# TIME LIMITED TRAUMA-FOCUSED TREATMENT

## for children and adolescents

Carlijn de Roos

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Doctoral thesis, Faculty of Dentistry (ACTA), University of Amsterdam

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# Time limited trauma-focused treatment for children and adolescents

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# Contents

# 1

# General introduction

# INTRODUCTION

More than half of children and young people are exposed to adverse events during childhood, such as motor vehicle accidents, interpersonal violence or sexual abuse (Landolt, Schnyder, Maier, Schoenbucher, & Mohler-Kuo, 2013) and are at risk for developing post-traumatic stress disorder (PTSD) and a range of other disorders (Bastien, Jongsma, Kabadayi, & Billings, 2020; Smith, Dalgleish, & Meiser-Stedman, 2019). For a young person to be diagnosed with PTSD, the adverse event to which they are exposed must be deemed "traumatic" in nature by either the International Statistical Classification of Diseases and Related Health Problems (ICD) or the Diagnostic and Statistical Manual of Mental Disorders (DSM). In DSM-IV (and now DSM-5), a traumatic event ("the A criterion") must involve some direct or indirect exposure to an event that involves actual or threatened serious injury, threatened death, death, or actual or threatened sexual violence (American Psychiatric Association 2000, 2013). In ICD-11, a trauma is described as one that is extremely horrific or threatening, either as series of events or single event (World Health Organization, 2018). The average prevalence rate of children who develop sufficient symptoms to warrant a diagnosis of PTSD after exposure to a traumatic event (as above) is approximately 16% (Alisic et al., 2014). Besides PTSD, children and adolescents may develop a wide variety of other mental health problems and disorders following exposure to traumatic events, such as generalized anxiety disorder, separation anxiety, depression, severe behavioral problems and substance abuse (Jonkman, Verlinden, Bolle, Boer, & Lindauer, 2013; Stallard, 2006; Teicher & Samson, 2013). Furthermore, subclinical PTSD is common in youth and may also generate significant distressing symptoms or severe impairment in functioning (Cohen et al., 2010; Copeland, Keeler, Angold, & Costello, 2007; NICE, 2018). Although a significant minority of traumatically exposed youth will develop PTSD, the prognosis for recovery after six months with PTSD without adequate treatment is poor (Gutermann et al., 2016, Hiller et al., 2016). Due to the high numbers of traumatically exposed children, the severity, chronicity and long-term consequences of such exposure, including an increased risk for transgenerational transmission, and high personal and societal costs, effective treatment is needed (Gutermann et al., 2016; Hiller et al., 2016; Smith et al., 2019).

## Background of this thesis

The starting point for a more systematic evaluation of protocolized trauma treatments for pediatric PTSD in the Netherlands was an explosion that occurred in a firework factory in Enschede in 2000. Many children and their parents were affected and referred to the

local Mental Health Care Institution (Mediant) in Enschede. At the time of the fireworks disaster in Enschede, there were few instruments available to measure pediatric post-traumatic stress symptoms that had been validated in the Dutch language. Also, there was a very small evidence base in respect of the efficacy of various trauma/PTSD-focused treatments with children and adolescents. In fact, there was only one trauma-focused treatment available in the Netherlands at that time, a cognitive behavioral therapy (CBT) protocol titled "Opvangprotocol" (Eland, de Roos, & Kleber, 2000), that could be deployed immediately for the victims of the Enschede fireworks disaster. EMDR, a trauma-focused psychological treatment with an extensive evidence base in adults with PTSD, had just been introduced in the Netherlands and the participating therapists in this trial were the first child and adolescent mental health professionals in the country trained to use EMDR with children and adolescents suffering from PTSD. As a trainer in both trauma-focused treatments, and motivated to test the efficacy of these interventions with youth, I initiated the first research project of this thesis together with Ricky Greenwald and professionals from Mediant Enschede (Chapter 2), a comparison of a CBT protocol with EMDR therapy. Afterwards, it was clear that more methodologically rigorous studies were needed to test the efficacy of these protocols for pediatric PTSD. This led me to propose and initiate a second randomized controlled trial (RCT) comparing EMDR therapy to cognitive behavioral writing therapy (CBWT) and a treatment wait-list for children and adolescents with PTSD, resulting in the current thesis.

## Purpose of the present thesis

The purpose of the present thesis was to increase the knowledge and to strengthen the evidence base of psychological treatments for specific trauma-related conditions, like pediatric PTSD, in children and adolescents aged 8 to18 years (hereafter referred to as "children" unless otherwise specified). Our main aim was to determine the relative efficacy and efficiency of three trauma-focused treatment methods (cognitive behavioral therapy, cognitive behavioral writing therapy and EMDR therapy) in reducing the severity of PTSD symptoms (primary outcome) and comorbid symptomatology (secondary outcome). The second aim was to identify predictors and moderators of PTSD outcomes based on the data obtained from the RCT comparing CBWT and EMDR, included in this thesis. A final aim was to examine the effectiveness and feasibility of a trauma-focused approach (i.e., EMDR therapy) for major depressive disorder (MDD). Because the focus of this thesis is on the effects of individual face-to-face delivered trauma treatment, group protocols or other forms of delivery (e.g. digital) of trauma treatment are not discussed in this dissertation.

## The effectiveness and relative efficiency of trauma-focused treatment protocols for pediatric PTSD

Since the inception of PTSD into the diagnostic nomenclature, efforts to develop, adapt and test trauma-focused interventions specifically for children and adolescents has lagged behind similar efforts for adults with PTSD. Treatments with demonstrated efficacy for adult PTSD, including prolonged exposure (PE) and EMDR, and that could readily be adapted for use with children and adolescent were rarely tested with children and adolescents and not in rigorously controlled designs like RCTs. This research-lag negatively affected the adaptation and dissemination of what were obviously evidence-based treatments for PTSD with adults into child and adolescent mental health services. Into this gap, one treatment protocol, entitled Trauma-Focused CBT, developed by a group of child sexual abuse researchers in the USA (Cohen, Deblinger, Mannarino, & Steer, 2004) became the dominant approach in the field of child traumatization. At the time research for this thesis commenced, well-designed trials involving youth with diverse trauma experiences were needed so that traumatized children and their parents might be provided access to a wider range of evidence-based treatments that would specifically target PTSD symptoms and lessen the likelihood of secondary psychopathology and further impairments in individual and family functioning. Results from rigorously designed clinical trials carried out in routine and specialist child and adolescent mental health services would help to facilitate and improve shared treatment decision making between patients and their healthcare providers, as well as among healthcare professionals, policy makers and other relevant stakeholders in relation to training and dissemination efforts. Thus, the overall aim of this thesis was to contribute to the evidence base for trauma treatments that had been evaluated with adults and recommended for use with adults in national and international guidelines, and were beginning to be recognized as potentially effective for children and adolescents. In this thesis we will describe two RCTs (Chapter 2 and 3) that tested the effectiveness and efficiency of both trauma-focused CBT ("opvangprotocol" and "cognitive behavioral writing therapy") and EMDR therapy on pediatric PTSD.

As noted above, since the inception of PTSD in the diagnostic nomenclature, several standardized treatment protocols for trauma-exposed youth began to appear (Smith et al., 2019), mainly trauma-focused cognitive behavioral approaches and EMDR. Given the fact that for TF-CBT approaches and EMDR a different theoretical framework and mechanism is assumed, both methods will be described consecutively. To date, evaluations of trauma-focused CBT approaches, particularly the TF-CBT protocol (Cohen et al., 2004), have been the subject of the most trials. Other cognitive behavioral approaches that have been evaluated

include cognitive therapy for PTSD (CT for PTSD, e.g. Smith et al., 2007; Meiser-Stedman et al., 2017), cognitive behavioral writing therapy (CBWT; Van der Oord, Lucassen, van Emmerik, & Emmelkamp, 2010), and prolonged exposure (PE, e.g., Foa, McLean, Capaldi, & Rosenfield, 2013). Recently, also a child-friendly version of narrative exposure therapy (NET) is developed (e.g., KIDNET; Schauer, Neuner, & Elbert, 2017). Most trauma focused cognitive behavioral treatment packages consist of a variety of procedures and techniques, although there is substantial overlap in treatment elements (Smith et al., 2019). Important treatment components include: development of a shared treatment rationale, psycho-education about PTSD, relaxation exercises, exposure to the trauma memory (via development of a trauma narrative or through imaginal reliving), cognitive restructuring, in vivo exposure to feared trauma-related stimuli and the sharing of the trauma narrative with loved ones, like parents, other caretakers or friends. These CBT approaches differ in the relative emphasis given to specific aspects of treatment, for example: the amount of therapy time spent on emotion-focused skills training; identifying and modifying trauma-related beliefs and avoidance strategies; the timing, amount, type and method of exposure (i.e., imaginal and in vivo; therapist- and patient -led exposure); and the use/amount of interventions targeted directly at parents and caregivers (Smith et al., 2019). For example, in Cohen et al.'s (2004) TF-CBT approach parents participate in parallel and conjoint sessions, where they are first provided psychoeducation and assistance in helping to guide their child to gain confidence and reduce avoidance through use of more adaptive emotion-related coping skills, and then helping their child to confront traumatic reminders, including have the child share their trauma narrative with the parent. Parent involvement in other forms of CBT can vary in intensity or format, for example, by offering conjoint sessions with parents to share the trauma narrative (CBWT), or only involve them at the start or end of the sessions to share observations about their child's functioning since the last session, and inform them about the course of the sessions (PE). Other differences between trauma-focused treatments concern the use of homework (PE, TF-CBT) and the total duration of the trauma therapy. For example, with regard to TF-CBT, duration of the trajectories ranges from about eight weekly sessions for PTSD, tied to a single event, to 10 to 20 weekly sessions for youth having experienced multiple traumas (Smith et al., 2019). Logically, the CBT variants that do not include treatment components prior to the trauma confrontation, like CBWT, CBT, CT, and prolonged exposure, have as shorter duration and last between four to six sessions for single trauma and six to 16 sessions for children having experienced multiple traumatic events. Hence, research is important to determine core elements and the optimal 'dose' in trauma therapy to improve efficiency. See Table 1.1 for an overview of the main treatment components of evidence based trauma treatments for child PTSD.

**Table 1.1: Overview of the main elements of evidenced based trauma treatments for pediatric PTSD**

| | TF-CBT | CBWT/CBT 'opvangprotocol' | KIDNET | Exposure therapy | EMDR therapy |
|---|---|---|---|---|---|
| Suitable for age | > 8 years<br>> 3 years, adapted version | > 3 years | > 6 years | > 8 years<br>> 3 years, adapted version | All ages |
| Case conceptu-alisation | Identification of distressing trauma memories | Identification of distressing trauma memories | Mapping lifeline (chronological, embedded in context of life history as a whole) with stones and flowers representing negative and positive memories respectively | Identification of distressing trauma memories | Identification of distressing trauma memories |
| Rationale and psycho-education | Treatment rationale<br>Psycho-education about PTSD and intervention | Treatment rationale<br>Psycho-education about PTSD and intervention | Treatment rationale<br>Psycho-education about PTSD and intervention | Treatment rationale<br>Psycho-education about PTSD and intervention | Treatment rationale<br>Psycho-education about PTSD and intervention |
| Preparation prior to trauma confrontation | Relaxation skills<br>Affect regulation<br>Cognitive coping | | | | |
| Trauma confrontation | Exposure to the trauma memory via development of a written trauma narrative (by the child). Reading (part of) narrative at start each session | Exposure to the trauma memory via development of trauma narrative (for CBWT: written narrative by the child. Children aged 3–8 years: writing with assistance of parents. Reading (part of) narrative at start each session. | Exposure to the trauma memory via development of a written trauma narrative (written by the therapist). Reading (part of) narrative at start each session | Prolonged imaginal exposure to the trauma memory (imaginal reliving). | Recall of the traumatic memory by focussing on the most distressing image, negative cognition, emotion, and physical responses associated with the image. |
| Transformation/ reprocessing of the trauma memory | Focus on hotspots: asking in detail for emotions, cognitions, sensory information and physiological reactions.<br>Cognitive restructuring<br>Enhancing safety and adequate coping strategies | Focus on hotspots: asking in detail for emotions, cognitions, sensory information and physiological reactions.<br>Cognitive restructuring<br>Enhancing safety and adequate coping strategies | Focus on hotspots: asking in detail for emotions, cognitions, sensory information and physiological reactions. | Focus on hotspots: asking in detail for emotions, cognitions, sensory information and physiological reactions | Desensitization of the memory by focusing on the memory and at the same time taxing the working memory (eye movements or other distracting task). Therapists ask for associations within the trauma network<br>Installation of a positive cognition<br>Body scan<br>Positive closure |

| | | | | | |
|---|---|---|---|---|---|
| Intervention for trauma-related stimuli | In vivo exposure to feared trauma-related stimuli | | | In vivo exposure to feared trauma-related stimuli | If indicated, desensitisation of most scary fantasy ("flashforward") in combination with "mental video check", and "future template") |
| Sharing | Social sharing of written story | Social sharing of written story | Social sharing of written story | | |
| Parent involvement | Parallel and conjoint sessions (enhancing parental skills), sharing session at the end of treatment. | CBT ("opvangprotocol") parallel sessions (enhancing parental skills)<br>CBWT: conjoint moments at the start of end of the sessions: sharing observations about their child's functioning since last session and informing parents about the session (limited in time). Conjoint sharing session at the end of treatment. | Parallel sessions and conjoint sharing session at the end of treatment. | Conjoint moments at the start of end of the sessions: sharing observations about their child's functioning since last session and informing parents about the session (limited in time) | Conjoint moments at the start of end of the sessions: sharing observations about their child's functioning since last session and informing parents about the session (limited in time) |
| Homework | Practising relevant skills | No homework | No homework | Homework, i.e., 5 days a week listening to audiotape of each imaginal exposure session (inclusive monitoring distress levels at home (SUD before, during and after each exposure task), record changes in cognitive and emotional responses to feared stimuli | No homework |

The theoretical framework of trauma-focused, cognitive behavioral approaches for pediatric CBT, including CT and PE, is based mainly on cognitive behavioral models originally developed to explain the aetiology and course of PTSD in adults (e.g., Ehlers & Clark, 2000; Smith et al., 2019). The more traditional adult models that underpin PE and CT approaches to pediatric PTSD, emphasize the important aetiological and maintaining role of: peri-traumatic responses; the content of the trauma memory and its relationship to memory functioning; avoidance of trauma-related reminders; the role of negative appraisals, and a wide range of maladaptive coping responses including cognitive avoidance, rumination, and substance use (in adolescence). Several studies involving children and adolescents aged eight to 18 years, have also found significant associations between PTSD symptoms and the abovementioned factors (Duffy et al., 2015; Meiser-Stedman et al., 2014; Mitchell, Brennan, Curran, Hanna, & Dyer, 2017). In the trauma-focused CBT protocols, a range of interventions are included to target these aetiological and maintaining factors (one or more) to reduce PTSD symptoms and related comorbidity.

The other psychological trauma treatment explored in this thesis is EMDR therapy. This is a standardised, eight-phase, trauma-focused treatment, involving the use of ("bilateral") eye movements, taps or tones as a form of stimulation for trauma processing (Shapiro, 2018; De Jongh, ten Broeke, Farrell, & Maxfield, 2020). The eight phases involve history taking and case formulation resulting in a treatment plan, preparation, assessment, desensitization, installation of a positive cognition, body scan, closure and (re)evaluation. For children and adolescents, Greenwald (1999) and Tinker and Wilson (1999) suggested age-appropriate modifications that have been integrated in the Dutch translation of the EMDR protocol, and an adapted version for children and adolescents available since 2000 (see de Roos, Beer, de Jongh, & ten Broeke, 2020). During treatment the child is motivated to activate (recall) the target trauma memory, including all images, thoughts, emotions and physical sensations. Next, the child is asked to focus on these four components of the memory at the same time as the therapists moves his or her fingers (concurrent dual attention task) horizontally back and forth with a distance of approximately 20 centimeters from the child's face. When this "set" of about 24 eye movements is stopped (after about 30 seconds) the child is requested to report briefly whatever comes to mind and to refocus on that during a further set of saccadic eye movements. This is repeated until the child reports a SUD rating of zero in relation to the target trauma memory. This is followed by the so-called "installation" of a related positive cognition until the client reports that the positive statement feels completely true. Next, a check of the bodily tension related to the memory (bodyscan) is carried out after which the session can be closed. It is assumed that EMDR therapy stimulates the inherent adaptive information processing system and facilitates integration of the targeted memory as an

adaptive contextualised memory (Shapiro, 2018; De Jongh et al., 2020). Compared to trauma-focused CBT, the EMDR protocol has more non-verbal elements (little is spoken), which could make the protocol more suitable for children of all ages. Furthermore, no explicit attempt is made to have the patient re-experience the trauma (De Jongh et al., 2020).

Efforts to identify the mechanisms through which EMDR works have largely focused on saccadic eye movements, and other tasks that place a "tax" on the available working memory (working memory hypothesis), in the activation and emotional processing of the highly distressing sensory information that tend to underpin traumatic intrusions and trauma memories in individuals with PTSD (Baddeley, 2012; Engelhard, van den Hout, & Smeets, 2011; Van den Hout et al., 2011). Based on the premise that the human working memory has only limited capacity, research has consistently demonstrated that performance of one task is at the expense of performing another task (Baddeley, 2012; Van den Hout et al., 2011). This research sits within a larger body of work relating to the important role that cognitive control over attention and working memory capacity play in human emotion regulation (Oberauer, 2019; Silvers & Guassi-Moreira, 2019). Disruption of trauma memory reconsolidation, including via tasks that involve high visuospatial demands, can disrupt reconsolidation of trauma memories (Iyaduri et al., 2018; Van Veen et al., 2015). In brief, the performance of saccadic eye movements appears to lessen the patient's experience of the trauma memory as being "vivid" and "distressing" before the memory is reconsolidated, presumably in a new less emotional elaborated state and less likely to be unintentionally activated (Van den Hout et al., 2011). There is evidence that tasks other than eye movements can also disrupt the trauma memory during the EMDR procedure, such as tapping, listening to tones, counting, calculations, and complex movements. Furthermore, research showed a linear relationship between the degree to which these tasks "tax" working memory (e.g., the speed of eye movements) and the lessening of the vividness and emotionally distressing nature of the trauma memory during intentional recall (Littel & van Schie, 2019; Van Veen et al., 2015). Accordingly, maximising working memory load during the EMDR session may help to improve its efficacy.

## Identifying predictors and moderators of treatment outcome of PTSD for youth

Although the majority of treatment outcome studies focuses on treatment efficacy (i.e., did the intervention work?), an urgent question for clinical practice is what factors predict treatment outcome and which treatment works best for whom (i.e., "moderation"; Kraemer, Wilson, Fairburn, & Agras, 2002; Kraemer, 2016). Knowledge of predictors and

moderators of outcome is important because it can aid in the process of personalizing a particular treatment to enhance its efficacy for a specific child or family when insufficiently responding to first line, evidence based trauma treatments (Kraemer, 2016). Predictors and moderators are variables that are present before treatment and are independent of treatment assignment. More specifically, a predictor is a variable that has a main effect on outcome regardless of treatment condition and answers the question of which children and adolescents are likely to benefit from any of the provided treatments (Kraemer et al., 2002). A moderator variable has an interactive effect with treatment condition on treatment outcome and suggests for whom which treatment is more effective compared with others. However, to date, few randomized controlled trials have explored moderators of child trauma treatment and the available literature with respect to the moderating value of candidate baseline variables is inconclusive due to suboptimal comparison groups and small sample sizes (Wiles et al., 2014). For the purpose of this thesis we explored potential predictors and moderators of treatment outcome, profiting from data of our multi-center RCT, in which EMDR therapy was compared to cognitive behavioral writing therapy (CBWT), and wait-list, for children and adolescents (aged 8 to 18 years) with a current diagnosis of PTSD, or subthreshold PTSD, tied to a single traumatic event (de Roos et al., 2017; Chapter 4).

## A trauma-focused approach (EMDR) beyond PTSD

The knowledge that emotionally charged memories are crucial in the aetiology and maintenance of PTSD is well recognized. The central role of trauma in the development and maintenance of other mental health conditions has received more attention lately (Sara & Lappin, 2017). This renewed insight has generated a series of research projects, which investigated whether a trauma-focused intervention such as EMDR therapy, directed at processing these symptom-related memories could reduce the primary symptomatology and comorbidity beyond PTSD. In one such study, 32 patients with PTSD and 32 patients with other mental health conditions including anxiety, mood, somatoform and personality disorders underwent a course of EMDR (De Jongh, Ernst, Marques, & Hornsveld, 2013). Both groups experienced significant and equal reductions in emotionality and vividness of the memories, suggesting that targeting aversive 'traumatic' memories with EMDR may have benefits for individuals with a broader range of conditions. The last years, multiple randomized controlled studies and case series involving EMDR have been carried out, showing that it may be effective for a broad range of disorders including chronic pain, depression, psychosis, obsessive compulsive disorder, and eating disorders (Maxfield, 2019; Matthijssen et al., 2020) However, research for youth on this topic is lacking.

In youth mental health care settings, therapists are regularly confronted with adolescents suffering from major depressive disorder (MDD), who do not react with (sufficient) symptom decreases or do not recover following the use of one or more first-line psychological treatments as CBT and interpersonal psychotherapy. MDD is a highly prevalent condition in adolescents (14–25%; Ryan 2005; National Institute of Mental Health, 2017) and one of the leading causes of disability being associated with burden of disease, poor functioning and high costs (Mullen, 2018). Although there are several treatments for adolescent MDD, of which CBT is the most frequently studied, current treatments show limited effectiveness (mean effect size = .29), including high rates of dropout and relapse post-treatment (Weisz et al., 2017). Therefore, there is an urgent need to develop, test and disseminate additional treatments that may be effective for adolescent MDD. Given the role that distressing emotionally laden memories play in depression, the high prevalence of MDD in adolescents, and limitations of existing treatment, we tested the effectiveness of EMDR therapy as a stand-alone treatment for adolescent MDD in a pilot, non-controlled study with depressed adolescents (see Chapter 5).

## Characteristics of the studies in this thesis

- Given the fact that the pediatric PTSD studies in this thesis started before the release of the DSM-5 (APA, 2013), the data and results of in this thesis are based on the definition of PTSD in the Diagnostic and Statistical Manual of Mental Distorders, 4th edition, Test Revision (DSM-IV-TR, American Psychiatric Association, 2000). For differences between DSM-IV-TR and DSM-5 see text in Box 1.1.
- Our main target is to determine the effectiveness of therapy as indexed by changes in symptom severity and diagnostic status following three trauma-focused treatments (EMDR therapy, CBT and CBWT) involving children and adolescents with PTSD or subthreshold PTSD (Chapter 2 and 3) and following EMDR therapy in adolescents with MDD (Chapter 5).
- All studies are performed in outpatient child and adolescent mental health clinics with treatment-seeking youth. Given that most children with PTSD and MDD have significant levels of diagnostic comorbidity, broad inclusion criteria were used to increase the external validity of the results. Furthermore, we used multiple informants (i.e., children, parents and clinicians) to assess symptomatology and assessors blinded to participant's treatment condition.
- The format of the intervention in all studies is individual, child-focused therapy, although the first study (Chapter 2, de Roos et al., 2011) included parallel sessions for the parents.

- To ensure treatment fidelity, all evaluated treatments are manualized and provided by experienced trauma therapists, who were supervised during the treatment phase by officially registered consultants for trauma-focused CBT and EMDR therapy.
- Besides efficacy and efficiency in the short term (post-treatment), follow-ups were conducted either at three months (Chapters 2 & 3) and one year after treatment (Chapter 3).

**Box 1.1**
**Differences in diagnostic criteria for PTSD between DSM-IV-TR and DSM-5**

The latest revision of the diagnostic criteria for PTSD in DSM-5 acknowledged the need for greater clarity in the trauma criteria (A), as well as the need for additional symptoms and a new symptom cluster, and two subtypes (APA, 2013). The trauma criterion (A) was refined to better specify what constitutes a trauma and the range of ways in which people are traumatically exposed. Three new symptoms were added, two to a new symptom cluster (criterion C) that now includes difficulties recalling aspects of the trauma, negative trauma-related beliefs, persistent negative/low mood, loss of interest in pre-trauma activities, constricted affect, and social alienation. Risky or destructive behavior was added to what was the arousal cluster in DSM-IV and is now renamed. Thus, in DSM-5 the PTSD symptom criteria have increased from 17 to 20 symptoms, arranged in a four-cluster symptom structure: B – intrusion; C – avoidance; D – negative alterations in cognitions and mood; and E – trauma-related alterations in arousal and reactivity. For the first time, the DSM PTSD criteria includes a dissociative subtype and separate trauma and symptom criteria for children aged 6 years or younger (PTSD Preschool Subtype). For the latter, DSM-5 acknowledges that events involving significant disruption to the caregiver-child relationship are potentially traumatic for younger children and the need for more behaviorally focused and developmentally appropriate symptom criteria in this age range. Thus, symptoms dependent on the verbalization of cognitive constructs and complex emotional states are excluded. Finally, recognizing the unique role of exposure to trauma and stress in the onset of a wide range of non-anxiety symptoms, PTSD and Acute Stress Disorder were removed from the anxiety disorders section and placed in a new section, Trauma and Stress Related Disorders, that includes Adjustment Disorder, Reactive Attachment Disorder, and Disinhibited Social Engagement Disorder (APA, 2013).

