy	5	50	3	33.3	8	42.1
Parent-child or family therapy	2	20	3	33.3	5	26.3
Different	4	40	3	33.3	7	36.8
None	3	30	4	44.4	6	31.6
<b>Participating parents</b>						
Gender (n, %) <sup>a</sup>						
Females	9	90	9	100	18	94.74
Males	1	10	0	0	1	5.26
Educational level (n, %)						
Vocational	4	40	2	22.2	6	31.6
Higher vocational	5	50	5	55.6	10	52.6
Academic	1	10	1	11.1	2	10.5
Other	0	0	1	11.1	1	5.3
Relationship to the child (n, %)						
Biological	10	100	9	100	19	100
Other	0	0	0	0	0	0

<sup>a</sup>For one participant, both mother and father participated (co-parenting). However, their mother was the primary reporter.

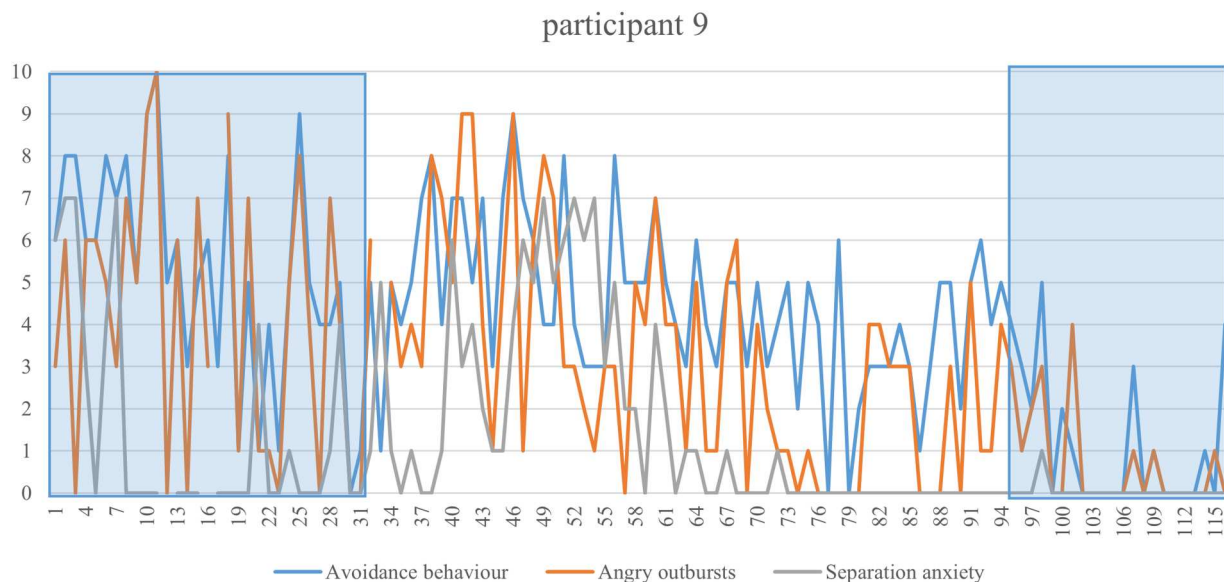
**Table 2.** Trauma characteristics per subgroup.