### Outline of this thesis

In **Chapter 1** the general introduction is presented and background information is provided. **Chapter 2** describes the results of a single-blind, mono-center randomized controlled study (de Roos et al., 2011) with two arms: EMDR therapy and a form of trauma-focused CBT that was widely used in child and adolescent mental health services in the Netherlands (i.e., "Opvangprotocol"). The participants were 52 treatment-seeking youth (aged 4–18 years) who were exposed to a single-event trauma (explosion at a Dutch firework factory) and had clinically significant symptoms of PTSD. Participants were offered up to four, one-hour sessions in each treatment condition, with additional parallel sessions offered to parents. Outcomes were assessed at post-treatment and at a three-month follow-up. **Chapter 3** describes the results of a single-blind, multi-center randomized controlled trial with three arms: EMDR therapy, cognitive behavior writing therapy (CBWT), and a wait-list where participants were subsequently re-randomized to the other two treatments after six weeks (WL). Participants were 103 treatment-seeking youth (aged 8–18 years) who have been exposed to single event traumas, with a DSM-IV diagnosis of PTSD (or subthreshold PTSD). They received up to six sessions, lasting up to 45 minutes each, of individual, child-focused EMDR or CBWT. No separate sessions were offered to parents in either treatment arm. Outcomes were assessed 4 times during the study, at baseline, at post-treatment and at 3- and 12-month follow-ups. Next, in **Chapter 4**, we address the results of a study which used data from the randomized controlled trial described in Chapter 3 (de Roos et al., 2017) to identify potential predictors and moderators of outcome in EMDR therapy and CBWT. In **Chapter 5** we describe the results of a pilot feasibility study evaluating the efficacy of EMDR therapy for adolescents with major depressive disorder (MDD). Participants were 32 treatment-seeking adolescents with MDD (aged 12–18 years) who received up to six sessions, up to 60 minutes in length, of EMDR therapy as a stand-alone treatment. Outcomes were examined at post-treatment and at a 3-month follow-up. **Chapter 6** presents a general discussion of the results, including their implications for future studies and clinical practice. **Chapter 7** provides a summary of the results of the included studies in English and Dutch.

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# 2

# A randomised comparison of cognitive behavioural therapy (CBT) and eye movement desensitisation and reprocessing (EMDR) in disaster-exposed children

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## ABSTRACT

**Background:** Building on previous research with disaster-exposed children and adolescents, a randomised clinical trial was performed in the treatment of trauma-related symptoms. In the current study two active treatments were compared among children in a broad age range and from a wide diversity of ethnic populations.

**Objective:** The primary aim was to compare the effectiveness and efficiency of Cognitive Behavioural Therapy (CBT) and Eye Movement Desensitisation and Reprocessing (EMDR).

**Design:** Children ($n$ = 52, aged 4–18) were randomly allocated to either CBT ($n$ = 26) or EMDR ($n$ = 26) in a disaster mental health after-care setting after an explosion of a fireworks factory. All children received up to four individual treatment sessions over a 4–8 week period along with up to four sessions of parent guidance. Blind assessment took place pre- and post-treatment and at 3 months follow-up on a variety of parent-rated and self-report measures of post-traumatic stress disorder symptomatology, depression, anxiety, and behaviour problems. Analyses of variance (general linear model repeated measures) were conducted on the intention-to-treat sample and the completers.

**Results:** Both treatment approaches produced significant reductions on all measures and results were maintained at follow-up. Treatment gains of EMDR were reached in fewer sessions.

**Conclusion:** Standardised CBT and EMDR interventions can significantly improve functioning of disaster-exposed children.


**Keywords:** Randomised controlled trial; eye movement desensitisation and reprocessing (EMDR); cognitive behavioural therapy (CBT); post-traumatic stress disorder (PTSD); disaster

## INTRODUCTION

Disaster-exposed children often experience symptoms of post-traumatic stress-disorder (PTSD), depression, anxiety, and behavioural problems, which may persist for years thereby potentially disrupting biological, psychological, and social development (Goenjian et al., 2001, 2005; La Greca, 2008; Yule et al., 2000). Despite the enormous public health significance of this problem and the value of making effective intervention available (Cohen et al., 2006), very few randomised controlled studies on treatment of disaster-exposed children have been reported.



Chemtob, Nakashima, and Hamada (2002) provided 248 hurricane-exposed elementary school children a series of four individual or group sessions of psycho-education and graded exposure. Compared to the waiting list control group, treated participants reported significant reductions in trauma symptoms that were maintained at 1-year follow-up. Thirty-two participants who still met criteria for PTSD were later randomised to three sessions of eye movement desensitisation and reprocessing (EMDR) or to a waiting list control group. Compared to the control group, those receiving EMDR showed significant reductions of PTSD symptoms, anxiety, and depression with improvements maintained at 6-month follow-up (Chemtob, Nakashima, & Carlson, 2002). Four months after Hurricane Katrina in 2005, 56 children (7–12 years old) with moderate to severe levels of post-traumatic stress symptoms were randomly assigned to 10 sessions of group or individual trauma/grief-focused treatment combining cognitive-behavioural and narrative strategies plus one parent meeting (Salloum & Overstreet, 2008). Participants in both conditions showed significant post-treatment decreases in symptoms of post-traumatic stress, depression, traumatic grief, and distress. In another study after Hurricane Katrina, 118 children (9–15 years old) were randomly allocated to individual Trauma-Focused Cognitive Behavioural Therapy (TF-CBT; 12 sessions) at a mental health clinic and a group CBT intervention (10 group sessions and 1–3 individual sessions) at school (Jaycox et al., 2010). Both interventions led to significant symptom reduction of PTSD symptoms, but many still had elevated PTSD symptoms at post-treatment. Finally, 31 children (8–14 years old) with a preliminary diagnosis of PTSD subsequent to war and the tsunami in north-eastern Sri Lanka were randomly assigned to six sessions of either narrative exposure therapy for children (KIDNET) or meditation– relaxation (Med-Relax; Catani et al., 2009). At 6-months follow-up, recovery rates were 81% for the children in the KIDNET group and 71% for those in the Med-Relax group (not significantly different).

The most common treatments for child PTSD are CBT and EMDR with a greater research base for CBT and related approaches (Adler-Nevo & Manassis, 2005; La Greca, 2008;

Stallard, 2006). Although both treatments have been proven to be efficacious in children and adolescents with post-traumatic stress reactions, only one direct comparison has been published. Jaberghaderi, Greenwald, Rubin, Zand, and Dolatabadi (2004) randomised 14 sexually abused Iranian girls (ages 12–13) to EMDR or CBT. Participants in both groups showed significant post-treatment reductions in post-traumatic stress symptoms. The EMDR group used fewer sessions. However, this study had many limitations including a small sample size, a single therapist for each treatment condition, and no verification of treatment fidelity.

A large fireworks factory exploded in Enschede, the Netherlands on May 13, 2000 killing 22 people, injuring many, destroying more than 500 houses, and damaging 1,500 more. In total about 10,000 people were affected, of which the number of children and adolescents is unknown. One-third of the affected area's inhabitants were first- and second-generation immigrants mostly of Turkish origin (Committee Oosting, 2001). The primary aim of the present study was to compare the effectiveness of an exposure-based cognitive behavioural treatment (CBT, "opvangprotocol") – the most widely used treatment for pediatric PTSD in the Netherlands – and EMDR among disaster-exposed children. The second aim of the present study was to compare the efficiency of both treatments, because a treatment's efficiency has direct consequences for health resource utilisation and costs and may also affect client retention and satisfaction.

## METHOD

### Participants

This field study was initiated 6 months after the fireworks factory exploded and ran from 2001 to 2004 at the disaster mental health after-care centre Mediant in Enschede, the Netherlands. Inclusion criteria were: (1) aged between 4 and 18 years, (2) having firework disaster-related symptoms, and (3) willingness to participate voluntarily. Exclusion criteria were: (1) problems were not disaster-related, (2) severe psychiatric conditions occurred requiring an emergency response (suicidal intent, psychosis), or (3) he/she was already receiving psychotherapy elsewhere. Use of such broad inclusion criteria is common in field studies and is deemed to strengthen their ecological validity.

Recruitment occurred as a routine procedure when parents approached Mediant for help with their children. Of the 133 children and adolescents assessed for eligibility, 13 (9.8%) reported symptoms that were not disaster-related, 6 (4.5%) only requested consul-

tation (the parents), 22 (16.5%) did not show up after the first contact, 18 (13.5%) refused participation to the study, 14 (10.5%) were excluded for an unknown reason, and 8 (6%) because another treatment was indicated. The 52 survivors were randomly allocated to EMDR (*n* = 26) and CBT (*n* = 26). The trial profile is shown in Figure 2.1.



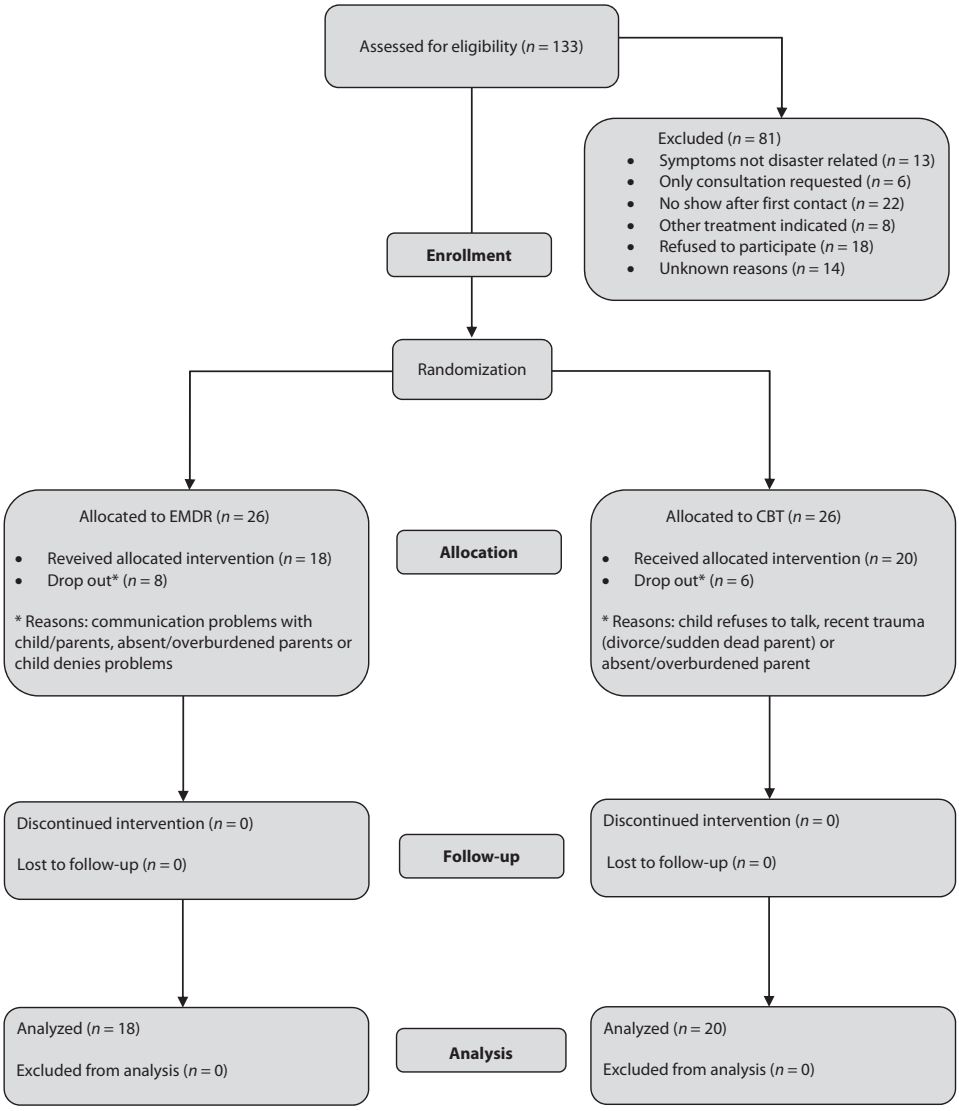


**Figure 2.1: Flow of participants through the study.**

## Procedure

The protocol and informed consent form had been approved by the local ethics committee. Children were first screened by a senior psychologist who conducted the initial interview meant for gathering of information on medical and psychiatric history including trauma history. The results of the screening were discussed by the fireworks after-care team. If they agreed that symptoms were disaster-related and the child fulfilled other inclusion criteria for this study, they were eligible to participate. Written consents were obtained. The manager of the after-care team then randomised participants to either CBT or EMDR by flipping a coin and assigned participants to therapists on the basis of availability. Assessments pre-treatment, post-treatment, and at follow-up were conducted by one independent assessor who was blind to the treatment conditions. Parents completed paper-and-pencil measures at pre-treatment, post-treatment, and at follow-up, and only children of 7 years and older completed self-report measures.

Both CBT and EMDR treatment were manualised to ensure that the respective interventions were standardised across clinicians. Psycho-education regarding explanation of post-traumatic symptoms and the treatment were part of both methods. Both CBT and EMDR entailed a focus on the identified disaster-related trauma memory. To equalise the treatment conditions, the therapist was allowed to treat other trauma memories if they spontaneously arose while working with the index trauma but was not allowed to systematically work through all trauma memories as might normally be done by some therapists (but not others) in clinical practice. Participants received up to four individual weekly sessions of 60 min duration. As in clinical practice, termination criteria were: (1) children were asymptomatic according to participant and parent verbal report, and (2) therapist and child (> 12 years)/parents agreed that no additional sessions were necessary. When there were still severe complaints after four sessions, the multidisciplinary team could decide to offer more trauma treatment. Three participants were referred for additional treatment (not trauma-related) after the research protocol was completed: one in the EMDR condition and two in the CBT condition.

Because parent guidance is an integral part of treatment for child and adolescent trauma, parents in both groups attended up to four sessions provided by the child's therapist or by a trained colleague. Parent sessions were typically held on the same day as the child sessions and were discontinued upon termination of the child's treatment. The child plus parent sessions in each treatment condition provided a total of up to 8 hours of treatment.

## Interventions

### *CBT*

The exposure-based CBT intervention (originally *opvangprotocol*; Eland, de Roos, & Kleber, 2002; see Table 2.1) was the predominant trauma treatment available to children in the Netherlands at the time of the study. The most important elements of the treatment are psycho-education about trauma and its effects, repeated exposure to the trauma memory via the development of a detailed trauma narrative, cognitive restructuring, exploring and correcting undesired or unhelpful coping behaviour, and relapse prevention. The trauma narrative is constructed over the course of several sessions by having the client describe the trauma in detail including thoughts, feelings, images/sensations, and events as they occurred. If the narrative exposure did not by itself lead to changes in dysfunctional trauma-related beliefs or behaviours, cognitive restructuring and advice about changing unhelpful coping behaviour was provided. Conjoint parent–child feedback is a common element in all sessions, giving children an opportunity to share their trauma narratives and other aspects of the session with their parents. Because of the wide age range of our sample, developmentally appropriate modifications were incorporated into the child sessions. This primarily involved using age-appropriate language to describe the events and its effects in the narrative, add drawings where necessary to the narrative to increase detail and clarity, and using age-appropriate language to provide advice about changing dysfunctional beliefs and coping skills. The applicability of this CBT protocol had previously



**Table 2.1: Overview of child session by session content for CBT and EMDR**

| Session | EMDR | CBT |
|---|---|---|
| 1 | • Psycho-education<br>• EMDR protocol on target memory with highest level of disturbance | • Psycho-education<br>• Exposure to the trauma memory via development of trauma narrative |
| 2 | • Finishing reprocessing previous target, or start reprocessing next target memory | • Exposure to the trauma memory via development of trauma narrative<br>• Cognitive restructuring and exploring and correcting undesired or unhelpful coping behaviour |
| 3 | • Finishing reprocessing previous target, or start reprocessing next target memory | • Exposure to the trauma memory via development of trauma narrative<br>• Cognitive restructuring and exploring and correcting undesired or unhelpful coping behaviour |
| 4 | • Finishing reprocessing previous target, or start reprocessing next target memory | • Relapse prevention |

been examined in a feasibility study (*N* = 47, age 4–18, single trauma) and showed that it was effective in reducing post-traumatic stress reactions and behaviour problems (Eland, de Roos, & Kleber, 1999).

***EMDR treatment***

EMDR is a treatment for traumatic memories and their sequelae requiring the client to attend a distracting (or "dual attention") stimulus (typically the therapist's fingers moving back and forth in front of client's face and sometimes audio tones or hand taps are used) while concentrating on the trauma memory (Shapiro, 2001). Briefly, EMDR treatment consists of (1) Taking history and planning treatment. (2) Explanation of and preparation for EMDR. (3) Preparation of the target memory. The client is asked to focus on the worst moment of the memory in a multi-modal manner including image, thought, emotion, and physical sensation. (4) Desensitisation of the memory. The therapist asks the patient to hold the target image in mind while concentrating on the stimulus for about 30 seconds. The client reports briefly what comes up and is guided by the clinician to refocus on that during further exposure to the distracting stimulus. This continues until the client reports no remaining distress related to the memory. (5) Guiding the client to embrace a relevant positive belief regarding the event. (6) Identification and processing of any residual disturbing body sensations. (7) Closure of the session. (8) Re-evaluation, in which the patient comments on previously processed targets as a basis for guiding further intervention. The EMDR procedure in the present study was based on Shapiro's (2001) protocol, with age-appropriate modifications suggested by Tinker and Wilson (1999) and Greenwald (1999). In this study, mainly the therapist's moving hand was used as the distracting stimulus.

***Parent guidance***

Parent guidance sessions were equivalent across treatment conditions. Goals of the parent guidance were to resolve parents' own emotional upset about the child's traumatic exposure and to correct cognitive distortions that the parents may have had. Parents also received psycho-education and advice on enhancing effective parenting and appropriate parental support, affective expression, and correcting of undesired coping behaviour of their child.

## Therapists and training

Treatment was conducted by eight licensed therapists (three psychotherapists, two psychologists, and two registered psychiatric social workers). Each of the therapists treated at least one participant in each condition, and up to seven participants in total. All clinicians

were trained in both treatments by the first author, a co-developer of the CBT protocol, and an expert on EMDR for children.

***Treatment adherence***

Several actions were taken to support and evaluate treatment adherence.

***Supervision***

Once a month the first author provided a full day (six contact hours) of group supervision to the clinicians on both methods. Supervision was also frequently provided by e-mail to ensure that therapists received supervision during the course of treatment with each participant.



***Session checklist forms***

To optimise treatment adherence, clinicians were required to follow detailed session checklist forms filling in client responses. These forms laid out each session in a step-by-step sequence of interventions, consistent with the instructions in the respective treatment manuals.

***Fidelity ratings***

Due to the lack of funding, taping of sessions was not possible. To evaluate treatment adherence, 25% of the completed session forms were randomly selected (blocked for equal sampling from each therapist and each treatment). The overall mean treatment integrity score (maximum was 100) was 98 for EMDR (*SD* = 6.9) and 96 for CBT (*SD* = 6.3). Interrater reliability was high (Cohen's kappa: .96).

## Measures

***Primary outcome measures***

The *UCLA PTSD Reaction Index* (PTSD-RI) for *DSM–IV* has been extensively used to assess children's trauma exposure and post-traumatic stress symptoms across a variety of trauma types, age ranges, settings, and cultures (Steinberg, Brymer, Decker, & Pynoos, 2004). In the present study, child and adolescent forms were used as a self-report scale with children from the age of 6 and older. The parent version was used for all ages. The disaster-related index event was the focus of the responses. A cutoff of 38 or greater for a single incident traumatic event has been found to have the greatest sensitivity and specificity for detecting PTSD (Steinberg et al., 2004). In the present study Cronbach's alpha was .85.

The *Child Report of Post-traumatic Symptoms* (CROPS; Greenwald & Rubin, 1999) is a 26-item self-report questionnaire not referenced to a specific event, covering a broad spectrum of children's post-traumatic symptoms. The CROPS has shown good validity and reliability with children ages 7–17 in several settings and languages as well as sensitivity to change in post-traumatic status (Greenwald et al., 2002). We did not use the CROPS with the younger children because of concerns about item comprehension. In the present study Cronbach's alpha was .89.

The *Parent Report of Post-traumatic Symptoms* (PROPS, Greenwald & Rubin, 1999) is a 32-item companion measure to the CROPS, with similar validity with children ages 7–17 (Greenwald et al., 2002). We used the PROPS with all participants because the PROPS symptoms apply also to younger children and because downward age extension has been successful in clinical practice. In the present study Cronbach's alpha was .90.

***Secondary outcome measures***

The *Birleson Depression Scale* (BDS; Birleson, 1981) was used to assess the degree of depression. This self-report inventory consists of 18 items with a three point scale. The BDS has shown satisfactory internal consistency and stability (Ivarsson & Gillberg, 1997). In the present study Cronbach's alpha was .78.

The *Multidimensional Anxiety Scale for Children* (MASC; March, Parker, Sullivan, Stallings, & Conners, 1997) is a 39-item self-report measure of anxiety symptoms in children and adolescents, aged 7–18. The MASC demonstrated good convergent and divergent validity (March et al., 1997). In the present study, Cronbach's alpha was .88.

The *Child Behaviour Check List* (CBCL; Achenbach, 1991) is a widely used 118-item behaviour rating scale for children ages 4–18, where parents rate their child's behavioural problems. It has very acceptable reliability and validity. Verhulst, van der Ende, and Koot (1996) reported Cronbach's alphas of .85, .86, and .92 for internalising, externalising, and total scores, respectively.

## Statistical analyses

Analysis of variance and the descriptive statistics were performed with SPSS 14.0 for Windows. Pre-treatment (baseline) demographic characteristics, clinical variables, and extent of exposure to the Enschede disaster were compared between the two treatment conditions using independent *t*-tests for continuous variables and Chi-square tests for categorical variables. The data were analysed using analysis of variance (GLM: general linear model, repeated measures). Time (pre-treatment, post-EMDR/CBT, and follow-up) was used

as a within-subject variable, and treatment (CBT or EMDR) as a between-subject variable. Two types of analyses were performed. Primary analyses were performed on the intention-to-treat sample using data from all randomised participants, while secondary analyses were performed using data from subjects who completed treatment. In the intention-to-treat analysis we replaced outcome data that were missing due to dropout using multiple imputations by fully conditional specification (Van Buuren, 2007). The imputation model was specified for 44 outcomes. Predictors in the imputation model included age, sex, treatment, treatment of parents, and ethnicity as well as other outcomes and were set up such that both relations between and within time were preserved. Five complete data sets were made by 20 Gibbs sampling iterations in Multivariate Imputation by Chained Equations (MICE; Van Buuren & Oudshoorn, 2000).



All GLM analyses were repeated for each set. Pooling of statistical parameters was done by Rubin's rules (Rubin, 1987). Pooling of ANOVA tables was done by the procedure of Li, Meng, Raghunathan, and Rubin (1991) applied to the *F*-statistic. Post hoc analysis also employed the effect size (ES) of the change using Cohen's *d* (Cohen, 1992). To correct for dependence among means in order to make direct comparisons to effect sizes from between-subjects studies, we used the correlation between the two means so that Morris and DeShon's (2002) equation can be applied. An effect size .50 is considered small, between .50–.80 is considered moderate, and > .80 is considered large. For all statistical analyses, a *p*-value < .05 was considered statistically significant.

A time-to-event analysis for treatment efficiency was done for three outcomes: number of child sessions, number of parent sessions, and the sum of these two. The analysis was performed by Cox regression using the number of sessions as the outcome, dropout as the censoring indicator, and treatment group as the explanatory variable. Ties were handled by the Efron approach. Additional covariates (age, sex, and indicators of trauma severity) were included to see whether these explain any observed differences in efficiency. The covariate trauma severity was measured by the following indicators: "present in inner ring" (yes/no), "thought I would die" (yes/no), "separated from parents" (yes/no), "house damaged or lost" (yes/no). We tested for proportionality of the hazards by weighted residuals approach of Therneau and Grambsch (2000). Calculations were done with the cox.zph function in R2.11.1. None of the terms of the model was significant at the .5 level. The data thus do not contradict the assumption of proportional hazards.

# RESULTS

## Descriptive statistics

In Table 2.3, demographic characteristics and clinical variables by treatment group are shown. Of the 52 children included in the study, 23% ($n = 12$) fell within the age range 4–6 years, 46% ($n = 24$) fell in the age range of 7–12 years, and 31% ($n = 16$) were aged 13–18 years. Of the total group, 55.8% were boys. A large proportion (47%) belonged to an ethnic minority group comprising Turkish (32%) and other ethnic origins, although 83% of the children were born in the Netherlands. Most of the participants were considered to have had "severe" exposure to the fireworks disaster (see Table 2.2). In the brief lifetime trauma screen (UCLA), 32.7% reported no other significant history of trauma exposure, 25%

**Table 2.2: Extent of exposure to Enschede disaster by treatment group ($N = 52$)**

| Variable | CBT $n = 26$ | EMDR $n = 26$ | Comparison |
|---|---|---|---|
| Present in inner ring | 17 | 20 | $\chi^2 = 2.35$, $df = 1$, ns |
| Thought that he/she was going to die | 17 | 17 | $\chi^2 = .00$, $df = 1$, ns |
| Separated from one of parents | 23 | 21 | $\chi^2 = .27$, $df = 1$, ns |
| Home damaged or lost | 17 | 14 | $\chi^2 = 1.47$, $df = 3$, ns |
| Parent severely injured | 0 | 3 | $\chi^2 = 3.18$, $df = 1$, ns |
| Injured her/himself | 2 | 5 | $\chi^2 = 1.65$, $df = 1$, ns |
| Family member died | 1 | 1 | $\chi^2 = .01$, $df = 1$, ns |
| Number of trauma's (Enschede disaster included) | 2.8 | 2.3 | $F = 3.01$, $df = 50$, ns |

**Table 2.3: Demographic characteristics and clinical variables by treatment group ($N = 52$)**

| Variable | CBT $n = 26$ | EMDR $n = 26$ | Comparison |
|---|---|---|---|
| Age | 10.0 | 10.2 | $t = .24$, $df = 1$, ns |
| *SD* | 4.1 | 4.0 | |
| Gender | | | |
| Male | 16 | 13 | $\chi^2 = .70$, $df = 1$, ns |
| Female | 10 | 13 | |
| Ethnicity | | | |
| Native | 14 | 11 | $\chi^2 = .69$, $df = 1$, ns |
| Immigrant | 12 | 15 | |
| Parents in treatment | | | |
| Yes | 13 | 12 | $\chi^2 = .08$, $df = 1$, ns |
| No | 13 | 14 | |

reported at least one other significant past trauma event, and 42.3% reported two or more prior traumatic events. The mean number of experienced traumatic events (the firework disaster included) was 2.4 (*SD* = 1.31). On the UCLA parent form, 17.3% of participants met full criteria of PTSD, and 59.6% met criteria for partial PTSD (i.e., criterion A met, and criteria (B+C) or (B+D) or (C+D).



## Pre-treatment differences

Pre-treatment assessment showed no differences between both treatment groups (intention to treat) on any of the demographic variable (see Table 2.2) and outcome measures except for the UCLA parent version ($t = 2.5$, $df = 50$, $p = .02$). Because data were collected over a 3-year period, which equated a range of participants receiving treatment 1–4 years post-disaster, time since disaster in relation to impact of treatment and/or severity of symptoms at pre-treatment was examined. The relation between "time since disaster" and "severity of symptoms" was positive on all measures, indicating that the longer after the disaster children were referred for treatment, the more severe the symptoms were. However, none of the regression weights were significantly different from zero. In addition, the regression weight relating "time since disaster" and "impact of treatment" was not significant.

## Dropout analysis

Of the 52 initial participants 14 (27%) dropped out: 8 (30.8%) from the EMDR group and 6 (23.1%) from the CBT group. The dropout rate was not significantly different across both groups ($\chi^2 = .39$, $df = 1$, $p = .53$). Thirty-eight children completed both the treatment and the follow-up (18 EMDR, 20 CBT). Of them, 21 were boys (55.3%). The main reason given for dropping out was that the parents were overburdened (57%). Other reasons for dropping out were: refusing to talk (7%), language problems (7%), and a new trauma rising to the forefront (14%). One adolescent refused treatment from a therapist not belonging to his own culture (7%) and one child showed spontaneous recovery before treatment started (7%). Dropout occurred in the very beginning before treatment was started and seemed to be unrelated to the treatment condition. For this group that did not receive the allocated treatment, it was attempted to conduct the assessments post-treatment and at follow-up, albeit without success. Comparison between the 14 dropouts and the 38 completers regarding presentation at time of initial assessment yielded no significant differences on any of the demographic characteristics or number of traumatic experiences (UCLA parent version, trauma screen). On the symptom scales, only the mean score of the PROPS was

marginally significantly higher for the dropout group than for the treatment completers ($t = 2.09$, $df = 48$, $p = .04$).

## Intention-to-treat analysis regarding change over time and intervention effects

Repeated measures analysis of variance of treatment outcome after treatment ($n = 52$) and at follow-up ($n = 52$) indicated a significant time effect (all $p$-values < .001) and no interaction effect between time and treatment condition for all measures ($p$-values between .11 and .51). This indicates that both CBT and EMDR were effective and that neither was significantly more effective than the other in reducing symptoms of PTSD, anxiety, depression, or behavioural problems. Findings remained the same when the analysis was repeated for native and immigrant children separately. Table 2.4 shows means and standard deviations for both treatment groups pre-treatment, post-treatment, and follow-up on all measures. At post-test, 0% met criteria of full PTSD and partial PTSD. At follow-up there was a slight increase: 5.8% met full criteria of PTSD and 0% met criteria for partial PTSD. The fraction of missing information of the estimates in Table 2.4 varied between 0 and .05. Since all are well below .10, the choice for $m = 5$ multiple imputations was adequate (Schafer, 1997, p. 198–200).

## Effect sizes

Table 2.4 also shows the effect sizes related to the various measures for the intention-to-treat sample concerning pre-treatment versus post-treatment and pre-treatment versus follow-up. Large effect sizes were found for both treatments on all but one outcome measures, which ranged for T1–T2 in the EMDR condition between .92 and 1.23 and in the CBT condition between .62 and 1.40. Effect sizes calculated for T1–T3 ranged in the EMDR condition between .88 and 1.62 and in the CBT condition between .80 and 1.27.

## Completer analysis

Among participants providing outcome data, 20 in the CBT group and 18 in the EMDR group completed treatment. Results were similar to the results of the intention-to-treat analysis showing that both treatment groups improved significantly on all measures (all $p$-values < .001). No interaction effect between time and treatment condition emerged ($p$-values between .09 and .69).

**Table 2.4: Means and SDs of measures for EMDR (*n* = 26) and CBT (*n* = 26) groups at pre-test, post-test, and follow-up, including corresponding effect sizes for the intention-to-treat sample**

| Variable | Pre-test T1 | Post-test T2 | Follow-up T3 | Effect size T1–T2 | Effect size T1–T3 |
|---|---|---|---|---|---|
| PROPS | | | | | |
| EMDR | 30.5 (11.5) | 17.7 (9.6) | 19.2 (13.1) | 1.08 | 1.01 |
| CBT | 34.7 (12.8) | 19.5 (11.7) | 21.3 (13.3) | 1.40 | 1.20 |
| CROPS* | | | | | |
| EMDR | 23.3 (9.9) | 12.0 (9.1) | 11.2 (8.0) | 1.02 | 1.10 |
| CBT | 22.7 (9.6) | 12.3 (8.1) | 11.9 (8.3) | 1.16 | .98 |
| UCLA Ch/Ad Total* | | | | | |
| EMDR | 31.4 (12.3) | 16.1 (9.1) | 14.2 (9.0) | 1.23 | 1.44 |
| CBT | 30.5 (10.4) | 16.9 (9.6) | 16.7 (9.3) | 1.06 | 1.27 |
| UCLA Par. Total | | | | | |
| EMDR | 31.3 (10.5) | 20.2 (9.6) | 15.6 (10.4) | 1.00 | 1.62 |
| CBT | 38.5 (8.2) | 22.8 (10.5) | 24.6 (11.9) | 1.38 | 1.07 |
| Birleson* | | | | | |
| EMDR | 13.5 (5.5) | 7.8 (5.2) | 6.5 (5.3) | .92 | 1.04 |
| CBT | 14.2 (6.3) | 7.6 (5.0) | 8.6 (6.0) | 1.09 | .80 |
| MASC Total* | | | | | |
| EMDR | 53.8 (17.7) | 33.1 (14.9) | 33.3 (17.4) | 1.12 | 1.02 |
| CBT | 47.6 (16.8) | 33.8 (18.9) | 31.6 (18.4) | .62 | .85 |
| CBCL Total | | | | | |
| EMDR | 56.3 (29.1) | | 36.7 (24.5) | | .88 |
| CBT | 56.3 (23.5) | | 41.8 (25.0) | | .87 |

UCLA Par. Total means UCLA Parent version Total, UCLA Ch/Ad Total means UCLA Child/Adolescent version.
* Lower *n* as children under 7 years did not complete these self-report measures: EMDR (*n* = 21), CBT (*n* = 19).

## Efficiency

In order to assess whether one of the treatment methods produced greater treatment gains with fewer appointments, the mean amount of sessions per group was calculated. The mean number of child sessions needed was 3.17 (*SD* = .86, range 2–5) in the EMDR group and 4.00 (*SD* = 1.03, range 2–7) in the CBT group ($t = 2.7$, $df = 36$, $p = .011$). Prior to session 4, 20% of the children in the CBT group and 66.6% in the EMDR group were asymptomatic. The time-to-event analysis showed that EMDR was more efficient than CBT in both the plain analysis (hazard ratio [HR]: .34 [.17–.67] 95% CI) and after correction for age, sex, and trauma severity (HR .33 [.15–.73]). The mean number of parent sessions was 3.11 (*SD* =1.53, range 0–5) for EMDR and 3.55 (*SD* =1.32, range 0–7) for CBT (not significant). The time-to-event analysis yielded a similar result (HR: .77 [.40–1.46]). The mean number of child and parent sessions summed together (EMDR 6.28, CBT 7.55) showed a significant difference

in favour of the EMDR group ($t = 2.16$, $df = 36$, $p = .038$). The corresponding plain time-to-event analysis produced a hazard ratio of .43 [.22–.85]. The ratio changed to .50 [.22–1.12]) after correcting for age, sex, and trauma.

## DISCUSSION

To our knowledge this was the first randomised controlled study for children's disaster-related post-traumatic stress symptoms comparing two active treatments among children in a broad age range and from a wide diversity of ethnic populations. Apparently both CBT and EMDR are capable of substantially reducing children's symptoms of post-traumatic stress, anxiety, depression, and behavioural problems presenting in a community mental health setting. The post-treatment gains of both treatments were maintained at 3-months follow-up, while no side effects were reported. These findings are especially promising considering that the children and parents in the present study received together only six to eight sessions of 60 min each, indicating that brief treatment in this context can be highly beneficial. The results bode well in the light of the large treatment needs among traumatised children worldwide and are consistent with data on adult studies on CBT and EMDR, in that both methods were efficacious and that the effect sizes were substantial (Bisson et al., 2007; Seidler & Wagner, 2006). Although no significant differences between the treatments were found, this does not mean that differences can be excluded since the study may be underpowered.

The finding that treatment gains of EMDR were reached in fewer sessions than those of CBT is in line with some previous randomised controlled studies comparing CBT and EMDR (Jaberghaderi et al., 2004; Power et al., 2002). However, it is possible that this finding of difference in efficiency was an artefact of slight differences across conditions in the treatment fidelity and of the research design. In this study, the session durations were roughly similar across treatment conditions, but the number of min per session was not precisely tracked. It is therefore conceivable that the mean duration of the CBT sessions might have been shorter than that of the EMDR sessions.

A number of other limitations must be recognised when considering the present findings. First, the relatively small number of participants may have resulted in a lack of sufficient power and sensitivity to detect small differences between the groups. Second, the study lacked a no-treatment control group. Third, follow-up assessments were undertaken at only 3 months post-treatment, thereby limiting conclusions regarding the sustainability of the treatment gains over a longer time period. Finally, in this unfunded field study the

fidelity ratings were based on session checklists with no systematic review of session recordings to verify the therapists' documentation. Therefore, the current findings must be interpreted with due caution.

Methodological strengths of our trial include the inclusion of two active trauma treatments, validated measures with clearly defined target symptoms, multiple sources to detect the impact of treatment on multiple symptom domains, random assignment to treatment condition, the same therapists for both treatment conditions cancelling possible therapist effects, blind evaluation, detailed manual-guided treatment protocols, expert therapist training, supervision and therapist checklist forms to support treatment adherence, (limited) assessment and confirmation of treatment fidelity, and field conditions and inclusion criteria supporting ecological validity.



## Conclusions

The present results provide support for the effectiveness of both EMDR and CBT among a heterogeneous, multicultural sample of children and adolescents with disaster-related symptoms indicating the feasibility of implementing these treatments for children. A difference is found between EMDR and CBT for efficiency. More research is needed to confirm EMDR's efficiency advantage and to address the issue of comparative efficacy between these treatments for psychological trauma.

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# 3

# Comparison of eye movement desensitization and reprocessing therapy, cognitive behavioral writing therapy, and wait-list in pediatric posttraumatic stress disorder following single-incident trauma: A multicenter randomized clinical trial

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## ABSTRACT

**Background:** Practice guidelines for childhood posttraumatic stress disorder (PTSD) recommend trauma-focused psychotherapies, mainly cognitive behavioral therapy (CBT). Eye movement desensitization and reprocessing (EMDR) therapy is a brief trauma-focused, evidence-based treatment for PTSD in adults, but with few well-designed trials involving children and adolescents.

**Methods:** We conducted a single-blind, randomized trial with three arms ($n$ = 103): EMDR ($n$ = 43), Cognitive Behavior Writing Therapy (CBWT; $n$ = 42), and wait-list (WL; $n$ = 18). WL participants were randomly reallocated to CBWT or EMDR after 6 weeks; follow-ups were conducted at 3 and 12 months posttreatment. Participants were treatment-seeking youth (aged 8–18 years) with a DSM-IV diagnosis of PTSD (or subthreshold PTSD) tied to a single trauma, who received up to six sessions of EMDR or CBWT lasting maximally 45 min each.

**Results:** Both treatments were well-tolerated and relative to WL yielded large, intent-to-treat effect sizes for the primary outcomes at posttreatment: PTSD symptoms (EMDR: $d$ = 1.27; CBWT: $d$ = 1.24). At posttreatment 92.5% of EMDR, and 90.2% of CBWT no longer met the diagnostic criteria for PTSD. All gains were maintained at follow-up. Compared to WL, small to large (range $d$ = .39–1.03) intent-to-treat effect sizes were obtained at posttreatment for negative trauma-related appraisals, anxiety, depression, and behavior problems with these gains being maintained at follow-up. Gains were attained with significantly less therapist contact time for EMDR than CBWT (mean = 4.1 sessions/140 min vs. 5.4 sessions/227 min).

**Conclusions:** EMDR and CBWT are brief, trauma-focused treatments that yielded equally large remission rates for PTSD and reductions in the severity of PTSD and comorbid difficulties in children and adolescents seeking treatment for PTSD tied to a single event. Further trials of both treatments with PTSD tied to multiple traumas are warranted.


**Keywords:** Posttraumatic stress disorder; eye movement desensitization and reprocessing; cognitive behavioral writing therapy; single trauma; children and adolescents

## INTRODUCTION

Meta-analyses indicate that approximately 16% of traumatically exposed youth develop posttraumatic stress disorder (PTSD; Alisic et al., 2014). Untreated, childhood PTSD is associated with significant psychiatric comorbidity, functional impairment at the child and family level and persistence into adulthood (Kessler, Petukhova, Sampson, Zaslavsky, & Wittchen, 2012). To reduce the acute and long-term effects of trauma and PTSD, early and effective treatment is needed.

Practice guidelines for childhood PTSD (AACAP, 2010; NICE, 2005; WHO, 2013) recommend trauma-focused psychological therapies as the first-line approach, primarily trauma-focused cognitive behavioral therapies (TF-CBT), involving some combination of coping skills training, cognitive restructuring, therapist- and client-led exposure (imaginal and in vivo) and parent interventions, as these have the largest evidence base. Eye movement desensitization and reprocessing (EMDR) therapy is a brief, trauma-focused treatment for PTSD. The core feature of EMDR is that the patient holds a disturbing image from the trauma memory in mind while engaging in sets of saccadic eye movements (Shapiro, 2001). This method is recommended for use with adults (NICE, 2005; World Health Organisation, 2013), but with a more limited evidence base in youth. To date, there have been six randomized controlled comparison trials (RCTs) of EMDR with trauma exposed youth (aged 4–18 years), three of which used trauma-focused CBT as the active control group (De Roos et al., 2011; Diehle, Opmeer, Boer, Mannarino, & Lindauer, 2014; Jaberghaderi, Greenwald, Rubin, Zand, & Dolatabadi, 2004). The results suggest that both treatments are equally effective in reducing child- and parent-reported symptoms of PTSD and comorbid difficulties. However, sample sizes were relatively small ($n$ = 14–52) and the studies lacked no-treatment controls to correct for natural recovery. Also, Jaberghaderi et al. (2004) did not use blind assessors or independent fidelity checks; only one trial used diagnostic interviews (Diehle et al., 2014); and the longest follow-up was only three months (De Roos et al., 2011). Given the overall quality of the evidence for EMDR in youth was low, further comparative trials are needed (Gillies et al., 2016; Morina, Koerssen, & Pollet, 2016).

Consistent with previous RCTs, we chose a form of trauma-focused CBT as a comparison treatment, Cognitive Behavioral Writing Therapy (CBWT; Van der Oord, Lucassen, Van Emmerik, & Emmelkamp, 2010), a brief, child-friendly version of the adult, internet-based writing therapy for PTSD (INTERAPY; Lange et al., 2003). CBWT involves exposure to the trauma memory and restructuring of trauma-related beliefs through writing and updating of the trauma memory on a computer with the support of a therapist. In a pilot study of 23 youth (aged 8–18 years) seeking treatment for PTSD, an average of 5.5 sessions of CBWT

yielded large, within-group effect sizes for PTSD, trauma-related beliefs, depression, and behavior problems (Van der Oord et al., 2010). The choice of CBWT was guided by two factors: (a) at the time that this study began, manualized versions of trauma-focused CBT including TF-CBT (Cohen, Mannarino, & Deblinger, 2006) were not widely available in the Netherlands (cf., Diehle et al., 2014); and (b) like EMDR, CBWT can be brief because it focuses entirely on exposure and reprocessing of the trauma memory, and does not include various forms of coping skills training or parent-focused sessions as in TF-CBT.

The current trial was designed to fill gaps in the existing literature by assessing the efficacy of EMDR and CBWT for childhood PTSD tied to a single traumatic event, in a large treatment-seeking sample, using a delayed-treatment control group, and a longer follow-up period. We hypothesized that EMDR and CBWT would both be superior to delayed-treatment in achieving remission from PTSD and reducing child- and parent-reported symptoms of PTSD, anxiety, depression, and behavior problems; and gains in both treatments would be maintained at 3- and 12-month follow-ups.

# METHODS

## Study design and participants

This study was a multicenter, single-blind, parallel-group study with three arms: EMDR, CBWT, and wait-list (WL). Participants were recruited from among new referrals to seven child and adolescent mental health clinics spread across the Netherlands. Recruitment occurred over 2.5 years (September 2010 – March 2013; 1-year follow-up until June 2014). The study was approved by the Ethics Committee of the University of Amsterdam and registered in the Dutch Trial Register (www.trialregister.nl, 3870 or NTR3870).

## Inclusion and exclusion criteria

Participants were: (a) aged 8–18 years; (b) able to read/write and communicate in the Dutch language; and (c) had a primary DSM-IV diagnosis of PTSD or subthreshold PTSD, with the PTSD symptoms being tied to a single traumatic event that occurred at least one month prior to trial assessment. Subthreshold PTSD was defined in one of two ways: (a) exposure to a traumatic event (Criterion A) plus the presence of ≥ 5 symptoms with at least one symptom each from Criterion B (re-experiencing), Criterion C (avoidance and numbing), and Criterion D (hyper arousal), plus symptom duration of at least one month (Criterion E), and clinically significant impairment in at least one aspect of functioning

(Criterion F); or (b) Criterion A, plus fulfilling the minimum symptom requirements for two of the three symptom criteria (B, C or D), plus meeting Criterion E and F. Our decision to define subthreshold PTSD in two ways was based on previous trials where the 5-symptom definition was used (e.g. Mannarino, Cohen, Deblinger, Runyon, & Steer, 2012) and the literature that define caseness as a combination of symptoms from at least two diagnostic clusters (AACAP, 2010; Carrion, Weems, Ray, & Reiss, 2002).

Exclusion criteria were: (a) the presence of symptoms other than PTSD in more urgent need of treatment (e.g. suicidal intent/acts, acute psychosis); (b) ongoing exposure to a severe threat to the child's safety; (c) starting psychotropic medication within three months of trial assessment; (d) currently receiving another form of psychological treatment; and (e) an IQ estimated to be ≤ 80 based on information contained in the medical history or referral letter.



## Procedure

After baseline assessment and informed written consent, eligible youth were randomized to EMDR, CBWT, or WL using a parallel design, blocked randomization per therapist, with five randomizations per block in the ratio of 2:2:1 (EMDR: CBWT:WL). The allocation ratio was chosen to ensure a sufficient sample size in the WL group for meaningful statistical comparisons with EMDR and CBWT, and to withhold immediate treatment from as few participants as possible for ethical reasons. Cards with names of the trial arms were kept in sequentially numbered, identical, opaque, sealed envelopes. The cards in the envelopes were shuffled and drawn by an independent randomization-assistant who revealed the allocation to the therapist. After the 6-week wait, WL participants still meeting inclusion criteria were rerandomized to EMDR or CBWT in the ratio of 1:1. Assessments were carried out at baseline, posttreatment/wait-list, and 3- and 12-months posttreatment by independent assessors blinded to treatment allocation. Participants received financial compensation of 15 Euro's for completing all post- and follow-up measures.

## Primary outcome measures

(a) PTSD symptoms measured by the child and parent versions of the Revised Children's Responses to Trauma Inventory (CRTI; Alisic & Kleber, 2010); and (b) DSM-IV PTSD diagnostic status assessed by the Anxiety Disorders Interview Schedule, Child and Parent Version (ADIS-C/P; Silverman & Albano, 1996). ADIS-C/P interviews were conducted by seven clinical psychologists trained to use the ADIS-C/P to assess PTSD and who did not provide

trial treatments. All interviews were audiotaped and 10% randomly selected, stratified by assessor and time of measurement, so that a selection of pretreatment ($n$ = 18), posttreatment ($n$ = 12), and follow-up interviews ($n$ = 22) could be rerated by a psychologist with experience of carrying out ADIS-C/P interviews. Interrater reliability for PTSD diagnosis (including subthreshold) based on the ADIS-C/P was j = .822 (child interview) and j = .634 (parent interview). The Clinician Administered PTSD Scale – Child and Adolescent Version (CAPS-CA; Nader et al., 1996), a structured diagnostic interview often used in pediatric PTSD trials, had not been translated and validated in a Dutch version when this study began.

## Secondary outcome measures

(a) Children's Post Traumatic Cognitions Inventory (C-PTCI; Meiser-Stedman et al., 2009; Diehle, de Roos, Meiser-Stedman, Boer, & Lindauer, 2015); (b) Revised Child Anxiety and Depression Scale, Child and Parent Version (RCADS-C/P; Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000); (c) Strengths and Difficulties Questionnaire, Adolescent and Parent Version (SDQ-A/P; Goodman, 2001); (d) Child Somatization Inventory, Child and Parent Version (CSI-C/P; Meesters, Muris, Ghys, Reumerman, & Rooijmans, 2003); and (e) the quality of life measure Kidscreen-27, Child and Parent Version (Ravens-Sieberer et al., 2007). Participants who experienced the sudden death of a loved one as part of their index trauma, also completed the Inventory of Prolonged Grief for Children and Adolescents (IPG; Spuij et al., 2012).

## Interventions

Eye movement desensitization and reprocessing and CBWT were manual-based and delivered in up to six weekly individual sessions lasting up to 45 min each, with no homework assignments, no separate sessions for parents, and no instructions given to parents to encourage their child to discuss the trauma or to confront reminders (see Appendix S1 for detailed information). Session duration was timed with a stop watch by the therapist. In session 1 of both treatments, information about PTSD and a brief explanation of the allocated treatment was offered to the youth and their parents. Thereafter, sessions were individual with 5 min at the start and end of each session for parents share their observations about their child's functioning over the past week. Treatment completion was defined as receiving six sessions, or less if: (a) Subjective Units of Distress Scale (SUDS) score was zero for the index traumatic memory in the EMDR condition or the written narrative was completed in the CBWT condition; and (b) there was agreement between the child, parents

and therapist that the PTSD symptoms were sufficiently reduced to warrant terminating treatment. At the end of treatment, participants were asked to refrain (if possible) from engaging in further treatment for the length of the first follow-up period (3 months) but if needed, additional treatment was offered.

***EMDR:*** Treatment followed the standard 8-phase protocol of Shapiro (2001) with age-appropriate modifications suggested by Tinker and Wilson (1999) and Greenwald (1999), using the Dutch translation of the EMDR protocol for children and adolescents. The phases are: history taking, treatment planning, preparation, reprocessing, installation of a positive cognition, check for and processing any residual disturbing body sensations, positive closure and evaluation.

***CBWT:*** This is manualized trauma-focused CBT, including psychoeducation, imaginal exposure, cognitive restructuring, promoting healthy coping strategies, and enlisting support from loved ones or friends (social sharing). The core feature of CBWT is the production of a detailed written narrative of the index trauma on a computer (for a full description see Van der Oord et al., 2010).



***Wait-list:*** Participants were given an appointment for reassessment for six weeks after randomization and told they would be randomly allocated to EMDR or CBWT (if needed) with treatment beginning within one week after allocation. WL participants were given a contact telephone number in the event of crisis or significant worsening in symptoms.

## Treatment fidelity/integrity

Trial therapists were 21 licensed clinical psychologists who provided both treatments in equal numbers but patients were not randomly allocated to therapists for logistical reasons. All trial therapists completed accredited courses in EMDR (3–4 days) and CBWT (2 days) and attended monthly supervision groups of one hour (each) of EMDR and CBWT, involving review of EMDR- and CBWT-specific protocol checklists and videotapes of sessions. Additional supervision was provided via e-mail and telephone upon request. A total of 122 videotapes (33%) of treatment sessions were randomly selected (EMDR = 54; CBWT = 68), stratified on treatment arm, therapist and session and rated for adherence by two psychology graduates who were blinded to outcome and trained to assess adherence (and contamination) using EMDR- and CBWT-specific fidelity checklists. Treatment adherence was very high for both conditions (EMDR = 97%; CBWT = 100%).