Participant	Sex	Age (year; month)	Trauma type <sup>a</sup>	Frequency (age in year; month)
<i>Subgroup aged 1.5–4 years</i>				
1	Male	1;6	<b>Accident (car)</b>	Single (1)
5	Male	2;0	<b>Medical trauma</b>	Chronic (0–2)
6	Female	1;6	<b>Medical trauma</b>	Chronic (0–0;6)
			Accident (fall)	Single (1;6)
9	Female	2;9	<b>Medical trauma</b>	Multiple (1–2)
			Disaster (nature)	Single (0;6)
			Accident (burn)	Multiple (1;6)
10	Male	2;8	<b>Medical trauma</b>	Multiple (1;6)
12	Male	3;0	<b>Domestic violence/witness physical assault</b>	Chronic (0–2;6)
			Accident (burn)/medical trauma	Single (1;6)
13	Female	3;10	<b>Witness physical assault</b>	Single (3;6)
14	Male	3;1	<b>Medical trauma</b>	Multiple (0–1)
16	Female	1;3	<b>Medical trauma</b>	Multiple (0–6)
			Disaster	Single (0;6)
18	Female	1;7	<b>Medical trauma</b>	Chronic (0–1)
			Accident (choking incident)	Single (1)
			Traumatic grief	Single (1)
<i>Subgroup aged 4+ to 8 years</i>				
2	Female	4;10	<b>Medical trauma</b>	Chronic (0–4)
3	Male	6;10	<b>Domestic violence/witness physical assault</b>	Chronic (2–6)
			Emotional abuse	Multiple (3–5)
			Being bullied	Chronic (5–6)
			Attacked by animal	Single (5)
			Medical trauma	Single (6)
4	Male	5;4	<b>Medical trauma</b>	Multiple (0–1;6)
			Accident (co-2 poisoning)	Single (0;8)
			Home invasion	Multiple (4–5)
7	Female	7;10	<b>Medical trauma</b>	Multiple (1–2)
			Home invasion	Single (4;9)
			Domestic violence/witness physical assault	Chronic (5–6)
			Bullying	Chronic (7)
8	Male	4;6	<b>Accident (car)</b>	Multiple (4–4;6)
11	Female	4;0	<b>Domestic violence/witness physical assault</b>	Chronic (2–3;3)
			Medical trauma	Single (2;10)
			Accident (car)	Single (3;9)
15	Male	6;1	<b>Medical trauma</b>	Multiple (1;6–3)
			Attacked by animal	Single (2)
			Traumatic grief	Single (3;6)
			Bullying	Single (4;6)
17	Male	7;4	<b>Accident (choking incident)/medical trauma</b>	Single (2)
19	Female	4;11	<b>Medical trauma</b>	Chronic (4)
			Traumatic grief	Single (3)

<sup>a</sup>Trauma type: the core traumatic type is marked in bold.

<sup>b</sup>Multiple (2–5 traumatic incidents) and Chronic (>5 traumatic incidents).





**Figure 2.** Example of a visual inspection of the daily diaries of participant 9 (time on the x-axis; severity of symptoms ranging from 0 (not present) to 10 (severely present) on the y-axis).

both phase comparisons. PEM values for the baseline and intervention phase comparison ranged from 30.3% to 100%, with most participants scoring above 70%. Regarding the baseline and follow-up phase comparison, participants obtained PEM values ranging from 35.84% to 100%, with most being above 90%. For an overview of all individual randomization tests, see Appendix 2, including a table with the number of measurements per phase for each participant (the mean number of measurements in total is 119).

**3.3.1.2. Group level: randomization tests.** The results of these randomization tests are shown in Table 4. As demonstrated in this table, regarding the baseline and intervention phase comparison, the complete group ( $N = 19$ ) showed a significant overall difference in means ( $p < .001$ ), as well for the young group (1.5–4 years,  $p < .001$ , mean Cohen's  $d = 1.0$ ) and for the older group separately (4+ to 8 years,  $p < .001$ , mean Cohen's  $d = 0.6$ ). Findings from the baseline and follow-up comparison indicate that a significant overall difference in means was maintained for all (sub)samples ( $p < .001$ ). For the comparison baseline and follow-up phase, the mean Cohen's  $d$  for the young group was 3.01 and 2.56 for the older group.

Table 4 also shows the results of the exploratory analyses regarding differences in standard deviations. For the baseline and intervention comparison, the overall effect of the difference in standard deviations was not significant for any (sub)sample. Remarkably, for the baseline and follow-up phase comparison, a significant overall effect of the standard deviation differences was found for the total and the older group (4+ to 8 years), but not for the younger group (1.5–4 years).

### 3.3.2. Non-daily measures

**3.3.2.1. PTSD diagnosis (DIPA).** The percentage of participants no longer meeting diagnostic criteria for PTSD post-treatment was 79% ( $n = 15$ ), with this remission rate maintained at follow-up (79%;  $n = 15$ ). Of the four children who still fulfilled PTSD criteria after treatment, three children further improved and lost their PTSD diagnosis at follow-up (participants 2, 10, and 12). However, three children who lost their PTSD diagnosis post-treatment, again fulfilled criteria for PTSD at follow-up (participants 5, 11, and 18). Only one participant (8) may be seen as a non-responder, still meeting the criteria for PTSD both post-treatment and at follow-up. Retrospective analysis of the DIPA at follow-up for the children fulfilling PTSD diagnosis showed different stressful situations that may explain maintenance or relapse of symptoms (e.g. visitation arrangement between child and father in case of previous domestic violence, regular medical check-ups).

### 3.3.2.2. Individual level: reliable change index CATS.

Table 5 displays the RCIs per participant calculated for the PTSD symptoms (i.e. the CATS total score). As can be seen in this table at T2, 11 of the 19 children showed a reduction in their PTSD symptoms that could be considered both reliable and clinically relevant. Two others (participants 10 and 15) had a nearly significant score (both RCIs = 1.95). Also, one parent (participant 8) reported a reliable and clinically significant increase in their child's PTSD symptoms. At follow-up (T3), 14 children demonstrated a reliable and significant decline in their PTSD symptoms. One other (participant 16) obtained a nearly significant score (RCI = 1.95).

**Table 3.** Results of the visual inspection of the daily diaries (i.e. the three main PTSD symptoms): percentage of median overlap (PEM) and uncorrected TAU.