### Statistical analysis

A priori power analyses indicated 100 participants were needed to have 80% power to detect large effect sizes (Cohen's $d = 1.2$) between the two treatments and WL at $p \leq .05$. Baseline differences were analyzed using parametric and nonparametric tests. Between-group comparisons on primary and secondary outcomes were carried out per the intention-to-treat principle using linear mixed models (LMM) including all randomized participants regardless of missing data. EMDR and CBWT versus WL comparisons were for pre-to-post treatment changes in outcome. EMDR versus CBWT comparisons were for changes in outcome from pretreatment to 12-month follow-up. WL participants reallocated after 6 weeks to EMDR/CBWT were not included in follow-up analyses. Any possible effect of waiting would not be independent from the subsequent effect of trauma treatment as it concerns the same individuals and may influence the outcome. Different models were estimated to compare differences between the three arms. All models included fixed coefficients to account for baseline differences and differential change over time between arms, and a random intercept to capture individual baseline differences. As 99 of 103 participants completed treatment, no separate completer-analyses were conducted. SPSS version 20.0 (IBM Corp, Armonk, NY) was used for all analyses. Further information about the calculation of effect sizes, reliable change, and number needed to treat is included in Appendix S2.

## RESULTS

### Inclusion, attrition, and treatment variables

Figure 3.1 presents the CONSORT flow-chart. All 103 participants were included in the intent-to-treat analyses. Tolerance for both treatments was quite high with only two drop-outs prior to posttreatment assessment: one child (2.3%) from EMDR was reported to the police as missing and one child (2.4%) from CBWT was placed outside of the home during treatment. Of the 18 participants randomized to WL, 16 (88.9%) completed the 6-week WL: one dropped out because of suicidal ideation, and one declined further participation. The remaining WL participants were randomly allocated to EMDR ($n = 11$) or CBWT ($n = 5$) at the end of the waiting period.

Eye movement desensitization and reprocessing was significantly briefer than CBWT for mean number of treatment sessions (EMDR = 4.1, $SD = 1.3$, range = 2–6; vs. CBWT = 5.4, $SD = .78$, range = 3– 6; $t(64.52) = 5.44$; $p < .001$) and mean length of treatment in minutes (EMDR = 140, $SD = 76.61$ vs. CBWT = 227, $SD = 67.50$; $t(80.17) = -5.49$; $p < .001$). Thirteen

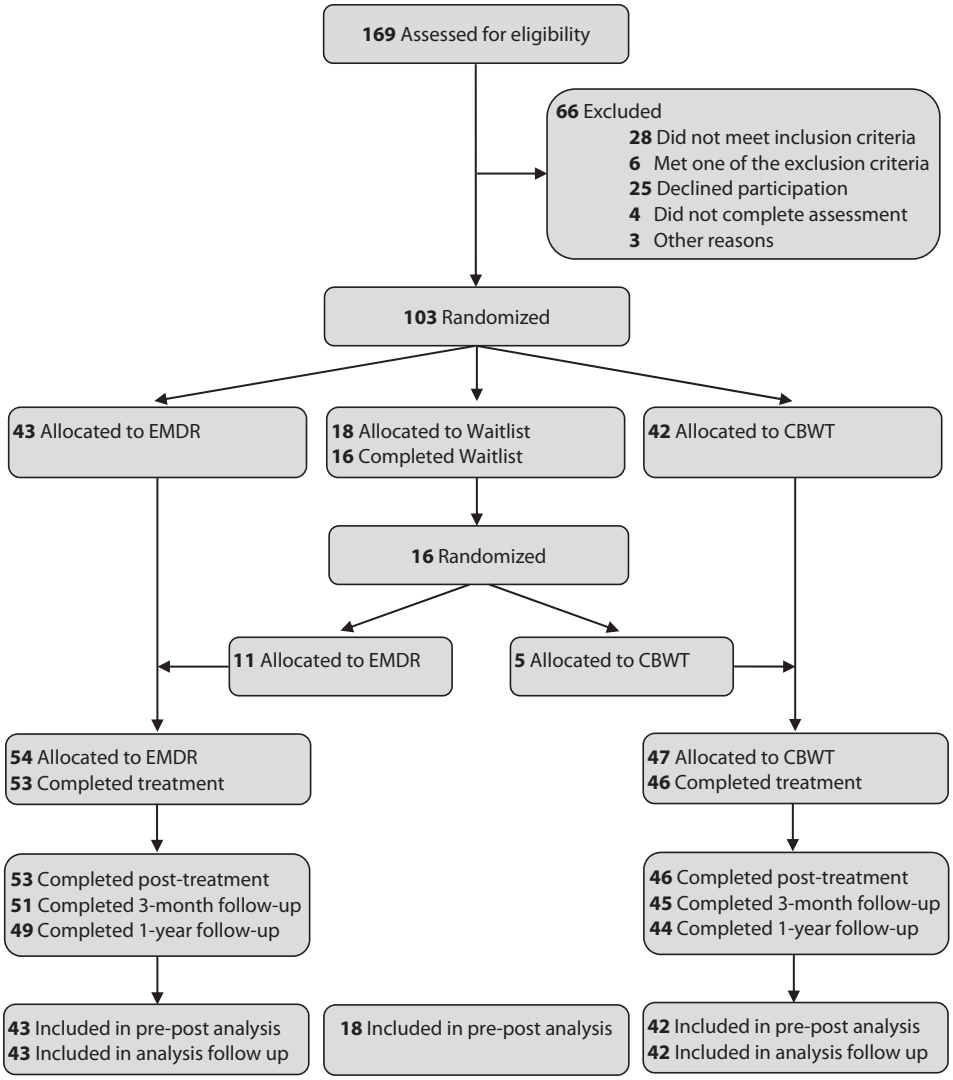


**Figure 3.1: Flow of participants through the trial.**
Abbreviations: EMDR, eye movement desensitization and reprocessing; CBWT, cognitive behavioral writing therapy.

participants sought further psychological treatment during the first follow-up interval: two for PTSD symptoms (EMDR = 1; CBWT = 1); five for issues of current safety (EMDR = 3; CBWT = 2); and six for eating, behavioral, or mood disturbances (EMDR = 3; CBWT = 3).

Table 3.1 provides information about gender, age, ethnicity, type of trauma, time since trauma, and proportion of participants meeting diagnostic criteria for PTSD and comorbid

disorders (any) by trial arm. No significant differences were found between arms for these variables. Also, there were no differences between the three arms at baseline for primary and secondary outcomes with the exception that total child-reported anxiety and depression (RCADS-C) was higher in the CBWT than the EMDR group.

Results for the primary outcomes are presented in Tables 3.2 and 3.3. Table 3.2 presents the means and standard deviations, LMM test statistics, and pre-to-post effect sizes for the CRTI. Compared to WL, EMDR and CBWT participants experienced significant pre-to-post treatment reductions in the frequency of child- and parent-reported PTSD symptoms. EMDR and CBWT did not differ at posttreatment on the CRTI. Improvements (intent-to-treat) in PTSD symptom severity from pre-to-post treatment were maintained at the 3- and 12-month follow-ups for EMDR and CBWT. However, EMDR participants made further improvements on child- and parent-reported PTSD symptoms from 3-month to 12-month follow-up ($t(80.72) = -2.28$, $p = .025$ and $t(75.91) = -2.89$, $p = .005$, respectively). The reliable change index (RCI) for child- and parent-reported PTSD symptoms as measured by the CRTI were as follows: (a) EMDR: $RCI_{child}$ [(83.27–51.03)/7.18] = 4.49 and $RCI_{parent}$ [(84.15–58.86)/8.54)] = 2.96; CBWT: $RCI_{child}$ [(90.93–56.63)/8.19] = 4.19 and $RCI_{parent}$ [(88.25–61.94)/9.69)] = 2.72. As all RCIs exceeded 1.96; changes in PTSD symptoms were more likely due to the effects of treatment than measurement error.

Table 3.3 presents the percentage of participants no longer meeting diagnostic criteria for PTSD and the percentage of participants still meeting subthreshold criteria. Remission rates were significantly higher for EMDR than WL based on the child and parent interviews (ADIS-C: Fisher exact = 22.89, $p < .001$; ADIS-P: Fisher exact = 16.50, $p < .001$) and also for CBWT versus WL (ADIS-C: Fisher exact = 16.50, $p < .001$; ADIS-P: Fisher exact = 16.65, $p < .001$). Remission rates in the EMDR group improved significantly from 3- to 12-month follow-up (ADIS-P: Fisher exact = 6.61, $p = .028$). EMDR and CBWT did not differ for remission rates at posttreatment or follow-up, except at the 12-month follow-up and based only on the parent interview (ADIS-P: Fisher exact = 5.97, $p = .029$). The number needed to treat (NNT) for EMDR was [ADIS-C: 1/(.70–.059); ADIS-P: 1/(.711–.133)] = 1.56/1.73 and for CBWT was [ADIS-C: 1/(.561–.059); ADIS-P: 1/(.732–.133)] = 1.99/1.67.

Table 3.4 presents the results for the secondary outcomes. Compared to WL, EMDR and CBWT participants experienced significant reductions in negative trauma-related cognitions (C-PCTI), in child-reported symptoms of anxiety and depression (RCADS-C), and parent-reported emotional/behavioral symptoms (SDQ-P). EMDR proved superior to WL for child-reported behavioral symptoms (SDQ-C) and quality of life (Kidscreen-C). CBWT was superior to WL for parent-reported anxiety and depression symptoms (RCADS-P). For within-group differences from 3- to 12-month follow-up, EMDR participants reported further reductions

**Table 3.1: Baseline sociodemographic and clinical characteristics by trial arm and for all participants, and comparisons between arms**

| Variable | EMDR (*n* = 43) | CBWT (*n* = 42) | WL (*n* = 18) | All (*n* = 103) | Statistic |
|---|---|---|---|---|---|
| Age, mean (*SD*), year | 12.96 (3.05) | 13.41 (2.76) | 12.47 (2.98) | 13.06 (2.92) | $F(2) = .71, p = .50$ |
| Female, no. (%) | 23 (53.5) | 25 (59.5) | 11 (61.1) | 59 (57.3) | $v^2(2) = .45, p = .80$ |
| Immigrant, no. (%) | 11 (25.6) | 14 (33.3) | 4 (22.2) | 29 (28.2) | $v^2(2) = 1.01, p = .60$ |
| Time since trauma | | | | | |
| Mean (SD), months | 18.30 (26.00) | 16.26 (22.35) | 13.00 (17.67) | 16.54 (23.12) | $F(2) = .33, p = .72$ |
| Range, months | 1–115 | 1–80 | 1–74 | 1–115 | |
| Full PTSD ADIS-C, no. (%) | 26 (60.5) | 26 (61.9) | 11 (61.1) | 63 (61.2) | $v^2(2) = .02, p = .99$ |
| Full PTSD ADIS-P, no. (%) | 26 (65.0) | 24 (57.1) | 11 (64.7%) | 61 (61.6%) | $v^2(2) = .62, p = .73$ |
| One or more comorbid disorder ADIS-C, no. (%) | 21 (48.8) | 25 (59.5) | 10 (55.6) | 56 (54.4) | $v^2(2) = .99, p = .61$ |
| One or more comorbid disorder ADIS-P, no. (%) | 25 (58.1) | 19 (45.2) | 8 (44.4) | 52 (50.5) | $v^2(2) = 1.73, p = .42$ |
| Trauma type, no. (%) | | | | | |
| Physical abuse/assault | 13 (30.2) | 6 (14.3) | 5 (27.8) | 24 (23.3) | $v^2(8) = 12.61, p = .13$ |
| Sexual abuse | 10 (23.3) | 11 (26.2) | 6 (33.3) | 27 (26.2) | |
| Accident/injury of a loved one | 4 (9.3) | 14 (33.3) | 2 (11.1) | 20 (19.4) | |
| Traumatic loss | 10 (23.3) | 5 (11.9) | 4 (22.2) | 19 (18.4) | |
| Disaster/other | 6 (14.0) | 6 (14.3) | 1 (5.6) | 13 (12.6) | |

Full PTSD means that participants met or exceeded the DSM-IV criteria for a diagnosis of PTSD. The remaining participants fulfilled inclusion criteria for subthreshold PTSD. EMDR, Eye movement desensitization and reprocessing; CBWT, cognitive behavioral writing therapy; PTSD, posttraumatic stress disorder.

**Table 3.2: Means and standard deviations for child- and parent-reported PTSD symptoms at pre, posttreatment and follow-up (intention-to-treat) by condition and between-condition comparisons**

| | Condition | | | | | | | | | | LMM Intention-to-Treat | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | EMDR *n* = 43 | | | | CBWT *n* = 42 | | | | WL *n* = 18 | | EMDR versus WL | | | CBWT versus WL | | | EMDR versus CBWT | |
| | Pre *M* (*SD*) | Post *M* (*SD*) | 3 months *M* (*SD*) | 12 months *M* (*SD*) | Pre *M* (*SD*) | Post *M* (*SD*) | 3 months *M* (*SD*) | 12 months *M* (*SD*) | Pre *M* (*SD*) | Post *M* (*SD*) | *t* | *p* | *d* | *t* | *p* | *d* | *t* | *p* |
| *CRTI Child* | | | | | | | | | | | | | | | | | | |
| Total score | 83.27 (20.74) | 51.03 (19.23) | 51.96 (20.58) | 47.46 (11.37) | 90.93 (23.64) | 56.63 (22.05) | 54.30 (20.22) | 51.53 (18.34) | 86.18 (20.52) | 80.16 (23.52) | -4.51 | < .001 | 1.27 | -4.87 | < .001 | 1.24 | -.52 | .60 |
| Intrusion | 16.91 (5.98) | 9.15 (3.81) | 9.36 (4.03) | 8.68 (2.41) | 19.38 (5.62) | 10.66 (4.57) | 9.75 (3.84) | 9.29 (3.03) | 18.00 (5.85) | 15.69 (4.53) | -3.55 | .001 | .92 | -4.14 | < .001 | 1.13 | -.79 | .43 |
| Avoidance | 28.91 (8.58) | 16.68 (7.44) | 17.53 (8.70) | 14.95 (5.23) | 28.60 (8.33) | 17.85 (7.69) | 16.55 (7.20) | 15.50 (6.77) | 27.88 (6.43) | 26.11 (9.70) | -4.80 | < .001 | 1.30 | -4.13 | < .001 | 1.15 | .92 | .36 |
| Arousal | 15.81 (5.52) | 10.30 (4.80) | 10.08 (4.35) | 10.05 (3.30) | 18.60 (6.43) | 12.05 (5.14) | 11.68 (5.15) | 11.45 (4.87) | 16.41 (5.83) | 16.06 (5.47) | -3.32 | .001 | .92 | -4.03 | < .001 | 0.99 | -.95 | .35 |
| O. Ch-Spec. Reactions | 21.67 (6.23) | 14.90 (5.04) | 14.95 (5.17) | 14.05 (4.17) | 24.54 (7.74) | 16.07 (6.97) | 16.33 (6.63) | 15.29 (6.71) | 23.88 (6.55) | 22.31 (7.49) | -2.88 | .005 | .82 | -3.78 | < .001 | .93 | -1.37 | .18 |
| *CRTI Parent* | | | | | | | | | | | | | | | | | | |
| Total score | 84.15 (22.82) | 58.86 (18.14) | 59.03 (22.06) | 50.00 (15.01) | 88.25 (25.91) | 61.94 (23.06) | 58.55 (22.37) | 57.61 (24.86) | 86.28 (17.38) | 81.74 (23.45) | -3.41 | .001 | .97 | -3.64 | < .001 | .92 | -.25 | .80 |
| Intrusion | 17.29 (6.05) | 11.08 (3.88) | 10.95 (4.53) | 9.30 (3.29) | 17.95 (5.56) | 12.49 (4.73) | 10.53 (4.45) | 10.50 (4.24) | 18.11 (5.30) | 16.33 (6.96) | -2.81 | .006 | .76 | -2.37 | .02 | .67 | .61 | .54 |
| Avoidance | 27.50 (8.71) | 19.16 (6.52) | 18.72 (8.05) | 16.22 (5.49) | 27.95 (9.77) | 19.30 (8.35) | 18.50 (8.59) | 18.34 (9.47) | 27.56 (8.43) | 27.05 (7.66) | -3.48 | .001 | .91 | -3.73 | < .001 | .87 | -.25 | .80 |
| Arousal | 16.81 (5.25) | 11.84 (4.62) | 12.71 (5.78) | 9.95 (3.92) | 18.19 (6.54) | 12.17 (4.72) | 12.13 (4.92) | 11.84 (5.29) | 17.56 (3.26) | 16.40 (4.69) | -2.19 | .03 | .80 | -3.00 | .003 | .84 | -1.02 | .31 |
| O. Ch-Spec. Reactions | 22.74 (7.02) | 16.78 (6.04) | 16.59 (6.45) | 14.54 (4.81) | 24.16 (8.18) | 17.98 (7.18) | 17.40 (6.69) | 16.92 (7.33) | 23.06 (6.42) | 21.93 (7.31) | -2.61 | .01 | .70 | -2.63 | .010 | .66 | .01 | .99 |

WL, Wait-List; EMDR, eye movement desensitization and reprocessing; CBWT, cognitive behavioral writing therapy; LMM, Linear Mixed Model; CRTI, Children's Responses to Trauma Inventory. O. Ch-Spec. Reactions, Other Child-Specific Reactions; PTSD, posttraumatic stress disorder.

Between-group effect sizes are Cohen's *d* based on the means and standard deviations from the LMM procedure. The reported effect sizes concern the differences between the treatment conditions (EMDR or CBWT) and wait-list and at posttreatment.

**Table 3.3: Proportion of participants no longer meeting DSM-IV PTSD and still meeting subthreshold PTSD diagnostic criteria at posttreatment and follow-up**

| | Posttreatment/Wait-List | | | 3-Month FUP | | 12-Month FUP | |
|---|---|---|---|---|---|---|---|
| | EMDR | CBWT | WL | EMDR | CBWT | EMDR | CBWT |
| ADIS-Child | *n* = 40 | *n* = 41 | *n* = 17 | *n* = 40 | *n* = 39 | *n* = 38 | *n* = 38 |
| % No PTSD (*n*) | 92.5[a] (37) | 90.2[a] (37) | 52.9[b] (9) | 95.0[a] (38) | 87.2[a] (34) | 100[a] (38) | 92.1[a] (35) |
| % Subthr PTSD (*n*) | 22.5 (9) | 34.1 (14) | 47.1 (8) | 22.5 (9) | 17.9 (7) | 18.4 (7) | 15.8 (6) |
| ADIS-Parent | *n* = 38 | *n* = 41 | *n* = 15 | *n* = 38 | *n* = 39 | *n* = 36 | *n* = 35 |
| % No PTSD (*n*) | 92.1[a] (35) | 82.9[a] (34) | 53.3[b] (8) | 86.8[a] (33) | 89.7[a] (35) | 100[b] (36) | 88.6[a] (31) |
| % Subthr PTSD (*n*) | 21.1 (8) | 9.8 (4) | 40.0 (6) | 13.2 (5) | 10.3 (4) | 5.6 (2) | 14.3 (5) |

FUP, Follow-up assessment; ADIS, Anxiety Disorders Interview Schedule for DSM-IV; WL, Wait-List; EMDR, eye movement desensitization and reprocessing; CBWT, cognitive behavioral writing therapy. Subthr: subthreshold. WL (*n* = 17): one of the dropouts partly completed the post wait-list assessment. No posttraumatic stress disorder (PTSD) means participants no longer met DSM-IV criteria for PTSD based on ADIS-C/P; Still subthreshold PTSD: ≥5 DSM-IV PTSD symptoms with at least one symptom in each Criteria (B, C, D) plus Criterion E/F met *or* fulfilling minimum symptom requirements for two of the three symptom Criteria (B, C, D) plus Criterion E/F met. Proportions sharing the same superscript are not significantly different from each other; $p \leq .05$ for all $2 \times 3$ Fisher-Freeman-Halton Exact comparisons for EMDR versus WL and CBWT versus WL; $p \leq .029$ for EMDR versus CBWT at 12-month FUP (ADIS-P) and $p \leq .028$ for EMDR 3-month FUP versus EMDR 12-month FUP (ADIS-P).

**Table 3.4: Means and standard deviations for secondary outcome measures at pre-, posttreatment and follow-up (intention-to-treat) by condition and results for between-condition comparisons**

| | Condition | | | | | | | | | | LMM Intention-to-Treat | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | EMDR *n* = 43 | | | | CBWT *n* = 42 | | | | WL *n* = 18 | | EMDR versus WL | | | CBWT versus WL | | | EMDR versus CBWT | |
| | Pre *M (SD)* | Post *M (SD)* | 3 months *M (SD)* | 12 months *M* (SD) | Pre *M (SD)* | Post *M (SD)* | 3 months *M (SD)* | 12 months *M* (SD) | Pre *M (SD)* | Post *M (SD)* | *t* | *p* | *d* | *t* | *P* | *d* | *t* | *p* |
| CPCTI Child | 45.25 (13.12) | 34.79 (12.34) | 35.58 (14.07) | 30.46 (7.35) | 48.44 (14.86) | 36.56 (12.64) | 37.36 (15.34) | 33.87 (12.21) | 48.43 (15.69) | 43.46 (14.09) | -2.26 | .03 | .39 | -2.86 | .005 | .46 | -.79 | .43 |
| RCADS Child | 33.93 (19.88) | 17.90 (19.18) | 16.53 (17.55) | 13.39 (11.66) | 43.89 (20.49) | 24.63 (20.02) | 22.88 (21.52) | 19.97 (18.84) | 36.49 (20.83) | 29.50 (18.09) | -2.64 | .01 | .45 | -3.69 | < .001 | .60 | -1.31 | .20 |
| RCADS Parent | 35.67 (19.33) | 23.14 (16.31) | 21.05 (19.25) | 16.92 (12.91) | 40.22 (22.33) | 24.98 (17.44) | 22.70 (17.94) | 22.83 (16.74) | 33.22 (20.44) | 30.13 (18.11) | -1.94 | .06 | .48 | -2.60 | .01 | .56 | -.82 | .42 |
| SDQ Child | 13.93 (6.02) | 8.38 (5.20) | 8.89 (5.80) | 7.57 (4.27) | 14.72 (7.17) | 11.63 (5.63) | 11.75 (5.90) | 10.37 (5.44) | 14.00 (4.30) | 14.22 (3.60) | -2.56 | .01 | 1.03 | -1.54 | .13 | .51 | 1.48 | .14 |
| SDQ Parent | 13.00 (5.72) | 8.84 (4.92) | 8.56 (6.29) | 7.92 (5.28) | 12.93 (6.58) | 9.59 (5.65) | 8.73 (6.18) | 8.47 (5.77) | 10.44 (4.59) | 11.00 (4.41) | -2.97 | .004 | .87 | -2.60 | .01 | .64 | .51 | .61 |
| CSI Child | 18.07 (17.43) | 9.75 (11.31) | 10.05 (12.45) | 8.08 (8.41) | 23.63 (17.88) | 18.04 (20.64) | 18.37 (19.99) | 13.37 (14.24) | 21.51 (14.42) | 19.06 (17.10) | -1.60 | .11 | .35 | -1.49 | .14 | .19 | .11 | .91 |
| CSI Parent | 14.18 (17.00) | 7.19 (9.02) | 8.21 (10.10) | 6.70 (8.15) | 17.59 (17.62) | 10.23 (11.72) | 9.55 (10.13) | 9.55 (10.07) | 16.84 (18.66) | 12.67 (12.42) | -5.80 | .56 | .16 | -.77 | .44 | .18 | -.24 | .81 |
| Kidscreen-27 Child | 102.88 (15.60) | 113.11 (15.84) | 112.99 (15.06) | 115.50 (12.16) | 98.93 (18.18) | 106.41 (16.90) | 104.30 (18.79) | 107.90 (19.30) | 104.83 (10.80) | 105.90 (16.66) | 2.56 | .01 | .50 | 1.87 | .06 | .39 | -.88 | .38 |
| Kidscreen-27 Parent | 101.31 (12.35) | 108.34 (12.66) | 106.36 (14.35) | 109.59 (11.37) | 101.01 (17.55) | 109.36 (14.29) | 110.25 (14.12) | 106.89 (15.22) | 102.80 (14.02) | 104.33 (12.77) | 1.35 | .18 | .43 | 1.70 | .09 | .41 | .50 | .62 |
| IPG Child | 60.30 (16.43) | 40.90 (12.61) | 42.44 (13.13) | 41.22 (10.16) | 50.60 (19.48) | 38.20 (8.23) | 38.00 (9.43) | 36.60 (5.22) | 60.00 (18.13) | 42.67 (10.07) | -.44 | .67 | .12 | .26 | .80 | .26 | .80 | .44 |

WL, Wait-List; EMDR, eye movement desensitization and reprocessing; CBWT, cognitive behavioral writing therapy; LMM, Linear Mixed Model; c-PTCI, Children's PostTraumatic Cognitions Inventory; RCADS, The Revised Child Anxiety and Depression Scale; SDQ, Strengths and Difficulties Questionnaire; CSI, Children's Somatization Inventory; IPG, Inventory of Prolonged Grief. Between-group effect sizes are Cohen's *d* based on the means and standard deviations from the LMM procedure. The reported effect sizes concern the differences between WL and treatment conditions (EMDR or CBWT) at postmeasurement; WL child SDQ *n* = 11.

in negative trauma-related beliefs (C-PTCI: $t(80.32) = -2.89$, $p = .005$), and CBWT participants further reductions in child-reported somatic symptoms (CSI-C: $t(79.33) = -2.45$, $p = .016$). No further improvements from 3- to 12-month follow-ups were found. For between-group differences at follow-up, EMDR and CBWT were similar on all secondary outcomes with the exception that EMDR participants reported further improvements in child- and parent-reported quality of life between posttreatment and the 3-month follow-up and between 3-month and 12-month follow-up, respectively (Kidscreen-27-C: $t(81.65) = -2.38$, $p = .02$; Kidscreen-27-P: $t(74.83) = -2.848$, $p = .01$). For the subgroup that had experienced death of a loved one, there were no significant improvements on the IPG for all measurements.