PP	Symptom	Description	PEM	Baseline – intervention				Baseline – follow-up		
				Trend line baseline phase	TAU		PEM	TAU		
					Uncorrected	<i>p</i>		Uncorrected	<i>p</i>	
1	1	Nightmares	96.15%	-.59	.004	-.51	<.001	100%	-.82	<.001
	2	Angry outbursts	98.72%	-.24	.244	-.51	<.001	100%	-.83	<.001
	3	Separation anxiety	97.44%	-.65	.002	-.53	<.001	100%	-.80	<.001
2	1	Sleep disturbance	41.75%	-.3	.256	.19	.024	100%	-.61	.001
	2	Emotion regulation problems	87.38%	.43	.1	-.17	.041	100%	-.69	<.001
	3	Fears, not trauma related	62.14%	.1	.745	-.02	.792	100%	-.48	.008
3	1	Negative emotional states	74.55%	.08	.538	-.12	.22	77.78%	-.26	.026
	2	Sleep disturbance	83.64%	-.08	.542	-.21	.03	92.59%	-.36	.002
	3	Eating problems	83.64%	.03	.854	-.18	.062	55.56%	.15	.197
4	1	Nightmares	97.01%	.07	.792	-.48	<.001	100%	-.77	<.001
	2	Startle response	40.3%	-.42	.015	.08	.403	82.35%	-.04	.805
	3	Hypervigilance	92.54%	-.09	.634	-.33	.001	100%	-.58	<.001
5	1	Intense distress	100%	-.45	<.001	-.66	<.001	92.86%	-.43	<.002
	2	Concentration problems	100%	-.44	<.001	-.69	<.001	92.86%	-.55	<.001
	3	Hypervigilance	100%	-.45	<.001	-.71	<.001	100%	-.61	<.002
6	1	Sleep disturbance	93.44%	-.31	.079	-.19	.063	100%	-.69	<.001
	2	Avoidance behaviour	91.80%	.01	.973	-.48	<.001	100%	-.54	.001
	3	Restlessness	90.16%	-.31	.078	-.63	<.001	100%	-.76	<.001
7	1	Posttraumatic play	100%	.34	.044	-.01	.888	100%	-.64	<.001
	2	Avoidance behaviour	95.83%	.28	.116	-.13	.188	100%	-.80	<.001
	3	Sleep disturbance	97.30%	.11	.586	-.22	.022	100%	-.86	<.001
8	1	Sleep disturbance	65.91%	.14	.397	-.04	.582	94.44%	-.37	.01
	2	Negative emotional states	30.3%	-.17	.308	.19	.011	77.78%	-.17	.242
	3	Tics	100%	-.07	.685	-.36	<.001	100%	-.68	<.001
9	1	Avoidance behaviour	75.81%	-.43	.001	-.16	.078	100%	-.60	<.001
	2	Angry outbursts	83.61%	-.12	.353	-.13	.144	100%	-.48	<.001
	3	Separation anxiety	53.23%	-.22	.134	.06	.522	95.45%	-.37	.006
10	1	Sleep disturbance	37.66%	.18	.19	.19	.031	78.57%	-.07	.615
	2	Separation anxiety	70.13%	.16	.262	-.13	.138	50%	.12	.370
	3	Crying inconsolably	83.12%	-.22	.117	-.29	.001	50%	.07	.607
11	1	Sleep disturbance	93.85%	-.42	.071	-.51	<.001	100%	-.78	<.001
	2	Hypervigilance	92.31%	-.01	1	-.44	<.001	100%	-.76	<.001
	3	Avoidance behaviour	96.92%	-.26	.264	-.52	<.001	100%	-.78	<.001
12	1	Sleep disturbance	68.25%	-.01	.944	-.03	.747	84.21%	-.25	.077
	2	Angry outbursts	68.25%	-.14	.382	-.13	.191	47.37%	.09	.504
	3	Negative emotional states	61.90%	-.55	<.001	-.11	.288	36.84%	.08	.557
13	1	Sleep disturbance	85.71%	-.14	.447	-.31	.003	92.86%	-.41	.011
	2	Avoidance behaviour	88.89%	-.53	.004	-.28	.004	100%	-.69	<.001
	3	Startle response	74.60%	.19	.313	-.07	.479	100%	-.67	<.001
14	1	Dissociative reactions	71.19%	-.13	.316	-.20	.031	100%	-.71	<.001
	2	Negative emotional states	74.58%	.07	.604	-.13	.162	100%	-.70	<.001
	3	Sleep disturbance	44.07%	-.09	.479	.14	.137	100%	-.64	<.001
15	1	Sleep disturbance	46.15%	-.16	.254	-.01	.903	95.65%	-.47	<.001
	2	Negative emotional states	81.54%	-.16	.251	-.13	.147	95.65%	-.42	.001
	3	Diminished interest	63.08%	-.11	.465	-.18	.051	91.3%	-.67	<.001
16	1	Avoidance behaviour	82.81%	.42	.004	-.26	.005	93.33%	-.50	<.001
	2	Sleep disturbance	90.62%	.3	.04	-.42	<.001	100%	-.65	<.001
	3	Startle response	84.38%	.05	.752	-.43	<.001	80%	-.50	<.001
17	1	Avoidance behaviour	67.8%	-.53	<.001	-.31	.001	100%	-.67	<.001
	2	Angry outbursts	91.53%	-.41	.001	-.47	<.001	94.12%	-.56	<.001
	3	Physical symptoms	55.93%	-.64	<.001	-.20	.024	100%	-.62	<.001
18	1	Sleep disturbance	62.81%	.28	.065	-.12	.103	93.33%	-.35	.011
	2	Avoidance behaviour	100%	.52	.001	-.14	.059	100%	.06	.713
	3	Separation anxiety	93.39%	-.03	.863	-.32	<.001	80%	-.30	.027
19	1	Separation anxiety	82.54%	-.09	.638	-.22	.023	100%	-.68	<.001
	2	Angry outbursts	87.3%	-.11	.588	-.32	.001	100%	-.62	<.001
	3	Physiological distress	79.37%	-.15	.436	-.20	.042	93.33%	-.62	<.001

Note. PP = participant; TAU can be interpreted as Pearson's *r* (.1-.29 = small, .3-.49 = medium, > .5 = large).