## DISCUSSION



The present trial is the first three-arm RCT demonstrating the efficacy of EMDR and a brief form of trauma-focused CBT compared to wait-list (WL) for pediatric PTSD following a single-incident traumatic event, and the first RCT with youth using computer-aided CBWT. Consistent with our hypotheses, both EMDR and CBWT yielded high rates of diagnostic remission from (subthreshold) PTSD with attrition during treatment being extremely low, supporting the feasibility and tolerance of both treatments. The recovery rates for EMDR and CBWT are in line with the intent-to-treat remission rates of one other single-incident PTSD study using trauma-focused cognitive therapy (92%, Smith et al., 2007), but were higher than those reported by other single-incident PTSD studies (i.e. CBT 65%, cognitive therapy 56%, Nixon, Sterk, & Pearce, 2012; prolonged exposure 68%, time-limited psychodynamic therapy 37%, Gilboa-Schechtman et al., 2010).

As hypothesized, both treatments yielded clinically significant reductions in child- and parent-reported symptoms of PTSD, anxiety, depression, and behavior problems and negative trauma-related appraisals reported by the child. No differences were found between EMDR and CBWT for the primary outcomes (PTSD), and most of the secondary outcomes at posttreatment, and 3- and 12-month follow-ups. The intention-to-treat, between-group, pre-to-post treatment effect sizes for EMDR and CBWT on child-reported PTSD symptoms ($d = 1.27$; $d = 1.24$, respectively) were larger than the mean posttreatment between-group effect sizes for psychological interventions reported in recent meta-analytic reviews of the child PTSD literature (Standard Mean Difference/Hedge's $g = -.42$ to .83, Gillies et al., 2016; Morina et al., 2016 respectively).

Participants in both EMDR and CBWT maintained (or improved slightly) on the primary and secondary outcomes from posttreatment to the 3-month follow-up and importantly,

between the 3- and 12-month follow-ups. EMDR participants made further gains compared to CBWT on child- and parent-reported PTSD symptoms (CRTI) between the 3- and 12-month follow-ups. We note that 12 months after treatment, diagnostic remission reached 100% for EMDR participants based on child and parent interviews. However, these further gains were only significant for EMDR from 3 to 12 month follow-up and relative to CBWT at 12-month follow-up for parent-rated PTSD. Overall, the differences between the two treatments during the follow-up period were relatively few (and minor in a clinical sense) and thus EMDR and a form of trauma-focused CBT were comparably effective in this trial.

While not a primary aim of the trial, we note the relative efficiency of EMDR and CBWT in reducing PTSD symptoms and associated difficulties. Both yielded significant reductions in a broad range of symptoms after a very limited time spent in treatment sessions, an average of 2 hr and 20 min for EMDR versus 3 hr and 47 min for CBWT. To this end, these results are consistent with previous EMDR trials in youth (De Roos et al., 2011; Jaber-Ghaderi et al., 2004) suggesting an incremental efficiency of EMDR compared to CBT protocols for PTSD in children albeit further trials are needed. The brevity of both interventions (i.e. around half the duration compared to standard trauma-focused CBT protocols) is an important and novel finding. The apparent efficiency of both treatments may reflect the fact that they discard components that may be unnecessary or minimally active (e.g. a stabilization phase, coping skills training, or parent-focused interventions).

The study benefitted from several strengths including: multisite recruitment of participants from among standard clinical referrals; broad inclusion criteria; a large sample size including both children and adolescents; a delayed-treatment control group; blinded multi-informant diagnostic assessments; manualized treatments with independent fidelity checks; and a 12-month follow-up. Still, several limitations are noted. Our findings may not generalize to children below 8 years of age or to those with PTSD tied to multiple traumatic events. However, there is evidence that youth aged 8–18 years exposed to multiple traumas respond well to brief, trauma-focused treatments including EMDR and CBT (Diehle et al., 2014; Van der Oord et al., 2010). While the treatment manuals used in this trial may be disseminated into routine care, similar outcomes may not be achieved without access to similar levels of training and regular supervision from similarly qualified experts. Generalization studies are needed. Finally, although participants were specifically asked not to disclose their treatment condition, it cannot be ruled out that some post-treatments assessors were unblinded.

In conclusion, EMDR and CBWT, involving no training in coping skills (emotion-regulation) prior to trauma memory work and with minimal parental involvement, were acceptable, well-tolerated treatments that yielded clinically significant reductions in single-incident PTSD and comorbid difficulties in five sessions (lasting 45 min) or less, with gains

being maintained up to one year posttreatment. Further research is warranted evaluating the efficacy and efficiency of EMDR and CBWT particularly in youth with PTSD symptoms arising from multiple traumas and below eight years of age.

## Supporting information

Additional Supporting Information may be found in the online version of this article:

- Appendix S1. Interventions: EMDR and CBWT.
- Appendix S2. Information about the calculation of effect sizes, reliable change, and number needed to treat.
- Figure S1. CONSORT 2010 checklist of information to include when reporting a randomized trial.



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**Key points**

- Very few RCTs have involved youth, exposed to a single-incident trauma, who were seeking treatment for PTSD from child and adolescent mental health services.
- EMDR and CBWT are manualized, time-limited interventions that were well-tolerated and effective for PTSD and comorbid symptoms relative to wait-list (WL). Treatment effects were maintained at 3- and 12-month follow-ups.
- Trauma treatment for youth with PTSD tied to a single-incident trauma can be effective with minimal parental involvement and without training in coping skills (emotion-regulation).

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# 4

# Predictors and moderators of treatment outcome for single incident pediatric PTSD: A multi-center randomized clinical trial

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*Submitted*

## ABSTRACT

**Background:** The current study explores predictors and moderators of pediatric PTSD outcomes for Eye Movement Desensitization and Reprocessing Therapy (EMDR) and Cognitive Behavioral Writing Therapy (CBWT).

**Methods:** Data were obtained as part of a published randomized controlled trial of up to six weeks of either EMDR therapy, CBWT, or wait-list, involving 101 youth (aged 8–18 years) with a PTSD diagnosis (full/subthreshold) tied to a single event. The predictive and moderating effects of the child's baseline sociodemographic and clinical characteristics, and parent's psychopathology, on child-reported PTSD symptoms were evaluated using linear mixed models (LMM) from pre- to post-treatment and from pre- to 3- and 12-month follow-ups.

**Results:** At post-treatment and 3-month follow-up, youth with an index trauma of sexual abuse, severe symptoms of PTSD, anxiety, depression, more comorbid disorders, negative posttraumatic beliefs, and with a parent with more severe psychopathology fared worse in both treatments. For children with more severe self-reported PTSD symptoms at baseline, the (exploratory) moderator analysis showed that the EMDR group improved more than the CBWT group, with the opposite being true for children and parents with a less severe clinical profile.

**Conclusions:** The most consistent finding from the predictor analyses was that parental symptomatology predicted poorer outcomes, suggesting that parents should be assessed and referred for their own treatment where indicated. The effect of the significant moderator variables was time-limited, and given the large response rate (> 90%) and brevity (< 4 hours) of both treatments, the present findings suggest a focus on implementation, rather than tailoring, of evidence-based trauma-focused treatments for pediatric PTSD tied to a single event.


**Keywords:** Posttraumatic stress disorder (PTSD); children and adolescents; eye movement desensitization and reprocessing (EMDR); trauma-focused cognitive behavioral therapy; moderation analysis; randomized controlled trial (RCT)

**Trial registration:** Dutch Trial Register, Identifier: NTR3870

## INTRODUCTION

Practice guidelines for pediatric Posttraumatic Stress Disorder (PTSD) recommend trauma-focused psychological therapies as the first-line treatment approach, i.e. various forms of cognitive behavioral therapy (CBT) including Trauma-Focused CBT, Prolonged Exposure, Cognitive Therapy for PTSD, as well as Eye Movement Desensitization and Reprocessing (EMDR) Therapy (ISTSS, 2019; NICE, 2018; WHO, 2013). These recommendations are supported by a number of meta-analyses that find both treatments superior to controls, usually wait-list or treatment as usual (Brown et al., 2017; Gutermann et al., 2016; Mavranezouli et al., 2020; Morina, Koerssen, & Pollet, 2016). To date, five randomized controlled trials (RCTs) have compared trauma-focused CBT to EMDR for pediatric PTSD, with no differences observed for diagnostic remission or symptom reduction (Jaberghaderi, Greenwald, Rubin, Zand, & Dolatabadi, 2004; Jaberghaderi, Rezaei, Kolivand, & Shokoohi, 2019; Diehle, Opmeer, Boer, Mannarino, & Lindauer, 2015; de Roos et al., 2011, 2017).

With so few RCTs having compared active treatments for pediatric PTSD, little is known about whether or which baseline (i.e., pre-randomization) variables predict or moderate outcomes in the evaluated treatments (i.e., which treatment works best for whom; Kraemer, 2016). RCTs reporting upon predictors have almost exclusively involved evaluations of trauma-focused CBT versus an unspecified treatment-as-usual or a wait-list (e.g., Kane et al., 2016; Nixon, Sterk, & Pearce, 2012; Nixon, Sterk, Pearce, & Weber, 2017; Quota, Palosaari, Diab, & Punamaki, 2012; Tol et al., 2010; Weems & Scheeringa, 2013). The same holds true for meta-analyses (Brown et al., 2017; Gutermann et al., 2016; Harvey & Taylor 2010; Moreno-Alcázar et al., 2017; Newman et al., 2014; Silverman et al., 2008; Trask, Walsh, & Dilillo, 2011). The variables that have been studied include: trauma type; the child's age, gender, and severity of PTSD and peri-traumatic dissociation; the mother's level of depression and trauma-related beliefs, social support and caretaker involvement. Across studies, only the presence of parental psychopathology (specifically depression) has consistently been found to be inversely related to the child's PTSD treatment response in trauma-focused CBT and control conditions. Evidence for the other candidate predictors or moderators in relation to treatment outcome has been inconsistent or contradictory.

With respect to EMDR therapy for pediatric PTSD, a recent meta-analysis by Moreno-Alcázar et al. (2017) identified eight RCTs that compared this treatment to either wait-list, standard care, placebo or trauma-focused CBT. Across studies, gender (male) was the only variable found to predict poorer outcomes, with no moderators evaluated. Overall, the inferences that can be drawn from the treatment literature as regards predictors and moderators of outcome in trauma-focused CBT and EMDR are limited due to the high level

of heterogeneity in respect of inclusion criteria and treatments evaluated, small sample sizes, and no or brief follow-ups, with further studies needed (Moreno-Alcázar et al., 2017; Taylor, Graham, & Weems, 2015).

The purpose of the present paper was to identify potential predictors and moderators of outcome in a previously published, multi-center, single-blind, RCT comparing EMDR therapy to Cognitive Behavioral Writing Therapy (CBWT), and delayed treatment (wait-list), for children and adolescents (aged 8–18 years) with a current diagnosis of PTSD or subthreshold PTSD tied to a single traumatic event (de Roos et al., 2017). Based on the predictors and moderators that have been explored in the pediatric PTSD literature, we evaluated the influence of the following pre-treatment variables on outcome: age, gender, trauma type, severity of the child's symptoms (PTSD, anxiety, and depression), the number of comorbid psychiatric diagnoses, the child's trauma-related beliefs, and parental psychopathology (overall, PTSD, anxiety, and depression). As parental psychopathology has been the most consistent outcome predictor in RCTs of trauma-focused CBT, and gender in trials of EMDR therapy, we hypothesized that participants with higher levels of parental psychopathology and boys would have poorer post-treatment outcomes, as indexed by child-reported PTSD symptoms, irrespective of treatment assignment. Given the limited information available regarding potential moderator variables, we had no a priori expectations about whether any of the evaluated variables would differentially influence outcomes in EMDR or CBWT.

# METHOD

## Participants

Participants were 103 treatment-seeking youth with a primary diagnosis of DSM-IV PTSD (full or subthreshold) tied to a single traumatic event that occurred at least one month prior to inclusion (for full details, see: de Roos et al., 2017). All were assessed at baseline, and again (blindly) at post-treatment/post-waitlist (WL), and at 3- and 12-month follow-ups. Participants who still met inclusion criteria at the end of the 6-week WL were re-randomized to EMDR or CBWT. The present study used all available treatment outcome data ($N$ = 101) from this trial. Two participants dropped out immediately after randomization (one from EMDR, one from CBWT) and were excluded because they did not receive any treatment. Figure 4.1 provides the CONSORT flow chart for the trial.

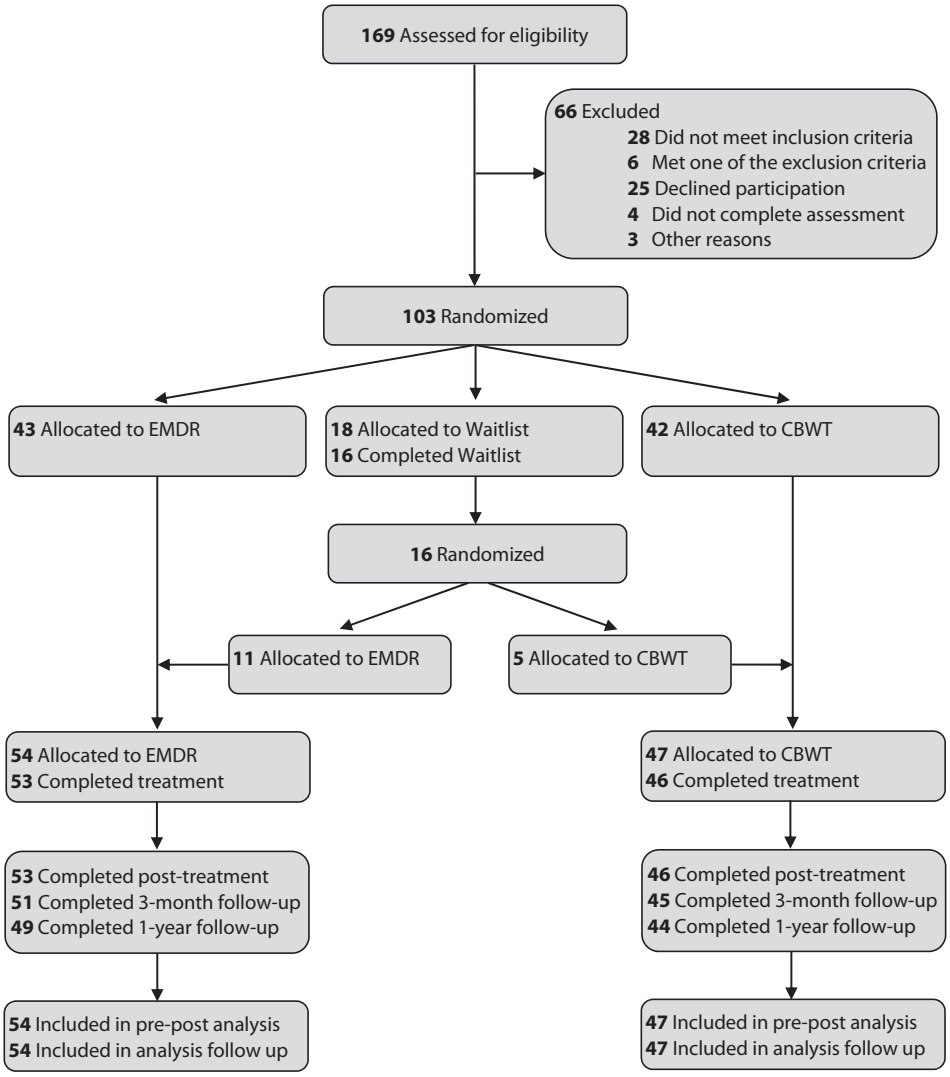


**Figure 4.1: Flow of participants through the trial.**
Abbreviations: EMDR, eye movement desensitization and reprocessing; CBWT, cognitive behavioral writing therapy.

## Measures

***Dependent variable – severity of the child's PTSD symptoms.***

The severity of the child's PTSD symptoms was assessed using the Revised Children's Responses to Trauma Inventory – Child Version (CRTI-C; Alisic & Kleber, 2010), a 34-item self-report measure of DSM-IV PTSD symptoms (1 = never; 5 = always) over the past seven

days. A total score is computed along with four subscales: intrusion (7 items), avoidance (11 items), arousal (6 items), and other child-specific responses to the trauma that are not mentioned in the DSM-IV PTSD criteria (10 items). The CTRI-C has excellent psychometric properties (e.g., Cronbach's α = 0.92; Alisic & Kleber, 2010). In the current study, the child's total score on the CTRI-C was the dependent variable in the predictor and moderator analyses for all time trajectories.

***Candidate predictors and moderators of outcome***

For all candidate predictor/moderator variables based on the child's characteristics, we used information obtained from both the child and the parent (included separately in the analyses), except for trauma-related beliefs (based only on child report). The severity of the child's PTSD symptoms was assessed using the Revised Children's Responses to Trauma Inventory – Child Version (CRTI-C; Alisic & Kleber, 2010). The child's anxiety and depression were assessed via total scores on the 47-item, Revised Child Anxiety and Depression Scale, Child and Parent Versions (RCADS-C/P; Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000). The number of comorbid diagnoses was assessed via separate child and parent interviews using the Anxiety Disorders Interview Schedule for DSM-IV, Child and Parent Versions (ADIS-C/P; Silverman & Albano, 1996). The child's trauma-related beliefs were assessed via the total score on the 25-item, Children's Post Traumatic Cognitions Inventory (C-PTCI; Meiser-Stedman et al., 2009; Diehle, de Roos, Meiser-Stedman, Boer, & Lindauer, 2015). Parental PTSD symptoms, only in relation to their child's index trauma, were assessed via the total score on the 22-item Impact of Event Scale-Revised (IES-R; Weiss & Marmar, 1997). Finally, overall parental psychopathology, anxiety and depression were assessed via total scores (and respective subscales) of the 53-item, Brief Symptom Inventory (BSI; Derogatis, 1992). For parent-report measures of the child's functioning, primarily mothers (88%) completed the measures, followed by fathers (11%) and other caretakers (1%).

## Interventions

For a full description of the two treatments, see De Roos et al. (2017). Briefly, CBWT and EMDR are manual-based, trauma-focused treatments that were delivered in up to six, weekly individual sessions lasting up to 45 minutes each. There were no homework assignments, no separate sessions for parents, and no instructions given to parents to encourage their child to discuss the trauma or to confront reminders in either treatment. EMDR followed the standard 8-phase protocol developed by Shapiro (2018) with age-appropriate modifications suggested by Tinker and Wilson (1999) and Greenwald (1999), using the Dutch translation

of the EMDR protocol for children and adolescents. It consists of history taking, treatment planning, preparation, reprocessing, installation of a positive cognition, checking for and then reprocessing any residual disturbing body sensations, positive closure and evaluation. During all reprocessing phases, the participant tracked the movement of therapist's index finger with their eyes as the therapist moved their hand back and forth horizontally across the participant's field of vision (saccades). CBWT (Van der Oord, Lucassen, van Emmerik, & Emmelkamp, 2010) included: psychoeducation, imaginal exposure (via the construction of a written narrative of the index trauma), cognitive restructuring, promoting healthy coping strategies, and enlisting support from loved ones or friends (social sharing). Both treatments were delivered by fully trained clinical psychologists, experienced in the treatment of pediatric PTSD, trained to administer either CBWT or EMDR before commencing the trial, and who received supervision from an expert in either CBWT or EMDR on a monthly basis during the trial.

## Statistical analyses

All analyses were conducted using version 23 of SPSS (IBM Corp, Armonk, NY). For the predictor/moderator analyses, we carried out linear mixed modelling (LMM) using all available measurement occasions for the outcome variable (child-reported PTSD symptoms as assessed by the CRTI-C). For all analyses, we used the baseline (pre-treatment) values for the candidate predictor/moderators. Variables lacking an observed value of zero with substantial interpretation were (grand) mean centered. In the first series of analyses, candidate predictors of change in child-reported PTSD symptoms were evaluated for all participants (i.e., across EMDR and CBWT conditions) from pre-treatment to post-treatment, pre-treatment to 3-month follow-up, and pre-treatment to 12-month follow-up. For the moderator analyses, an interaction term was added to the model to assess whether the moderator influenced changes in child-reported PTSD symptoms for the three time episodes described above, differently for the EMDR and CBWT groups. For all analyses, a random intercept was introduced into the models to account for baseline differences between participants, with alpha set to .05 for both main and interaction effects.

# RESULTS

## Baseline differences

Table 4.1 presents descriptive data for the candidate predictor and moderator variables at baseline separately for participants randomized to EMDR or CBWT, as well as comparisons between the two groups. Overall, the two groups were similar except that: 1) the CBWT group scored higher than EMDR on the child-report measures of PTSD (CRTI-C), depression and anxiety (RCADS-C), and negative trauma-related beliefs (C-PTCI), and 2) the two groups

**Table 4.1: Descriptive statistics for the outcome and predictor/moderator variables at baseline by treatment group and between group comparisons (*N* = 101)**

| | Treatment group | | Group comparison | |
|---|---|---|---|---|
| Variable | EMDR (*n* = 54) | CBWT (*n* = 47) | $F/X^2$ | *p* |
| **Child** | | | | |
| Age in months, *M* (*SD*) | 153.11 (37.19) | 161.94 (32.83) | 1.58 | .21 |
| Female, no. (%) | 30 (56) | 28 (60) | .17 | .68 |
| Trauma type, no. (%) | | | 10.37 | .04 |
| Physical abuse/assault | 15 (28) | 8 (17) | | |
| Sexual abuse | 14 (26) | 13 (27.7) | | |
| Accident/injury to loved one | 5 (9) | 15 (32) | | |
| Traumatic loss | 13 (24) | 5 (11) | | |
| PTSD-child report (CRTI-C), *M* (*SD*) | 80.95 (21.04) | 91.74 (23.20) | 5.94 | .02 |
| PTSD-parent report (CRTI-P), *M* (*SD*) | 83.84 (22.72) | 87.39 (25.76) | .53 | .47 |
| Anx/dep-child report (RCADS-C), *M* (*SD*) | 31.59 (19.58) | 44.01 (19.65) | 9.96 | .002 |
| Anx/dep-child report (RCADS-P), *M* (*SD*) | 35.04 (19.31) | 38.63 (21.97) | .74 | .39 |
| No. comorbid disorders-child interview (ADIS-C), *M* (*SD*) | .92 (1.26) | 1.13 (1.42) | .57 | .45 |
| No. comorbid disorders-parent interview (ADIS-P), *M* (*SD*) | .93 (1.28) | .85 (1.16) | .28 | .60 |
| Trauma-related beliefs (C-PTCI), *M* (*SD*) | 43.12 (12.81) | 49.90 (14.59) | 5.82 | .02 |
| **Parent** | | | | |
| PTSD (IES), *M* (*SD*) | 19.29 (20.33) | 18.68 (22.91) | .02 | .89 |
| Overall psychopathology (BSI) *M* (*SD*) | 27.02 (29.95) | 24.78 (38.45) | .10 | .75 |
| Depression subscale | 3.25 (3.71) | 2.93 (4.82) | .13 | .72 |
| Anxiety subscale | 3.58 (4.59) | 2.98 (5.12) | .37 | .55 |

Abbreviations: EMDR, Eye Movement Desensitization and Reprocessing; CBWT, Cognitive Behavioral Writing Therapy; CRTI-C/P, Children's Responses to Trauma Inventory – Child/Parent Versions; RCADS-C/P, Revised Child Anxiety and Depression Scale –Child/Parent Versions; ADIS-C/P, Anxiety Disorders Interview Schedule for DSM-IV – Child/Parent Versions; C-PTCI, Children's Post Traumatic Cognitions Inventory; IES, Impact of Event Scale; BSI, Brief Symptom Inventory.

differed in the distribution of trauma types. Baseline differences between the two treatment groups do not create a problem for the analyses as individual differences are utilized by LMM to detect whether there is a predictor or moderator effect.

## Predictor analyses

Table 4.2 presents the results of the LMM analyses for the effects (irrespective of treatment condition) of the candidate predictors on child-reported PTSD symptoms from pre-to post-treatment, pre-treatment to 3-month follow-up, and pre-treatment to 12-month follow-up. As can be seen in Table 4.2, age and gender did not significantly predict outcomes but trauma type did. For all types of traumatic events, PTSD symptoms significantly improved after trauma treatment (see Table 4.2, change per week). However, children exposed to physical abuse or assault showed a significantly greater decline in PTSD symptoms than children exposed to one of the other types of traumatic events (Table 4.2, estimate -1.303). On the contrary, sexually abused children showed a significantly smaller decline in PTSD symptoms than children exposed to one of the other traumatic events (Table 4.2, estimate .982). Only the predictive effect for sexual abuse remained from pre-treatment to 3-month follow-up.

With regards to child psychopathology, children who had more severe symptoms of PTSD, depression, and anxiety, more comorbid diagnoses, and more negative trauma-related beliefs, experienced a significantly smaller decline in PTSD symptoms (child-reported) as measured from pre- to post-treatment. These predictive effects were maintained from pre-treatment to the 3-month follow-up assessment, but only when based on information obtained from the parent and not the child. The exception was that severity of the (child-reported) trauma-related beliefs still predicted poorer outcome from pre-treatment to the 3-month-follow-up. None of the child psychopathology variables predicted outcomes from pre-treatment to 12-month follow-up.

In respect of parental psychopathology, children whose parent reported higher levels of PTSD (tied to their child's index trauma), depression and anxiety, and overall psychopathology, experienced a significantly smaller decline in PTSD symptoms (child-reported) as measured from pre- to post-treatment and from pre-treatment to the 3-month follow-up. Parental psychopathology did not predict outcomes from pre-treatment to the 12-month follow-up.

**Table 4.2: Results of linear mixed models testing predictor by time interaction on change per week in child-reported PTSD symptoms from pre-treatment to post-treatment and follow-up (*N* = 101)**

| | Pre- to post-treatment | | | | Pre-treatment to 3 months | | | | Pre-treatment to 12 months | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Outcome/predictor variables | Change pw *(SE)* | Estimate *(SE)* | *t* | *p* | Change pw *(SE)* | Estimate *(SE)* | *t* | *p* | Change pw *(SE)* | Estimate *(SE)* | *t* | *p* |
| **Child variables** | | | | | | | | | | | | |
| Age in months | -.2.227 (.170) | .008 (.005) | 1.67 | .097 | -1.144 (.088) | .002 (.002) | .78 | .438 | -.395(.037) | -.000 (.001) | -.25 | .807 |
| Gender (male = 0) | -2.172 (.237) | < .001 (.310) | -.002 | .999 | -1.097 (.119) | -.082 (.155) | -.53 | .597 | -.380(.053) | -.026 (.067) | -.39 | .699 |
| Trauma type | | | | | | | | | | | | |
| Physical abuse/assault | -1.973 (.177) | -1.303 (.436) | -2.99 | .003 | -1.076 (.095) | -.332 (.199) | -1.67 | .096 | -.372 (.041) | -.122 (.085) | -1.43 | .153 |
| Sexual abuse | -2.409 (.190) | .982 (.347) | 2.83 | .005 | -1.227 (.097) | .409 (.184) | 2.23 | .027 | -.422 (.043) | .099 (.075) | 1.33 | .184 |
| Accident/injury to loved one | -2.025 (.180) | -.765 (.402) | -1.91 | .057 | -1.065 (.097) | -.318 (.184) | -1.73 | .085 | -.381 (.041) | -.070 (.084) | -.84 | .404 |
| Traumatic loss | -2.045 (.177) | -.844 (.430) | -1.96 | .051 | -1.138 (.094) | -.011 (.204) | -.053 | .958 | -.411 (.040) | .087 (.086) | 1.00 | .318 |
| PTSD-child report (CRTI-C) | -2.297 (.170) | .014 (.006) | 2.24 | .025 | -1.159 (.086) | .000 (.003) | .056 | .956 | -.399 (.037) | -.001 (.001) | -.58 | .565 |
| PTSD-parent report (CRTI-P) | -2.375 (.177) | .022 (.006) | 3.99 | < .001 | -1.159 (.090) | .007 (.003) | 2.39 | .017 | -.393 (.038) | .001 (.001) | .79 | .428 |
| Anxiety/depression-child report (RCADS-C) | -2.279 (.172) | .024 (.008) | 3.15 | .002 | -1.137 (.088) | .006 (.004) | 1.62 | .106 | -.394 (.038) | -.000 (.002) | -.06 | .952 |
| Anxiety/depression-parent report (RCADS-P) | -2.447 (.178) | .031 (.006) | 5.08 | < .001 | -1.154 (.090) | .011 (.003) | 3.08 | .002 | -.390 (.038) | .002 (.002) | 1.15 | .250 |
| No. comorbid disorders-child interv. (ADIS-C) | -2.362 (.192) | .219 (.103) | 2.12 | .035 | -1.222 (.102) | .094 (.059) | 1.60 | .110 | -.406 (.045) | .011 (.025) | .44 | .659 |
| No. comorbid disorders-parent interv. (ADIS-P) | -2.428 (.195) | .245 (.094) | 2.61 | .009 | -1.261 (.103) | .119 (.054) | 2.22 | .027 | -.426 (.044) | .034 (.025) | 1.34 | .180 |
| Trauma-related beliefs (C-PTCI) | -2.164 (.173) | .033 (.011) | 2.94 | .003 | -1.111 (.090) | .012 (.006) | 2.17 | .031 | -.398 (.039) | .002 (.002) | 1.01 | .314 |
| **Parent variables** | | | | | | | | | | | | |
| PTSD (IES) | -2.376 (.180) | .020 (.005) | 4.19 | < .001 | -1.152 (.089) | .009 (.003) | 3.27 | .001 | -.387 (.037) | .002 (.001) | 1.55 | .122 |
| Overall psychopathology (BSI) | -2.456 (.185) | .012 (.002) | .12 | < .001 | -1.155 (.091) | .006 (.002) | 3.74 | < .001 | -.386 (.038) | .001 (.001) | 1.61 | .108 |
| Depression subscale | -2.427 (.183) | .108 (.021) | 5.03 | < .001 | -1.135 (.090) | .047 (.014) | 3.35 | .001 | -.385 (.038) | .013 (.007) | 1.75 | .082 |
| Anxiety subscale | -2.379 (.183) | .089 (.020) | 4.54 | < .001 | -1.131 (.090) | .041 (.013) | 3.21 | .001 | -.384 (.038) | .010 (.007) | 1.47 | .142 |

Abbreviations: EMDR, Eye Movement Desensitization and Reprocessing; CBWT, Cognitive Behavioral Writing Therapy; CRTI-C/P, Children's Responses to Trauma Inventory – Child/Parent Versions; RCADS-C/P, Revised Child Anxiety and Depression Scale – Child/Parent Versions; ADIS-C/P, Anxiety Disorders Interview Schedule for DSM-IV – Child/Parent Versions; C-PTCI, Children's Post Traumatic Cognitions Inventory; IES, Impact of Event Scale; BSI, Brief Symptom Inventory.

## Sensitivity analyses

Sensitivity analyses were performed for the EMDR and CBWT participants ($N$ = 85), who in the original study were first randomized to treatment (thereby not including those that were first randomized to WL and then to either CBWT or EMDR). The predictive effects were comparable to the pre- to post-treatment results reported above. Furthermore, two additional significant predictors were observed: child-reported anxiety and depression at pre-treatment predicted the child's PTSD scores from pre-treatment to 3-month follow-up, and the parent's overall level of psychopathology predicted the child's PTSD scores from pre-treatment to 12-month follow-up.

## Moderator analyses

Table 4.3 provides the results of the LMM analyses testing the effects upon outcome (change in child-reported PTSD symptoms from baseline) of the interaction between time, the candidate moderator, and treatment assignment (EMDR vs CBWT), from pre- to post-treatment, pre-treatment to 3-month follow-up, and pre-treatment to 12-month follow-up. Given the fact that the randomization procedure did not involve stratification by trauma type and a rather skewed distribution of trauma types between conditions, we excluded this variable from the moderator analyses. Results of the moderator analyses showed a significant effect for several indices of child and parental psychopathology, indicating a differential effect of these variables on outcomes in EMDR and CBWT. Specifically, outcome from pre- to post-treatment was significantly moderated by the baseline severity of the child's PTSD (child- and parent-report), anxiety and depressive symptoms (parent-report only), and by the severity of the parent's psychopathology (PTSD, depression, anxiety, and overall psychopathology). Parental depression and anxiety continued to moderate outcomes from pre-treatment to the 3-month follow-up, and parental anxiety from pre-treatment to the 12-month follow-up. A significant effect was observed for age, in that older children experienced a smaller reduction in PTSD symptoms in CBWT than EMDR therapy, but only from pre-treatment to the 3-month follow-up.

To further explore the direction and strength of the moderating effects of child and parent psychopathology on outcomes (rates of decrease in child-reported PTSD symptoms in EMDR and CBWT), the effects on outcome of the moderator measured at the low (total score < 40$^{th}$ percentile) and high (total score > 60$^{th}$ percentile) ends of severity at baseline, were calculated as an illustration (cf., Hayes 2013). By taking these percentiles as a reference point, the results refer to a large part of the sample. As the RCT from which these data were drawn was not designed as a moderator study, we did not test for differential outcomes between EMDR and CBWT to reduce the risk of false positive/negative findings.

**Table 4.3: Results of linear mixed models testing for effect between time, moderator and treatment condition, with estimates of change per week and the difference in change estimates between CBWT and EMDR for child reported PTSD symptoms from pre-treatment to post-treatment and follow-up (*N* = 101)**

| | Pre- to post-treatment | | | | Pre-treatment to 3 months | | | | Pre-treatment to 12 months | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Outcome/moderator variables | CBWT Estimate (SE) | EMDR Δ Estimate (SE) | *t* | *p* | CBWT Estimate (SE) | EMDR Δ Estimate (SE) | *t* | *p* | CBWT Estimate (SE) | EMDR Δ Estimate (SE) | *t* | *p* |
| **Child variables** | | | | | | | | | | | | |
| Age in months | 0.016 (.007) | -.015 (.009) | -1.63 | .104 | .008 (.004) | -.011 (.005) | -2.26 | .024 | 001 (.002) | -.003 (.002) | -1.26 | .208 |
| Gender (male = 0) | -.014 (.390) | .314 (.633) | .50 | .620 | .053 (.218) | -.268 (.308) | -.87 | .385 | .051 (.097) | -.147 (.134) | -1.09 | .274 |
| PTSD-child report (CRTI-C) | .018 (.008) | -.035 (.016) | -2.17 | .031 | .004 (.004) | -.007 (.007) | -.95 | .342 | .001 (.002) | -.004 (.003) | -1.30 | .194 |
| PTSD-parent report (CRTI-P) | .031 (.007) | -.031 (.012) | -2.48 | .014 | .012 (.004) | -.010 (.006) | -1.60 | .109 | .003 (.002) | -.004(.003) | -1.40 | .162 |
| Anx/dep-child report (RCADS-C) | .023 (.010) | -.011 (.018) | -.64 | .524 | .005 (.005) | .004 (.008) | .47 | .639 | .001 (.003) | -.002 (.004) | -.64 | .523 |
| Anx/dep-parent report (RCADS-P) | .039 (008) | -.029 (.014) | -1.99 | .047 | .016 (.004) | -.011 (.007) | -1.54 | .125 | .004 (.002) | -.004 (.003) | -1.35 | .178 |
| No. comorbid disorders-child interv. (ADIS-C) | .194 (.118) | .049 (.234) | .21 | .836 | .076 (.074) | .054 (.120) | .45 | .655 | .049 (.032) | -.092 (.050) | -1.82 | .069 |
| No. comorbid disorders-parent interv. (ADIS-P) | .263 (.110) | -.090 (.213) | -.42 | .673 | .132 (.076) | -.023 (.106) | -.22 | .826 | .064 (.034) | -.062 (.050) | -1.25 | .214 |
| Trauma-related beliefs (C-PTCI) | .031 (.013) | -.014(.026) | -.55 | .585 | .013 (.008) | -.001 (.012) | -.05 | .964 | .005 (.003) | -.006 (.005) | -1.19 | .236 |
| **Parent variables** | | | | | | | | | | | | |
| PTSD symptoms (IES) | .028 (.005) | -.045 (.013) | -3.57 | < .001 | .013 (.003) | -.009 (.006) | -1.34 | .182 | .003 (.002) | -.003 (.003) | -.95 | .343 |
| Overall psychoapthology (BSI) | .015 (.003) | -.026 (.010) | -2.66 | .008 | .008 (.002) | -.007 (.004) | -1.65 | .100 | .002 (.001) | -.003 (.002) | -1.58 | .115 |
| Depression subscale | .138 (.023) | -.233 (.076) | -3.07 | .002 | .070 (.016) | -.084 (.035) | -2.38 | .018 | .022 (.009) | -.027 (.016) | -1.69 | .092 |
| Anxiety subscale | .123 (.021) | -.255 (.064) | -4.00 | < .001 | .064 (.014) | -.077 (.030) | -2.56 | .011 | .021 (.008) | -.027 (.013) | -2.02 | .044 |

Abbreviations: EMDR, Eye Movement Desensitization and Reprocessing; CBWT, Cognitive Behavioral Writing Therapy; CRTI-C/P, Children's Responses to Trauma Inventory – Child/Parent Versions; RCADS-C/P, Revised Child Anxiety and Depression Scale – Child/Parent Versions; ADIS-C/P, Anxiety Disorders Interview Schedule for DSM-IV – Child/Parent Versions; C-PTCI, Children's Post Traumatic Cognitions Inventory; IES, Impact of Event Scale; BSI, Brief Symptom Inventory.
Note: *T* and *p* values are for the difference in Δ estimates (change per week) between CBWT and EMDR groups.

Table 4.4 provides the estimated mean of child-reported PTSD symptoms from pre- to post-treatment for high- and low-scoring groups of EMDR therapy and CBWT participants, and the difference in estimates (within groups), for the significant moderator variables (see Appendix S4.1 for the pre-treatment to follow-up results). At higher severity levels of the child (PTSD, anxiety and depression) and parental psychopathology moderators (PTSD, overall psychopathology, depression, and anxiety), CBWT and EMDR therapy appeared equally effective. At the lower severity level of these moderators (< 40$^{th}$ percentile), participants in CBWT experienced a greater decrease in PTSD symptoms than those in EMDR therapy (CRTI-C, range of 7 to 14 points). The one exception to this pattern of results was that children with more severe PTSD symptoms at baseline (child-reported) experienced a greater decrease in PTSD symptoms (child-reported) in EMDR therapy than CBWT (5 points on the CRTI-C scale).

## DISCUSSION

To our knowledge, the current study is only the second RCT (see also Kane et al., 2016) that has evaluated candidate moderators for two active psychological treatments for children and adolescents (aged 8–18 years) meeting full or subthreshold diagnostic criteria for PTSD, and the first to include EMDR therapy. The results add to the literature in that the present study is the first to investigate the role of differential treatment moderators at a long-term follow-up (i.e., 12 months). The main results of the predictor analyses showed that a more severe clinical profile at the child and parental level predicted a smaller reduction in child-reported PTSD symptoms from pre- to post-treatment in both CBWT and EMDR therapy. The same pattern held true from pre-treatment to the 3-month follow-up, with the exception that mainly parental reports of the child's symptoms and parental psychopathology continued to predict poorer outcomes. Interestingly, the results of the (exploratory) moderator analyses showed differential responses in outcome, mainly from pre- to post-treatment, albeit there were high rates of improvement for both methods at post treatment (> 90% achieved diagnostic remission) in less than four hours of therapy (de Roos et al., 2017).

Contrary to expectation and the limited literature available, gender did not predict outcome while trauma type did; those with sexual abuse as their index trauma fared worse in both treatments. An important finding is that parental psychopathology (i.e., PTSD, anxiety, depression, and overall psychopathology) predicted poorer outcomes for the child in both treatments. This is largely consistent with an extensive body of literature

**Table 4.4: Estimated means for child-reported PTSD symptoms at pre- and post-treatment, and difference (Δ) between these means, separately for participants scoring at the high- and low-end of the significant moderator variables in EMDR and CBWT groups**

| | Severity of child-reported PTSD symptoms | | | | | |
|---|---|---|---|---|---|---|
| | Low severity (< 40th percentile) | | | High severity (> 60th percentile) | | |
| Moderator/treatment condition | Pre-treatment | Post-treatment | Pre- to post-treatment Δ | Pre-treatment | Post-treatment | Pre- to post-treatment Δ |
| **Child psychopathology** | | | | | | |
| Child-reported PTSD (CRTI-C) | | | | | | |
| EMDR | 66.92 | 47.60 | 19.32 | 94.03 | 66.93 | 27.10 |
| CBWT | 73.93 | 44.94 | 28.99 | 94.93 | 72.40 | 22.53 |
| Parent-reported PTSD (CRTI-P) | | | | | | |
| EMDR | 72.93 | 50.56 | 22.37 | 78.73 | 55.33 | 23.40 |
| CBWT | 87.44 | 54.72 | 32.72 | 89.14 | 65.41 | 23.73 |
| Parent-reported anx/dep (RCADS-P) | | | | | | |
| EMDR | 72.67 | 47.49 | 25.18 | 79.00 | 57.18 | 21.82 |
| CBWT | 85.80 | 52.95 | 32.85 | 89.42 | 66.47 | 22.95 |
| **Parental psychopathology** | | | | | | |
| PTSD symptoms (IES) | | | | | | |
| EMDR | 69.75 | 50.43 | 19.32 | 77.61 | 52.35 | 25.26 |
| CBWT | 86.97 | 58.24 | 28.73 | 88.48 | 63.90 | 24.58 |
| Overall psychopathology (BSI-Total) | | | | | | |
| EMDR | 72.08 | 53.15 | 18.93 | 77.28 | 52.52 | 24.76 |
| CBWT | 87.10 | 57.34 | 29.76 | 89.74 | 61.50 | 28.24 |
| Depression (BSI-Depression) | | | | | | |
| EMDR | 74.50 | 53.56 | 20.94 | 77.17 | 52.98 | 24.19 |
| CBWT | 88.82 | 57.69 | 31.13 | 85.69 | 60.40 | 25.29 |
| Anxiety (BSI-Anxiety) | | | | | | |
| EMDR | 76.92 | 58.80 | 18.12 | 75.81 | 51.19 | 24.62 |
| CBWT | 86.90 | 54.67 | 32.23 | 86.95 | 62.96 | 23.99 |

Abbreviations: EMDR, Eye Movement Desensitization and Reprocessing; CBWT, Cognitive Behavioral Writing Therapy; CRTI-C/P, Children's Responses to Trauma Inventory Child/Parent Versions; RCADS-P, Revised Child Anxiety and Depression Scale – Parent Version; IES, Impact of Event Scale; BSI, Brief Symptom Inventory.

which shows that parental psychopathology (particularly maternal depression) is one of the most consistent risk factors for the development and severity of PTSD in children exposed to a traumatic event (Alisic, Jongmans, van Wesel, & Kleber, 2011; Trickey, Siddaway, Meiser-Stedman, Serpell, & Field, 2012). At the very least, this finding emphasizes the importance of assessing parental psychopathology at intake or during the diagnostic phase, and where necessary, referring the parent for their own treatment. With respect to the child's levels of psychopathology as predictors of child PTSD outcomes, the literature is rather mixed. To this end, the results of the present study are consistent with earlier CBT studies (Nixon et al., 2012; Warmser-Nanney, Scheeringa, & Weems, 2016) in that children with more severe PTSD, depression and anxiety at baseline fared worse in both EMDR and CBWT. It is conceivable that clinicians could add extra sessions to either of these treatments to enhance outcomes for more affected children. Finally, a noteworthy finding is that children with more trauma-related beliefs fared less well in both treatments. This finding is consistent with cognitive models of PTSD as applied to both adults and children (Ehlers & Clark, 2000; Meiser-Stedman et al., 2019), that emphasize the central role of such beliefs in the development, maintenance and severity of PTSD, and as such are important targets for treatment. In this regard, the present study extends findings for the relevance of trauma-related beliefs to outcomes in EMDR therapy.

As to the moderator analyses, the overall results suggest that children with high scores on the significant moderator variables, especially child and parental psychopathology, experienced similar levels of improvement in both treatments. There were two exceptions to this pattern. First, children reporting higher levels of PTSD at baseline experienced a greater reduction in PTSD symptoms in EMDR therapy at post-treatment than those who received CBWT. Second, children with lower levels of psychopathology, and children whose parent had lower levels of psychopathology, appeared to fare better in CBWT than EMDR therapy. Both sets of results should be interpreted with caution as the child's baseline levels of PTSD were higher in the CBWT than EMDR therapy group (Table 4.4), and both treatments yielded high rates of diagnostic remission and symptom change in the original trial. While not measured in this study, it is possible that the findings for the moderating role of child psychopathology partly reflects an interaction between the child's level of distress measured at the symptom level and the levels of emotional arousal they experienced during subsequent treatment sessions. In EMDR therapy, the child is asked to recall the most disturbing images from their traumatic memory, which is usually accompanied by an immediate increase in emotional arousal, and this may benefit those with more severe PTSD symptoms. In CBWT, the child builds an increasingly detailed, written trauma narrative over successive sessions, alongside cognitive restructuring, identifying positive coping responses,

and sharing the narrative with loved ones, all of which may elicit emotional arousal in a more gradual fashion and benefit children with less severe PTSD. As emotional arousal is argued to be necessary to the activation and reconsolidation of the trauma memory, and thus an essential change mechanism in all trauma-focused therapies (Layne, Ryan, Nadel, & Greenberg, 2015), future comparative studies should measure in-session arousal as part of a process of identifying possible outcome moderators and mediators. Again, our findings with respect to an apparent association between lower baseline levels of parental psychopathology and greater reductions in child PTSD from pre- to post-treatment in CBWT than EMDR therapy must be viewed with caution for the reasons mentioned above. In addition, we did not measure parenting style/skills or change in the parent's symptoms during the course of the child's treatment, both of which may be important to interpreting the current findings. Overall, it should be noted that both for the predictor and moderator analyses, the significant effect of variables on outcome were time-limited and primarily found for the pre- to post-treatment interval (a short time span of up to 6 weekly treatment sessions) and to a lesser extent from pre-treatment to the 3-month follow-up, with one exception for pre-treatment to 1-year follow-up.

As with any study, several strengths and limitations need to be noted. The present study benefits from the data being collected as part of a large RCT comparing two active, evidence-based treatments for pediatric PTSD, and involving blinded diagnostic assessments, a wide range of standardized child- and parent-report symptom measures, low attrition rates (2%), and 3- and 12-month follow-ups (de Roos et al., 2017). However, an important limitation is that this trial was not designed to test for predictor and moderator effects. The choice of candidate predictors and moderators for the present study was pragmatic, reflecting the measures that were used to assess clinical outcomes in the earlier RCT. Secondly, this study was carried out in the Netherlands, with clinically referred children (aged 8-18 years) who had a current DSM-IV diagnosis of either full or subthreshold PTSD tied to a single traumatic event, and thus the current findings may not generalize to other populations, trauma types or clinical settings.

In conclusion, the present study aimed to address important gaps in the pediatric PTSD treatment literature about predictors and moderators of outcome in two forms of evidence-based, trauma-focused treatments for pediatric PTSD. Given the limited duration of the significant differential treatment (moderator) effects on PTSD outcomes, and the brevity and large, equal effects of both EMDR therapy and CBWT for pediatric PTSD tied to a single event, the future challenge appears to be on enhancing delivery of trauma-focused treatments rather than tailoring them.

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**Key points**

- There is limited research on patient-level predictors and moderators of treatment outcome to pediatric PTSD.
- The most consistent finding of the predictor analyses is that parental psychopathology negatively affects child PTSD outcome, emphasizing the importance of assessing and treating parental psychopathology, when indicated, to enhance or accelerate child treatment outcomes.
- Due to the time-limited significance of the differential treatment (moderator) effects on outcome, and the brevity and large effect size for EMDR therapy and CBWT for pediatric PTSD tied to a single event, the future focus should be on enhancing administration of these treatments instead of personalizing them.



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**Appendix S4.1: Estimated means for child-reported PTSD symptoms at pre-treatment, 3-month follow-up and 12-month follow-up, and difference (Δ) between pre-treatment means and FUs, separately for participants scoring at the high-and low-end of the significant moderator variables in EMDR and CBWT groups**

| | Severity of child-reported PTSD symptoms | | | | | |
|---|---|---|---|---|---|---|
| | Low severity (< 40th percentile) | | | High severity (> 60th percentile) | | |
| Moderator/treatment condition | Pre-treatment | 3-month follow-up | Pre-treatment to 3-month FU Δ | Pre-treatment | 3-month follow-up | Pre-treatment to 3-month FU Δ |
| Child variable | | | | | | |
| Age in months | | | | | | |
| EMDR | 68.75 | 46.23 | 22.52 | 80.09 | 52.55 | 27.54 |
| CBWT | 77.29 | 44.04 | 33.25 | 82.62 | 57.02 | 25.60 |
| Parental psychopathology | | | | | | |
| Overall psychopathology (BSI-Total) | | | | | | |
| EMDR | 68.30 | 45.43 | 22.87 | 71.97 | 50.06 | 21.91 |
| CBWT | 82.38 | 46.32 | 36.06 | 85.04 | 54.93 | 30.11 |
| Depression (BSI-Depression) | | | | | | |
| EMDR | 70.39 | 48.49 | 21.90 | 71.92 | 49.67 | 22.25 |
| CBWT | 83.64 | 47.32 | 36.32 | 81.57 | 53.39 | 28.18 |
| Anxiety (BSI-Anxiety) | | | | | | |
| EMDR | 72.93 | 51.84 | 21.09 | 70.56 | 48.35 | 22.21 |
| CBWT | 81.88 | 45.53 | 36.35 | 82.89 | 55.45 | 27.44 |
| | Low severity (< 40th percentile) | | | High severity (> 60th percentile) | | |
| Moderator/treatment condition | Pre-treatment | 12-month follow-up | Pre-treatment to 12-month FU Δ | Pre-treatment | 12-month follow-up | Pre-treatment to 12-month FU Δ |
| Anxiety (BSI-Anxiety) | | | | | | |
| EMDR | 67.67 | 45.96 | 21.71 | 65.23 | 42.36 | 22.87 |
| CBWT | 72.38 | 41.82 | 26.42 | 74.79 | 50.92 | 23.87 |

Abbreviations: EMDR, Eye Movement Desensitization and Reprocessing; CBWT, Cognitive Behavioral Writing Therapy; BSI, Brief Symptom Inventory.