**3.3.2.3. Group level: multilevel analyses CATS, CBCL, and OBVL.** Table 6 displays the descriptives for the total sample ( $N = 19$ ) with means and standard deviations of the CATS, CBCL, and OBVL data per measurement. Table 6 shows the results of the multilevel analyses. Findings indicate that during the waiting time (i.e. from T0 to T1) there was no significant reduction in the severity of children's PTSD

symptoms, children's emotional and behavioural problems (i.e. total problems) nor a decrease in parenting stress. As hypothesized, at post-treatment (T2) and at FU (T3) both compared to pre-baseline, a significant reduction was found for PTSD symptoms, total problems, internalizing problems, externalizing problems, and parenting stress. Effect sizes were very large for PTSD symptoms and total problem behaviour, large

**Table 4.** Results of the randomization tests of the daily diaries on a group level (i.e. the mean score of the three main PTSD symptoms).

(Sub)sample		Baseline – Intervention		Baseline – Follow-up	
		Sum( <i>p</i> )	<i>p</i>	Sum( <i>p</i> )	<i>p</i>
Mean	Total sample	1.957	<.001	1.094	<.001
	Children aged 1.5–4 years	.72	<.001	1.062	<.001
	Children aged 4+ to 8 years	1.237	<.001	.032	<.001
SD	Total sample	9.193	.404	7.334	.042
	Children aged 1.5–4 years	4.766	.4	6.248	.912
	Children aged 4+ to 8 years	4.427	.467	1.086	<.001

for internalizing problems and externalizing problems, and small to medium for parenting stress.

#### 4. Discussion

To our knowledge, this is the first study to evaluate the effect of EMDR on young children aged 1.5–8 years, including a subsample of children aged 1.5–4 years. The most participants were exposed to chronic and/or heterogeneous types of trauma, and all fulfilled a DSM-5 diagnosis, assessed by a clinical diagnostic interview. Our findings provide preliminary support for the efficacy of a six-session EMDR treatment in reducing PTSD symptoms for the total sample, as well as separately for the group of children aged 1.5–4 years and 4+ to 8 years. Furthermore, behavioural and emotional problems and parenting stress decreased significantly. During the waiting time between baseline and pre-treatment assessment, there was no significant reduction in symptoms on all measures, indicating high external validity and suggesting that results can be attributed to the EMDR intervention. The proportion of participants achieving loss of PTSD diagnosis and all treatment

**Table 5.** Reliable change indices for the CATS (PTSD symptoms).

Participant	Pre-baseline (T0) total score	Post-EMDR (T2) total score	Follow-up (T3) total score	RCI	
				T0-T2	T0-T3
1	24	14	8	2.79	4.46
2	13	16	11	-0.84	0.56
3	20	16	6	1.12	3.91
4	20	9	14	3.07	1.67
5	31	9	24	6.14	1.95
6	27	7	1	5.58	7.26
7	20	3	3	4.74	4.74
8	12	20	15	-2.23	-0.84
9	15	14	9	0.28	1.67
10	17	10	8	1.95	2.51
11	30	6	22	6.7	2.23
12	18	17	9	.28	2.51
13	22	9	7	3.63	4.19
14	15	3	3	3.35	3.35
15	18	11	1	1.95	4.74
16	20	14	2	1.67	5.02
17	21	10	5	3.07	4.46
18	31	2	19	8.09	3.35
19	26	9	14	4.74	3.35

Note. RCIs are considered reliable and clinically relevant when score > 1.96.