# 5

# Effectiveness of trauma-focused treatment for adolescents with major depressive disorder

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## ABSTRACT

**Background:** Major Depressive Disorder (MDD) in adolescence has a high prevalence and risk of disability, but current treatments show limited effectiveness and high drop-out and relapse rates. Although the role of distressing experiences that relate to the development and maintenance of MDD has been recognized for decades, the efficacy of a trauma-focused treatment approach for MDD has hardly been studied.

**Objective:** To determine the effectiveness of eye movement desensitization and reprocessing (EMDR) therapy as a stand-alone intervention in adolescents diagnosed with MDD. We hypothesized that reprocessing core memories related to the onset and maintenance of MDD using EMDR therapy would be associated with a significant decrease in depressive and comorbid symptoms.

**Method:** We recruited 32 adolescents (12–18 years) fulfilling DSM-IV criteria for mild to moderate severe MDD from an outpatient youth mental health care unit. Treatment consisted of six weekly 60-minute individual sessions. Presence or absence of MDD classification (ADIS-C), symptoms of depression (CDI), symptoms of posttraumatic stress (UCLA), anxiety (SCARED), somatic complaints (CSI), and overall social-emotional functioning (SDQ) were assessed pre and post-treatment and three months after treatment.

**Results:** 60.9% of the adolescents completing treatment no longer met DSM-IV criteria for MDD after treatment anymore, and 69.8% at follow-up. Multilevel analyses demonstrated significant posttreatment reductions of depressive symptoms (CDI: Cohen's $d$ = 0.72), comorbid posttraumatic stress, anxiety and somatic complaints, while overall social-emotional functioning improved. These gains were maintained at 3-month follow-up (Cohen's $d$ = 1.11). Severity of posttraumatic stress reactions significantly predicted the posttreatment outcome; however, duration of MDD, number of comorbid disorders, or having a history of emotional abuse, emotional neglect or physical neglect were not predictive for outcome.

**Conclusions:** This is the first study suggesting that EMDR therapy is associated with a significant reduction of depressive symptoms and comorbid psychiatric problems in adolescents with mild to moderate-severe MDD.


**Keywords:** EMDR; trauma focused treatment; major depressive disorder; adolescents; pilot study

## INTRODUCTION

Major depressive disorder (MDD) is one of the most common psychiatric disorders of childhood and adolescence (Mullen, 2018). It has been estimated that 14 to 25% of adolescents experience at least one episode of a depressive disorder before entering adulthood (Ryan, 2005). MDD is a leading cause of disability in terms of burden of disease, and poor functioning (Smith, 2014; Stikkelbroek, Bodden, Deković, & van Baar, 2013). Furthermore, MDD with adolescent onset has been found to be associated with a range of physical health problems and other mental health disorders in adult life (Thapar, Collishaw, Pine, & Thapar, 2012; Weersing, Jeffreys, Do, Schwartz, & Bolano, 2017) as well as with social problems, legal problems, and elevated suicide risk (Stikkelbroek et al., 2013).

There are several treatments for adolescent MDD, with cognitive behavioural therapy (CBT) being recommended as psychosocial intervention for both mild and moderate to severe forms of MDD (NICE guideline, 2019). The efficacy of CBT has been established in several reviews and meta-analyses (Compton et al., 2004; Oud et al., 2019; Weisz, McCarty, & Valeri, 2006) and is known to be the intervention with the largest body of evidence. However, the effectiveness of CBT for this target population has been found to be attenuated when compared to active control conditions, and when applied to clinically complicated samples (Lewis et al., 2010; Weersing et al., 2017). For example, in a Dutch multicentre study carried out in specialized mental health institutions for depressed adolescents (12–21 years; Stikkelbroek, 2016) CBT was not found to be more effective than treatment as usual (TAU). In fact, CBT performed worse on both drop-out (CBT 57% *vs* TAU 41%) and the number of adverse events during treatment (CBT 3 *vs* TAU 0). The relative poor efficacy of CBT for adolescent MDD is underlined by a mean effect size of 0.29, as computed in a recent meta-analysis of CBT for adolescent MDD (Weisz et al., 2017). Therefore, there is an urgent need to enhance the treatment outcome for depressed adolescents.



Eye movement desensitization and reprocessing (EMDR) therapy (Shapiro, 2017) is a recommended treatment for posttraumatic stress disorder (PTSD; ISTSS Guidelines Committee, 2018; World Health Organization, 2013). It has been found to be capable of processing memories of distressing events (Shapiro, 2017). Individuals with MDD frequently report an adolescent onset, often following exposure to distressing experiences (Mandelli, Petrelli, & Serretti, 2015; Monroe, Slavich, & Georgiades, 2014). Strongest evidence for a relationship between childhood adverse events and the development of MDD has been found for interpersonal experiences, like humiliation and entrapment (Kendler, Hettema, Butera, Gardner, & Prescott, 2003), and different forms of abuse, primarily emotional abuse and neglect (Hovens et al., 2010, Mandelli et al., 2015).

In the past five years several studies have been conducted demonstrating preliminary evidence for the efficacy of EMDR therapy in the treatment of MDD in adults. Promising results were obtained from studies investigating EMDR therapy as an adjacent therapy to CBT (Hoffman et al., 2014), to pharmacological treatment (Minelli et al., 2019; Ostacoli et al., 2018) and to inpatient treatment (Hase et al., 2015; 2018). Three studies, investigating the efficacy of EMDR as a stand-alone treatment, demonstrated significant reductions of depressive symptoms (Gauhar, 2016), even for patients with long-term depression (Wood, Ricketts, & Parry, 2018) and treatment-resistant depression (Minelli et al., 2019). Treatment of MDD also resulted in significant decreases of trauma symptoms (Gauhar, 2016) and anxiety symptoms (Minelli et al., 2019), improved social functioning (Minelli et al., 2019) and quality of life (Gauhar, 2016).

While research involving EMDR treatment for adults with depression is emerging rapidly, research on the effectiveness for adolescents has not followed in the same pace. To our knowledge only one case series (Bae, Kim, & Park, 2008) has been published, which included two adolescents. Although these adolescents did not report traumatic events in their history, they had experienced loss and rejection in family and peer relationships. EMDR was targeted on these memories involving loss and rejection. Both adolescents displayed a significant decline of depressive symptomatology after three and seven EMDR sessions, respectively. This result was maintained at 2- and 3-month follow-up. Given that distressing or traumatic events have been found to be associated with the onset and maintenance of depressive disorders it is conceivable that adolescent MDD is responsive to EMDR therapy when the memories of these events are targeted and resolved. Therefore, the purpose of the present study was to investigate the effectiveness of EMDR in adolescents (12–18 years) with a primary diagnosis of MDD (DSM-IV; American Psychiatric Association, 1994). It was hypothesized that the application of EMDR therapy would be associated with a significant decrease in the severity of depressive symptoms and in the percentage of patients meeting DSM-IV criteria for MDD. Furthermore, we hypothesized that treatment would be associated with a significant decrease in severity of co-morbid symptoms (i.e., posttraumatic stress symptoms, anxiety, somatic and emotional-behavioural problems). In addition, we examined whether duration of MDD, baseline posttraumatic stress disorder severity, number of comorbid disorders, or having a history of emotional abuse, emotional neglect or physical neglect would significantly predict post-treatment outcome. Moreover, to determine the safety of the intervention for this target group the number of adverse events was recorded.

# METHOD

## Participants

Patients were recruited from the regular referrals to the Mental Health Institution (MHI) Rivierduinen Leiden Children and Youth department, an outpatient mental health care unit, between December 2015 and March 2018. Inclusion criteria were: (a) age 12–18 years (b) mild to moderate depressive disorder according to the criteria of the Dutch guidelines (Dutch Multidisciplinary Guideline for Depression in Youth, 2009), i.e. five to eight symptoms according to DSM IV (American Psychiatric Association (APA), 1994), interference of the condition with a maximum of three out of four life domains (school, social situations, leisure, and home/family) and a Global Assessment of Functioning (GAF) > 45 (c) identified memories of at least one distressing or traumatic event related to the depressive symptomatology. Exclusion criteria were: (a) severe suicidal or psychotic symptoms, (b) a suicide attempt or serious non-suicidal self-injury requiring hospitalization in the three months prior to intake (c) substance dependence (d) IQ estimated to be ≤ 80 based on information from the referral letter or diagnostic phase (e) insufficient Dutch language skills.

## Procedure

Patients referred for treatment of depressive symptoms at the participating department were screened for eligibility by the first and third author. After the institutions' regular intake assessment, adolescents who had depressive symptoms were informed about the study by their clinician. Next, pre-treatment assessment (T0) was administered and a session with the EMDR therapist was planned. This session was aimed at checking the inclusion criterion 'identified memories of at least one distressing or traumatic event related to the depressive symptomatology'; since no standardized instruments are available to make an inventory of depression-related memories beforehand. Subsequently, remaining in- and exclusion criteria were again checked, and in case of eligibility and willingness to participate, informed consent of both adolescents and their caregivers was obtained. Following EMDR treatment, remaining symptoms and need for further treatment of each adolescent were discussed with participants, parents and the multidisciplinary staff.

Outcomes were measured post-treatment (T1) and three months after treatment (follow-up, T2) by a team of eight independent assessors (i.e., trained clinicians and master level students), who were not involved in the treatment. Adverse events, such as suicidal attempts, serious self-injurious behaviour and crisis contacts, were recorded using a checklist by the therapists at the start of each session.

For administration of the ADIS-C all assessors were trained according to a protocol consisting of observing live and videotaped interviews and completed an exam to prove adequate administration of the interview. Supervision was provided for each assessment and the reports were reviewed and discussed to ensure that administration, scoring and reporting would not drift. Therapists who conducted the EMDR sessions were blind to assessment data.

## Intervention

The Dutch version of the standard EMDR procedure with age-specific adaptations for children and adolescents (De Roos, Beer, de Jongh, & Ten Broeke, 2015) was used for the present study. This procedure includes eight phases: history taking, preparation, assessment, desensitization, installation, body scan, closure and re-evaluation (Shapiro, 2017). Treatment consisted of six weekly 60-minute individual treatment sessions. Memories were placed in a hierarchy based on the Subjective Units of Disturbance (SUD), and were treated subsequently from high to low SUD. Each session was followed by a 10 to 15-minute meeting with the adolescent and one or both parents. The content of this meeting was discussed beforehand with the adolescent and could comprise any one of the following elements: (1) an outline of the content of the session (2) parents' view on the course of symptoms in the week before the session and (3) the need and possibilities for emotional support of the adolescent after the session.

In the present study, EMDR therapy was carried out by a team of seven clinical psychologists. Six of them were registered EMDR Europe Practitioners. All sessions were videotaped and all therapists participated in monthly two-hour supervisions by a certified EMDR Europe Child and Adolescent Consultant (second author). Additional supervision by email or telephone was provided on request. Early completion of treatment (< 6 sessions) was assigned in cases where all target memories from the case conceptualisation could be retrieved without emotional disturbance (i.e., SUD related to the memory was reduced to zero).

## Assessment instruments

The participants' demographic characteristics (e.g., living condition, level of education, history of mental health service use) were assessed at baseline. All measurements were administered at all assessments (baseline (T0), post-treatment (T1) and 3-month follow-up (T2), except the Childhood Trauma Questionnaire (CTQ), which was only administered at T0.

The primary outcome measure of this study was the presence of a MDD diagnosis on the Anxiety Disorders Interview Schedule for DSM-IV Child version (ADIS-C). The ADIS-C assesses a wide range of diagnoses according to DSM-IV criteria (American Psychiatric Association, 1994; Siebelink & Treffers, 2001; Silverman & Albano, 1996). The ADIS-C has strong evidence for providing reliable and valid diagnoses and proved to possess adequate sensitivity to clinical change in treatment outcome research (Silverman & Ollendick, 2005).

The Dutch version of the Children's Depression Inventory (CDI; Kovacs, 1985; Timbremont, Braet, & Roelofs, 2008) was used to assess affective, behavioural and cognitive aspects of depressive symptoms in the past 2 weeks. The CDI includes 27 items dealing with sadness, self-blame, loss of appetite, insomnia, interpersonal relationships, and school adjustment which are scores on a 3-point Likert scale (0–2, total range 0–54). Acceptable levels of internal consistency, validity and test–retest reliability have been established (Kovacs, 1985; Roelofs et al., 2010). Reliability of the total scale in the current study was acceptable (α = .78).

The University of California at Los Angeles Post-Traumatic Stress Disorder Reaction Index Adolescent version (UCLA PTSD RI; Steinberg, Brymer, Decker, & Pynoos, 2004) was used to screen for exposure to traumatic events and to assess PTSD symptoms. The symptom scale consists of 22 items which are scored on a 5-point Likert scale (0–4; total range 0–88) and assesses the frequency of occurrence of PTSD symptoms during the past month. The original list of traumatic events covering medical trauma, natural disasters, community violence and abuse was adapted for the present study by adding four items concerning experiences of loss and separation (death and separation from loved ones) and humiliation (bullying and being isolated/ignored). These experiences, considered as 'attachment trauma' (Hofmann et al., 2014) have been identified as being connected to the onset of depressive episodes (see, e.g., Bae et al., 2008; Kendler et al., 2003). Reliability of the UCLA total scale in the current study was excellent (α = .91).

The Dutch version of the Screen for Child Anxiety Related Emotional Disorders (SCARED; Muris, Bodden, Hale, Birmaher, & Mayer, 2007; Muris, Merckelbach, Schmidt, & Mayer, 1998) was used to assess signs of anxiety disorders in the past three months. The SCARED is a 41-item inventory rated on a 3-point Likert-type scale (0 = 'not true' or 'hardly ever true'; 1 = 'somewhat true' or 'sometimes true'; 2 = 'very true' or 'often true'; total range 0–82). Reliability of the SCARED total scale in the current study was excellent (α = .92).

The Children's Somatisation Inventory (CSI; Garber, Walker, & Zeman, 1991; Dutch version: Treffers, Goedhart, & Siebelink, 1998) was used to assess the extent and frequency of 35 somatic complaints (e.g. headaches, constipation, dizziness) in children and adolescents in the past two weeks. Items are scored on a 5-point Likert scale (0: 'not at all', 4 'a whole lot') (total range 0–140). Reliability of CSI total scale in the current study was excellent (α = .93).

The Dutch adolescent version of the Strengths and Difficulties Questionnaire (SDQ; Goedhart, Treffers, & Van Widenfelt, 2003; Goodman, 1997) was used as a global assessment of psychological problems. The SDQ consists of 25 items which are scored on a 3-point Likert scale ranging from 'not true', 'somewhat true' or 'certainly true' (total range 20–80). In this study the 'total difficulties scale' was used in the analyses. Reliability of the SDQ total scale in the current study was good (α = .80).

The Childhood Trauma Questionnaire (CTQ; Bernstein et al., 2003) was used to assess experiences of childhood maltreatment. The CTQ is a self-report list consisting of 28 items which are scored on a 5-point Likert scale. The CTQ has a good criterion validity in both a clinical and a healthy sample (Bernstein et al., 2003). The subscales Emotional Neglect, Emotional Abuse and Physical Neglect were used in the analyses. Reliability of the CTQ total scale in the current study was excellent (α = .90).

## Data analyses

All statistical analyses were performed using IBM SPSS Statistics for Windows (version 24). Descriptive statistics were produced to describe the demographic characteristics and baseline variables of the sample. To investigate the effect of EMDR therapy time contrasts were created (T0–T1, T0–T2) by means of dummy coding. Linear mixed model analyses were used for the main analyses. The mixed model for investigating the general efficacy of the EMDR intervention included a random term for the intercept and fixed terms for time contrasts (T0–T1, T0–T2). The covariance matrix was set to scaled identity. Effect sizes were calculated using Cohen's *d* (Cohen, 1992), and determined by calculating the mean difference between scores from baseline (T0) to post-treatment (T1) and from baseline (T0) to follow-up (T2), dividing the result by the pooled standard deviation (Cohen, 1988). Cohen's d was calculated for both depressive symptoms and comorbid symptoms.

To identify possible predictors of treatment outcome (depressive symptoms as measured by the CDI), baseline posttraumatic stress symptom severity (UCLA), number of comorbid disorders (ADIS-C) and depression-specific baseline factors (i.e., history of emotional abuse or neglect (CTQ), and duration of the disorder) were entered separately in the linear mixed model analyses. The same time contrasts as described above were used (i.e. T0–T1 and T0–T2). The level of significance was set at α = .05.

# RESULTS

## Patient flow and sample characteristics

Before referral to our institution, and entering the study, the majority of the patients ($n = 23$; 72%) received some form of treatment. Based upon the UCLA, 73% of the adolescents had experienced a non-criterion A-event (i.e., bullying/humiliation, being ignored/isolated and bereavement of a loved one) prior to therapy. The characteristics of the study population are presented in Table 5.1. The treatment sample was characterized by a long duration of MDD ($M = 72.4$ weeks, $SD = 74.42$, range 18–364 weeks; depressive disorder was present in the family in 59%) and a high number of comorbid disorders ($M = 2.39$, $SD = 1.38$; for all but one patient comorbid disorders were classified at T0). These comorbid disorders comprised primarily social phobia, generalised anxiety disorder and dysthymic disorder. From the different forms of childhood trauma, emotional neglect (32% above cut-off), emotional abuse (23% above cut-off) and physical neglect (19% above cut-off) were reported most frequently (Table 5.2).

Figure 5.1 shows the patient flow through the study. In total, 32 patients were included with a mean age of 15.8 years ($SD = 1.50$). Five (15.6%) were early completers and needed only four ($n = 1$) or five ($n = 4$) EMDR sessions. Seven (21.9%) dropped out before the end of treatment; three withdrew from treatment and study because of a lack of interest, one because of spontaneous remission, one because the parent demanded more intensive treatment, one because of insufficient ability to attend treatment sessions and one because the adolescent was not able to experience the emotional load related to the identified depression-related memories (SUD). Independent samples *t*-tests were performed to compare dropouts with completers on age, gender, baseline severity of MDD symptoms and posttraumatic stress reactions, duration of MDD and number of comorbid disorders at baseline. Therapist factors were excluded because of the low number of patients in each cell of the crosstabs (32 clients were treated by 8 therapists). From all tested variables, only duration of MDD differed significantly between the groups, with dropouts having a shorter duration of depressive symptoms ($M = 36.86$, $SD = 11.60$) compared to completers ($M = 86.22$, $SD = 79.84$) ($t(df = 27.14) = 2.98$, $p = 0.006$).

## Depression

As can be seen from Figure 5.2, 14 out of 23 adolescents who completed treatment and T1 assessment (60.9%) no longer fulfilled the criteria of a MDD diagnosis as determined by

the ADIS-C after treatment (T1). For the intent to treat group this rate was 43.8% (14 out of 32). The percentage no longer obtaining a MDD diagnosis further increased to 69.8% for completers (16 out of 23) and to 50.0% for the intent to treat group (16 out of 32) at follow-up (T2). Table 5.3 shows a significant decrease of depressive symptoms (CDI), with a sharp reduction of symptoms during treatment (T0–T1: Cohen's $d = 0.72$) and a further decrease afterwards (T0–T2; Cohen's $d = 1.11$).

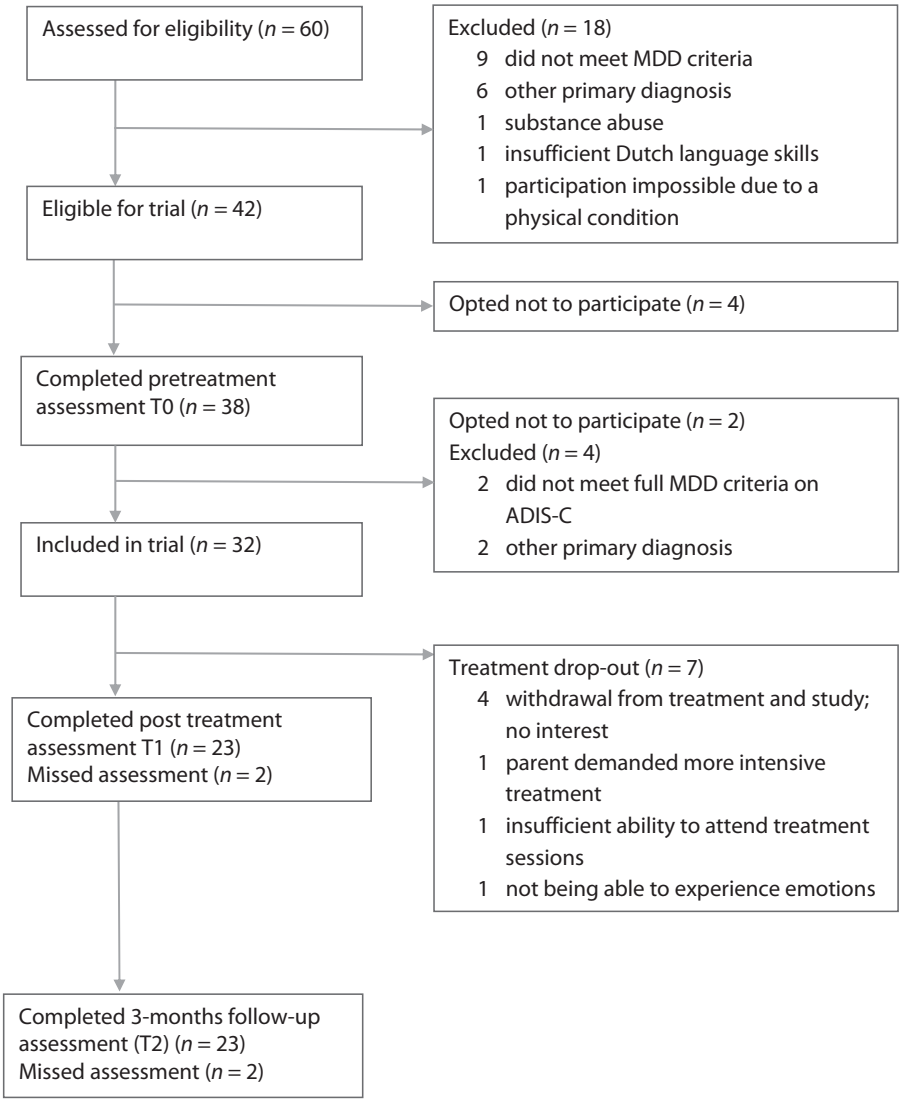


**Figure 5.1: Patient flow chart.**

**Table 5.1: Sample characteristics**

| Characteristics of the study population | *N* | % |
|---|---|---|
| Gender, male | 5 | 16 |
| Nationality, Dutch | 28 | 88 |
| Living condition | | |
| Living with both parents | 19 | 59 |
| Living with one parent | 8 | 25 |
| Parents divorced, living with both, alternating | 2 | 6 |
| Other (adoptive parents, grandparents, shared student household) | 3 | 9 |
| Level of education (*n* = 31) | | |
| Low to middle level secondary education or vocational education | 12 | 39 |
| High level: secondary education/ high school /professional education | 18 | 58 |
| | 1 | 3 |
| History of mental health service use | | |
| Outpatient psychiatric treatment | 13 | 41 |
| No treatment | 9 | 28 |
| Social work / school counseling | 7 | 22 |
| Multiple treatments | 2 | 6 |
| Other treatment | 1 | 3 |
| Receiving psychotropic medication | 1 | 3 |
| Index trauma from UCLA PTSD-RI at T0 (*n* = 30) | | |
| Bullying/humiliation[a] | 10 | 33 |
| Being ignored/isolated[a] | 7 | 22 |
| Bereavement of a loved one | 5 | 17 |
| Serious accident | 2 | 6 |
| Sexual assault | 2 | 6 |
| Illness/medical trauma | 1 | 3 |
| Natural disaster | 1 | 3 |
| Other experience with violence/serious danger | 2 | 2 |
| Total number of comorbid DSM-IV classifications on ADIS-C at T0 (*n* = 31) | | |
| 0 | 3 | 10 |
| 1 | 5 | 16 |
| 2 | 9 | 29 |
| 3 | 7 | 23 |
| 4 | 5 | 16 |
| 5 | 2 | 7 |
| Comorbid DSM-IV classification on ADIS-C at T0 (*n* = 31) | | |
| Social phobia | 18 | 56 |
| Generalized anxiety disorder | 12 | 38 |
| Dysthymic disorder | 9 | 28 |
| Attention-deficit/hyperactivity disorder | 5 | 16 |
| Specific phobia | 5 | 16 |
| Posttraumatic stress disorder | 4 | 13 |
| Obsessive compulsive disorder | 2 | 6 |
| Panic disorder | 2 | 6 |
| Separation anxiety disorder | 2 | 6 |
| Agoraphobia | 1 | 3 |

UCLA PTSD-RI, University of California at Los Angeles Post-Traumatic Stress Disorder Reaction Index Adolescent version; ADIS-C, Anxiety Disorders Interview Schedule for DSM-IV – Child version.