**Table 6.** Results of the multilevel analyses of CATS, CBCL, and OBVL.

	Pre-baseline (T0)			Pre-EMDR (T1)			Post-EMDR (T2)			Follow-up (T3)						
	M	SD	<i>p</i>	M	SD	<i>p</i>	M	SD	<i>p</i>	M	SD	<i>p</i>				
				β	CI	β	CI	β	CI	β	CI	<i>p</i>				
PTSD symptoms*	21.05	5.81		-0.04	-0.7	.852	10.47	5.04	-1.33	-2.12 to -0.92	<.001	9.53	6.91	-1.45	-2.24 to -1.03	<.001
Total problem behaviors**	62.63	8.15		-0.04	-0.49	.868	52.11	5.14	-1.25	-1.69 to -0.80	<.001	51.58	6.50	-1.31	-1.76 to -0.86	<.001
Internalizing problems**	62.16	8.64		.07	-0.34	.727	53.21	7.97	-.93	-1.33 to -0.52	<.001	51.26	8.84	-1.13	-1.54 to -0.72	<.001
Externalizing problems**	57.89	10.83		-0.06	-0.45	.757	50	5.96	-.83	-1.21 to -0.44	<.001	49.47	9.29	-.88	-1.27 to -0.49	<.001
Parenting stress***	59.79	11.05		.03	-0.19	.779	54.63	12.99	-.45	-0.66 to -0.24	<.001	54.47	11.05	-.46	-0.68 to -0.25	<.001

Note. \* = Child and Adolescent Trauma Screen (CATS; Kooij & Lindauer, 2019; Sachser et al., 2017). \*\* = Child Behavior Checklist (Achenbach & Rescorla, 2000, 2001)\*\*\* = Opvoedbelevingsvragenlijst (OBVL; Vermulst et al., 2015); Theoretical ranges: PTSD symptoms = 0–48, total problem behaviors = 24–100, internalizing problems = 33–100, externalizing problems = 34–100, and parenting stress = 30–80; M and SD are descriptive; and β, Confidence Interval (CI), and *p* are model-based; Results should be interpreted as Cohen's *d* (2, -49 = small, .5–.79 = medium, .8–1.19 = large, and >1.20 = very large).

gains (measured at the group level) were maintained at follow-up. During treatment and assessment there was no attrition at all, and no adverse events were reported supporting the feasibility and acceptability of EMDR in young children and their parents. As most children suffered from PTSD tied to multiple traumas (e.g. a combination of domestic violence and medical trauma), these results demonstrate that even severely traumatized children can profit from a brief course of EMDR therapy.

The positive results are in line with the results of Olivier et al. (2022), showing a comparable remission rate of PTSD diagnoses, reduction of PTSD symptoms, behavioural and emotional problems. Interestingly, as in the study of Olivier, large variations in severity of PTSD symptoms were reported in the daily diaries during EMDR. Therefore, therapists should realize that high variability in PTSD symptoms during treatment is common, making symptom reduction difficult to observe by parents and therapists. However, at follow-up, symptoms were significantly reduced. Importantly, therapists need to normalize variation and motivate parents and children to complete the treatment to benefit from it fully.

When comparing our findings to RCTs on the effectiveness of an adapted version of TF-CBT for younger children (mainly aged 3–8 years; Scheeringa et al., 2011; Salloum et al., 2016; Hitchcock et al., 2022), a similar remission rate in PTSD diagnosis and a similar reduction of emotional and behavioural problems was found. However, treatment effects in the current study were reached in fewer sessions (6 EMDR sessions of 60 min versus 12 TF-CBT sessions of 60–90 min), which may suggest that EMDR can be more efficient. This finding is in line with the results of randomized controlled comparison trials with trauma-exposed youth aged 8–18 years (EMDR vs. a form of TF-CBT), where relative efficiency for EMDR is shown (De Roos et al., 2017; De Roos, 2021). Regarding attrition rate, the absence of dropout in our study (0%), is in contrast with the high attrition rate of more than 50% in Scheeringa et al. (2011). This may be explained by multiple factors such as the context of Hurricane Katrina and a difference in population (mostly minority and single parent). Future work needs to demonstrate similarities and differences – and thus advantages and disadvantages – for different age groups regarding the treatment of their PTSD with EMDR versus a TF-CBT approach.

A key limitation of our study was the absence of an active (treatment) control condition; as a result, placebo effects were not controlled for. However, in a SCED design, participants serve as their own control, allowing for within-participant evaluation of treatment efficacy. Also, we added an extra assessment (standardized questionnaires) after waiting time in the baseline phase/ pre-EMDR to control for

spontaneous recovery. A second limitation is that the independent assessors who evaluated the child's diagnostic status were not blinded to the treatment phase the child was in. Further, all measures regarded caregiver reports (interviews and questionnaires), which is unavoidable because of the young age of the target population. Therefore, it is essential to consider the caregiver's psychological responses to their child's trauma, as these may have affected the reporting of their child's symptoms (Woolgar et al., 2022). Lastly, the generalisability of the findings might be affected by more than 50% of the participants having indicated medical trauma as their core trauma.

Despite these limitations, the current study has several strengths including its experimental control by applying randomization of the baseline length, replication, and the three-month follow-up phase. A multi-informant and multi-method approach was used with a diagnostic clinical interview done by independent assessors, together with validated and standardized questionnaires. Therapists and parents/children were blind to assessment outcomes. Daily idiosyncratic measures of the three main PTSD symptoms throughout the different phases of the study (mean of 119 data points per child) provided rich detail about the change of the symptoms in real life. Finally, the treatment was manualized and therapists used session checklists and video-recordings, which were supervised to optimize treatment adherence. The participants were a heterogeneous group with different types of chronic traumatic experiences, increasing the generalizability of the findings. Given the absence of attrition and harmful effects, we conclude that the intervention was highly acceptable to the participants and their parents, as well as safe.

Further research is needed to respond to the urgent need for evidence-based trauma treatment for young children and to extend the empirical evidence base. Besides EMDR, no other trauma method with age-appropriate modifications is currently available for children below the age of three, so comparison trials with active control conditions are not possible yet for the youngest. We recommend both Randomized Controlled Trials (RCTs) and Single-Case Experimental Design (SCED) studies, depending on the research questions. SCED studies with randomization of phases are particularly suitable for exploring novel questions, such as the efficacy of EMDR for young children with symptoms beyond PTSD, component analyses of EMDR, and investigations into its working mechanisms. The most significant gap in the literature on EMDR effectiveness is for children aged 0–4 years. Therefore, conducting an RCT comparing EMDR to a waitlist for children aged 0–4 with paediatric PTSD, using a larger sample size and an extended follow-up period (six months or one year), is a priority. Future research could also investigate whether young

children with specific characteristics or types of trauma, such as medical trauma – which is highly prevalent in this age group – might benefit more from EMDR than others. Furthermore, the caregiver's psychological responses to their child's trauma have to be taken into account.

Taken together, these findings provide preliminary evidence that a brief EMDR therapy is feasible and effective in reducing the rate of PTSD diagnoses, severity of PTSD symptoms, behavioural and emotional problems in a sample of young children aged 1.5–8 years and reducing parenting stress as well. These results require replication, and future trials are warranted.

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## Disclosure statement

C. de Roos receives income from a published book about EMDR therapy and from training postdoctoral professionals in EMDR. S. Bouwmeester receives income from training professionals in SCED. J. Offermans, R. Lindauer, and F. Scheper have no conflict of interest.

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## Data availability statement

Due to the General Data Protection Regulation, the European privacy legislation applicable in this study, raw data may not be transported to or shared with other parties.

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