[a] Category was added to the original list of possible traumatic experiences for this study.

**Table 5.2: Results of linear mixed model analyses**

| | *M* (*SD*) *n* = 32 T0 | *M* (*SD*) *n* = 24 T1 | *M* (*SD*) *n* =25 T2 | T0 vs T1 | | | | T0 vs T2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Unstandardized β (95% CI) | *t*-test (*df*) | *p* value | Cohens' *d* | Unstandardized β (95% CI) | *t*-test (*df*) | *p* value | Cohens' *d* |
| CDI | 26.59 (7.64) | 20.25 (9.74) | 16.92 (9.73) | -6.183 (-8.833 to -3.533) | *t*(50.07) = -4.69* | < .001 | 0.72 | -9.868 (-12.519 to -7.218) | *t*(50.07) = -7.48* | < .001 | 1.11 |
| UCLA | 36.00 (15.28) | 19.22 (13.21) | 18.77 (14.54) | -16.488 (-22.651 to -10.324) | *t*(49.94) = -5.37* | < .001 | 1.17 | -17.881 (-23.044 to -11.717) | *t*(49.94) = -5.83* | < .001 | 1.16 |
| SCARED | 56.80 (19.28) | 37.43 (22.46) | 36.70 (22.06) | -18.235 (-23.945 to -12.526) | *t*(45.54) = -6.43* | < .001 | 0.93 | -19.235 (-25.018 to -13.451) | *t*(46.14) = -6.69* | < .001 | 0.97 |
| CSI | 36.83 (23.16) | 26.35 (19.34) | 22.91 (21.14) | -11.373 (-19.429 to -3.317) | *t*(48.87) = -2.84* | .007 | 0.49 | -15.213 (-23.342 to -7.083) | *t*(49.84) = -3.76* | < .001 | 0.63 |
| SDQ total | 19.50 (5.05) | 15.96 (7.06) | 15.17 (6.71) | -37.311 (-43.953 to -30.668) | *t*(50.33) = -11.28* | < .001 | 0.58 | -38.2997 (-44.971 to -31.629) | *t*(50.07) = -7.48* | < .001 | 0.73 |

CDI, Children's Depression Inventory; UCLA, University of California at Los Angeles Post-traumatic Stress Disorder Reaction Index Adolescent version; SCARED, Screen for Child Anxiety Related Emotional Disorders; CSI, Children's Somatisation Inventory, SDQ, Strengths and Difficulties Questionnaire.

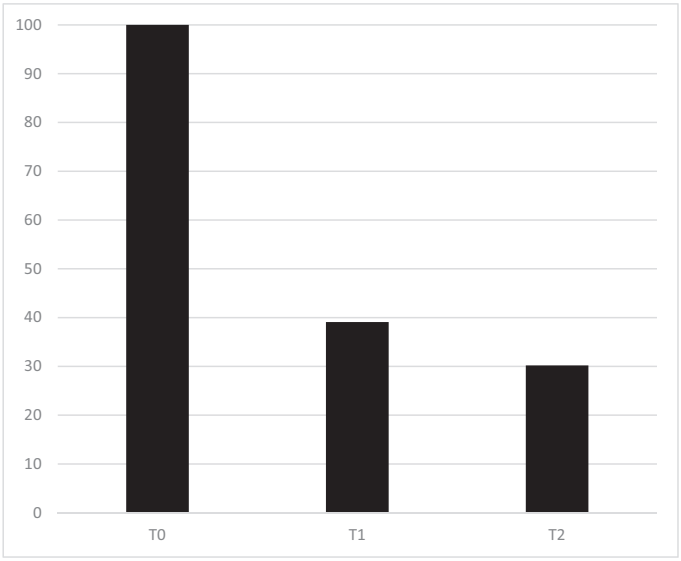


**Figure 5.2: Proportion of patients completing treatment meeting DSM-IV criteria for MDD (ADIS-C) at different points in time.**

Cohen's κ was calculated for the inter-rater agreement on the ADIS-C at T1. Half of the interviews ($n$ = 12) were double-scored and κ was calculated at .082.

## Comorbid symptoms

Posttraumatic stress symptoms (UCLA), anxiety symptoms (SCARED), somatic complaints (CSI) and general social-emotional problems (SDQ) showed a significant decrease following EMDR therapy which was maintained at follow-up. For all measures medium to large effect sizes were found (see Table 5.2).



## Prediction of post-treatment outcome

Severity of PTSD symptoms significantly predicted treatment outcome as measured by the CDI ($p$ < .01; see Table 5.3); with higher levels of PTSD symptoms at baseline predicting greater reductions of MDD symptoms during treatment. No other significant predictors of treatment outcome could be identified.

## Adverse events

No adverse events were reported during the study.

**Table 5.3: Results of predictor analyses on treatment outcome as measured by level of depressive symptoms (CDI)**

| | Time x predictor effects | | |
|---|---|---|---|
| | *B* | *t (p)* | 95% CI |
| Severity of PTSD symptoms | 0.27 | 2.85 (.01) | 0.08–0.46 |
| Number of comorbid disorders | 1.37 | 1.23 (.23) | -0.87–3.62 |
| Duration of MDD | 1.65 | 0.52 (.61) | -4.75–8.05 |
| Emotional abuse | 0.29 | 1.02 (.31) | -0.29–0.87 |
| Emotional neglect | 0.28 | 0.92 (.36) | -0.34–0.91 |
| Physical neglect | -0.27 | -0.24 (.81) | -2.54–1.99 |

PTSD, Post Traumatic Stress Disorder; MDD, Major Depressive Disorder.

## DISCUSSION

To our knowledge, besides one study on two cases (Bae et al., 2008) this is the first outcome study that examined the effectiveness of EMDR therapy in adolescents with a primary diagnosis of MDD. The results demonstrated a significant decrease in depressive symptoms and comorbid posttraumatic stress, anxiety, somatic complaints and overall social-emotional functioning. More than 60% of the adolescents completing treatment no longer fulfilled the criteria of a MDD diagnosis after treatment. The medium to large effect sizes suggested clinically relevant effects that were maintained at 3 months of follow-up.

It is noteworthy that remission of depressive symptoms was achieved after only six one hour sessions. For the completers most of the MDD related memories that were identified were processed using EMDR therapy. This suggests that the number of six sessions seemed sufficient for most of the adolescents. To this end, there are no similar studies with adolescents to compare our results to, but the present findings are consistent with the case study by Bae et al. (2008), and studies reporting the effect of EMDR therapy as a stand-alone intervention in adult MDD (Gauhar, 2016; Minelli et al., 2019; Wood et al., 2018).

Treatment result in our study seemed to be significantly influenced by baseline severity of posttraumatic stress reactions, meaning that adolescents with high levels of posttraumatic stress reactions demonstrated a larger decrease of depressive symptoms during treatment. None of the remaining predictors (i.e., number of comorbid disorders, duration of MDD and having a history of emotional abuse, emotional or physical neglect) seemed to have influenced treatment outcome. To this end, it could be particularly hopeful that the results suggest that a long duration of MDD and having many comorbid problems (74.2% had two or more comorbid disorders) did not significantly interfere with the effects

of EMDR therapy in this population, which is in contrast to what is often observed in studies that used cognitive behavioural therapy (Weersing et al., 2017). Yet, these results should, of course, be interpreted with caution, since this is a first small feasibility study with limited power.

The fact that adverse events, such as suicidal attempts, serious self-injurious behaviour and crisis contacts, did not occur suggests that treatment of MDD using a trauma-focused approach is safe. Related to this, the drop-out rate (21.9%) was comparable to drop-out rates obtained in other studies of EMDR therapy as a stand-alone treatment of MDD (e.g. Gauhar, 2016: 23%; Minelli et al., 2019: 15.4%; Woods et al., 2018: 30%). On the other hand, compared to the dropout-rate (57%) of a Dutch CBT study with a comparable population (Stikkelbroek et al., 2013) the drop-out rate of the present study can even be considered as low.

This study is a pilot study and has, therefore, several limitations. The most important limitation is the absence of a waiting list and/or an active control condition so we cannot rule out that the observed improvements were either an artefact of time or due to placebo effects. Secondly, the sample size was small and the follow-up period of 3 months was relatively short. Thirdly, given the wide array of studies showing that this population often suffers from suicidal intentions we wanted to be cautious and excluded individuals with severe depression. Although the results of the present feasibility study do not support the notion that the use of EMDR is unsafe in terms of adverse events, it could be argued that the exclusion of a severe subgroup might make the results less generalizable. Interestingly, however, there are few studies with which we can compare our results on this point. For example, while in the study by Stikkelbroek et al. (2013) with comparable mean CDI total scores, severity of depression was not an exclusion criterion, acute suicide risk was. Besides the obvious limitations of the present study some strengths should also be noted. An important strength of this study is that it included a representative group of adolescents seen in routine mental health care, in terms of a relatively long duration of depressive symptoms, many comorbid problems, and having received unsuccessful prior treatment or counselling, which makes the results highly generalizable. Another strength is the use of a semi-structured DSM based clinical interview, conducted by trained interviewers. Finally, the therapists used a manualized treatment protocol, session checklists and video-recorded sessions, which were evaluated and discussed during supervision to enhance treatment integrity.



Yet, despite the promising results, most patients still suffered from symptoms of depression after completion of EMDR treatment. More specifically, 39.1% of adolescents who completed treatment still fulfilled the diagnostic criteria of MDD according to ADIS-C;

62.5% scored above CDI cut-off of 16, and 68% of the patients received additional treatment interventions (i.e., CBT, emotion regulation training, parent counselling, family interventions, medication or a combination of these) for the remaining complaints after the study. Further research is needed to determine whether addition of evidence-based interventions aimed at cognitive restructuring or family interventions may lead to stronger symptom reduction, even lower drop-out, and less after care. More generally, given the heterogeneous nature of MDD, it would be naïve to expect that one single treatment approach, e.g. trauma-focused treatment, would be sufficient to cure all different appearances of MDD. That is, for a certain subgroup of adolescents with MDD treatment using EMDR therapy might be of value as our results suggest, but the treatment of other subgroups, with regard to which (combinations of) interventions are the most successful, requires further investigation.

In conclusion, the results of this study showed that the application of EMDR therapy was safe and associated with a significant reduction of depressive symptoms and comorbid psychiatric problems. Clearly, randomized controlled trials with sufficient statistical power are needed to establish the efficacy of EMDR therapy in adolescents with mild to moderate or severe MDD.

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Carlijn de Roos and Ad de Jongh receive income from published books about EMDR and for training postdoctoral professionals in EMDR.

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# 6

# General discussion

# GENERAL DISCUSSION

The purpose of this thesis was to increase the knowledge and to strengthen the evidence base of psychological treatments for specific trauma-related conditions, like pediatric PTSD. The main aims were to study:

1. the relative effectiveness and efficiency of three trauma-focused treatment methods (cognitive behavioral therapy (CBT), cognitive behavioral writing therapy (CBWT) and EMDR therapy in reducing the severity of PTSD symptoms and comorbid symptomatology (Chapter 2 and 3);
2. predictors and moderators of PTSD outcomes based on the data obtained from the RCT comparing CBWT and EMDR (Chapter 4); and
3. the effectiveness and feasibility of a trauma-focused approach (i.e., EMDR therapy) for major depressive disorder (MDD; Chapter 5).

In this final chapter, we will place our findings in a broader perspective and discuss clinical implications and directions for future research.

## Effectiveness and relative efficiency of trauma-focused treatment in pediatric PTSD

Reviews and meta-analyses have summarized the effectiveness of psychological and psychosocial treatments for PTSD in children and adolescents (aged 8–18 years) exposed to a range of traumatic events, both single incident and multiple traumas (Bastien, Jongsma, Kabadayi, & Billings, 2020; Gutermann et al., 2016; Harvey & Talor, 2010; Kowalik, Weller, Venter, & Drachman, 2011; Morina, Koerssen, & Pollet, 2016). The overall conclusion of these different reviews and meta-analyses is that trauma-focused interventions (i.e., EMDR therapy, prolonged exposure therapy, trauma-focused CBT, cognitive therapy for PTSD) yield effect sizes in the medium to large range, relative to no-treatment control conditions, for the symptoms of PTSD and comorbid conditions (Smith, Dalgleish, & Meiser-Stedman, 2019). The effects of these treatments were maintained at follow-ups, and relapse rates were low. Of the available treatments for pediatric PTSD, the approach evaluated in the largest number of RCTs, and RCTs with the greatest methodological rigour, are the various forms of trauma focused CBT (Smith et al., 2019).

The evidence base for EMDR therapy as applied to pediatric PTSD has grown gradually over the years. In a recent review (Matthijssen et al., 2020) we included a table (see Table 6.1) showing relevant information about the ten RCTs that have been published until now.

**Table 6.1: Overview of RCTs EMDR in children and adolescents with PTSD or clinical important PTSD symptoms**
Included in Matthijssen et al., 2020

| Author(s) | *N* | Setting | Intervention (number of sessions) | Memories/ phenomena targeted | Outcomes/ dependent variables | Measure(s) | Results |
|---|---|---|---|---|---|---|---|
| Ahmad et al. 2008 | 33 | Children 6–16 years who have experienced at least one traumatic event, and grown up in a psychosocially exposed condition (physically or mentally unavailable parent for several reasons) | EMDR (8) vs WL<br>EMDR: *n* = 17<br>WL: *n* = 16 | Disturbing memories related to at least one traumatic event, for example maltreatment, sexual abuse, witnessing an unnatural death or accident | PTSD symptoms<br>Treatment session measures | DICA<br>PTSS-C | EMDR > WL<br>Significant reduction in PTSD symptoms |
| Chemtob et al. 2002 | 32 | Children 6–12 years who have experienced a hurricane | EMDR (3) vs WL<br>EMDR: *n* = 17<br>WL: *n* = 15 | Disturbing memories related to the hurricane | PTSD symptoms<br>Anxiety<br>Depression<br>Number of visits to school nurse | CRI<br>RCMAS<br>CDI | For both treatments, significant reduction pre- to post treatment and pre- to 6 months FU in PTSD symptoms, anxiety/ depressive symptoms and health care visits |
| De Roos et al., 2011 | 52 | Children 4–18 years who experienced an explosion of a fireworks factory | EMDR (max. 4) vs CBT (max. 4)<br>EMDR: *n* = 26<br>CBT: *n* = 26 | Disturbing memories related to the explosion of the fireworks factory | Posttraumatic stress<br>Anxiety<br>Depression<br>Emotional/ behavioral symptoms | UCLA<br>PTSD-RI<br>CROPS<br>PROPS<br>BDS<br>MASC<br>CBCL | EMDR = CBT:<br>Significant reduction on all measures: PTSD, anxiety, depression and emotional/ behavioral symptoms post treatment and at 3 months follow up.<br><br>Mean number of sessions:<br>EMDR > CBT (3.2 sessions vs 4 sessions) |

**Table 6.1:** ***Continued***

| Author(s) | *N* | Setting | Intervention (number of sessions) | Memories/ phenomena targeted | Outcomes/ dependent variables | Measure(s) | Results |
|---|---|---|---|---|---|---|---|
| De Roos et al., 2017 | 103 | Children 8–18 years who experienced a single traumatic event | EMDR (max. 6) vs Cognitive Behavioral Writing Therapy (max. 6) vs WL.<br>EMDR: *n* = 43<br>CBWT: *n* = 42<br>WL: *n* = 18 | Disturbing memories related to single event trauma f.e. physical or sexual abuse, accident/ injury, traumatic loss | PTSD diagnosis and symptoms<br>Anxiety<br>Depression<br>Emotional/ behavioral symptoms<br>Somatic symptoms<br>Negative trauma-related beliefs<br>Quality of life | ADIS-C/P<br>CRTI- C/P<br>RCADS-C/P<br>SDQ- Y/P<br>CSI-C-P<br>CPTCI<br>Kidscreen27 C/P | EMDR > WL<br>CBWT >WL<br>EMDR=CBWT<br>Significant reduction post treatment in PTSD, anxiety, depression, emotional/ behavioral symptoms and negative trauma-related beliefs, maintained at 3 and 12 month follow-up.<br><br>Mean number of sessions:<br>EMDR > CBWT<br>(4.1 vs 5.4 sessions) |
| Diehle et al., 2015 | 48 | Children 8–18 years who experienced a single or multiple traumatic events | EMDR (8) vs TF-CBT (8)<br>EMDR: *n* = 25<br>TF-CBT: *n* = 23 | Disturbing memories related to a single or multiple traumatic event | PTSD diagnosis and symptoms<br>Anxiety<br>Depression<br>Behavioral problems | CAPS-CA<br>ADIS-P<br>CRIES-C<br>RCADS-C/P<br>SDQ-P | EMDR = TF-CBT<br>Significant reduction PTSD post treatment<br><br>Mean number of sessions<br>EMDR = TF-CBT |
| Jaberghaderi et al., 2004 | 19 | Girls 12–13 years who have experienced sexual abuse<br>14 completed pre and post treatment | EMDR (max. 12) vs CBT (max.12)<br>EMDR: *n* = 7<br>CBT: *n* = 7 | Disturbing memories related to sexual abuse | PTSD symptoms<br>Problematic behavior in school | CROPS<br>PROPS<br>Rutter Teacher Scale | EMDR = CBT:<br>Significant reduction in PTSD symptoms and behavioral problems post treatment<br><br>Mean number of sessions:<br>EMDR > CBT<br>(mean 6.1 vs 11.6) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Jaberghaderi et al. 2019 | 139 | Children, aged 8–12 years who were victims of domestic violence | CBT (6 to max 12 (vs EMDR (3 to max. 12) vs Control<br>CBT: *n* = 40<br>EMDR: *n* = 40<br>Control: *n* = 59 | Disturbing memories related to physical abuse and witnessing incidents of domestic violence | Traumatic life events<br>PTSD symptoms<br>Problematic behavior exhibited in school | LITES<br>CROPS<br>PROPS<br>RTS | EMDR = CBT > Control<br>Significant reduction in PTSD post treatment<br>No change in behavior in classroom<br>Mean number of sessions:<br>EMDR > CBT<br>(mean 5 vs 9, personal communication, 4-3-20) |
| Kemp et al., 2009 | 27 | Children 6–12 years who have experienced a motor vehicle accident | EMDR (4) vs WL<br>EMDR: *n* = 13<br>WL: *n* = 14 | Disturbing memories related to motor vehicle accident | PTSD symptoms<br>Anxiety<br>Depression<br>Behavioral problems<br>Memory related distress | CPTS-RI<br>PTS-RI/P<br>STAIC<br>CDS<br>CBCL | EMDR > WL<br>Significant reduction in PTSD symptoms (CPTS-RI), clinician rated PTSD diagnostic criteria and SUDS. Gains maintained at 3 and 12 month FU |
| Meentken et al., 2020 | 74 | Children 4–15 years who experienced medical trauma | EMDR vs CAU (mean 3.5)<br>EMDR:n = 37 CAU: *n* = 37 | Disturbing memories related to single or multiple medically related trauma | Subthreshold PTSD symptoms (CAPS-CA/ DIPA), anxiety, quality of sleep | CRTI<br>SCARED-NL<br>CDI-2<br>SSR/CSHQ | EMDR > CAU. Significant reduction in symptoms of blood injection-injury phobia, depression and sleep problems.<br>EMDR = CAU : subthreshold PTSD symptoms. |
| Soberman et al., 2002 | 29 | Boys 10–16 years with conduct problems in residential or day treatment, multiply traumatized population | CAU vs CAU + EMDR (3)<br>CAU: *n* = 15<br>CAU + EMDR: *n* = 14 | Disturbing memories, related to conduct/ behavioral problems | PTSD symptoms<br>Behavioral problems<br>Memory related distress | IES-8<br>CROPS<br>PROPS<br>PRS<br>BRS | CAU + EMDR > CAU:<br>Significant reductions in memory related distress (SUD) post treatment.<br>And significant reduction of problem behaviors at 2 month FU. |

EMDR, Eye Movement Desensitization and Reprocessing; ADIS, Anxiety Disorders Interview Schedule; BDS, Birleson Depression Scale; BRS, Behavioral Reward Scale; C/P/A, Child version/Parent version/Adolescent version; CAPS-CA, Clinician-Administered PTSD Scale for Children and Adolescents; CBCL, Child Behavior Checklist; CBWT, Cognitive Behavioral Writing Therapy; CDI, Children's Depression Inventory; CDS, Children's Depression Scale; C-PTCI, Child Post Traumatic Cognitions Inventory; CPTS-RI, Child Post Traumatic Stress Reaction Index; CRI, Child Reaction Index; CRTI, Revised Children's Responses to Trauma Inventory; CRI, Children's Reaction Index; CRIES, Children Revised Impact of Event Scale; CROPS, Child Report of Posttraumatic Stress Symptoms; CSHQ, Child Sleep Habits Questionnaire; CSI, Child Somatization Inventory; DICA, Diagnostic Interview for Children and Adolescents; IES-8, Impact of Event Scale; LITES, Life Incidence of Traumatic Events Scale; MASC, Multi-dimensional Anxiety Scale for Children; PROPS, Parent Report of Posttraumatic Stress Symptoms; PTSD, posttraumatic stress disorder; PTSS-C, Post-Traumatic Stress Symptom Scale for Children; PRS, Problem Rating Scale; PTS-RI, Post-Traumatic Stress Reaction Index; RCADS, Revised Children's Anxiety and Depression Scale; RCMAS, Revised Children's Manifest Anxiety Scale; RTS, Rutter Teacher Scale; SCARED-NL, Dutch Screen for Child Anxiety Related Emotional Disorders; SDQ, Strengths and Difficulties Questionnaire; SSR, Sleep Self Report; STAIC, State-Trait Anxiety Inventory for Children; SUDS, Subjective Units of Disturbance; TF-CBT, trauma-focused cognitive behavioral therapy; UCLA PTSD-RI, University of California Los Angeles PTSD Reaction Index; VOC, Validity of Cognition; WL, wait-list.

Most of these studies have involved comparison between EMDR therapy and wait-list control conditions (Ahmad & Sundelin-Wahlsten, 2008; Chemtob, Nakashima, & Carlson, 2002; de Roos et al., 2017; Kemp, Drummond, & McDermott, 2010), care-as-usual (CAU; Meentken et al., 2020; Soberman, Greenwald, & Rule, 2002) or a psychoeducation control group (Jaberghaderi, Rezaei, Kolivand, & Shokoohi, 2019). However, five of the RCTs also involved comparisons between EMDR therapy and trauma-focused CBT (de Roos et al., 2011, 2017; Diehle, Opmeer, Boer, Mannarino, & Lindauer, 2015; Jaberghaderi, Greenwald, Rubin, Zand, & Dolatabadi, 2004; Jaberghaderi et al., 2019), with sample sizes ranging from 19 to 139 participants of various ages (range 4–18 years). Only two studies included also preschool-aged children (Meentken et al., 2020; de Roos et al., 2011). All but one RCT found that EMDR therapy was associated with a significant reduction in PTSD and comorbid symptoms or a loss of PTSD diagnosis compared to wait-list, psychoeducation or CAU. Treatment gains occurred in a relatively limited number of sessions (3 to 8 sessions). The only RCT which did not find a significant decrease in severity of PTSD symptoms was the study of Meentken et al. (2020), possibly due to a floor effect, i.e., as children with full-blown PTSD were excluded there was little room for a decline in PTSD symptom scores across the treatment and control groups. Furthermore, the five RCTs comparing EMDR therapy to trauma-focused CBT showed that both trauma treatments were equally effective for symptoms of PTSD and comorbid conditions. The only apparent difference between the two treatments is preliminary evidence from four of the five RCTs (de Roos et al., 2011, 2017; see Chapter 2 and 3 in this thesis; Jaberghaderi et al., 2004; 2019) in which EMDR achieved treatment gains in fewer sessions than trauma-focused CBT (range 25–50% more efficient, see Table 6.1). It must be noted that the methodological quality of the RCTs involving EMDR therapy for pediatric PTSD have varied because of small sample sizes, absence of a diagnostic interview for PTSD, lack of appropriate treatment fidelity checks, and no long-term follow-up assessments. Accordingly, further more methodologically rigorous RCTs of EMDR therapy for pediatric PTSD are needed.

To determine the relative effectiveness of a broad range of psychological interventions for pediatric PTSD, Mavranezouli et al. (2020) recently conducted a systematic review and *network meta-analyses*, a type of analysis that allows estimation of the relative effects of treatment that may not have been directly compared in RCTs. Their network meta-analysis included 32 trials involving 17 different treatment protocols and 2,260 children and adolescents. Consistent with previous meta-analyses, individual forms of trauma focused CBT consistently showed large effects for PTSD symptoms at post-treatment compared to wait-list control conditions. EMDR therapy was effective relative to wait-list controls at post-treatment but to a lesser extent than trauma-focused CBT. However, due to the narrow

inclusion criteria for RCTs, their findings for EMDR therapy were based on only four of the ten RCTs of EMDR therapy that were included for analysis (Ahmad & Sundelin-Wahlsten, 2008; Diehle et al., 2015; de Roos et al., 2017; Soberman et al., 2002).

Regarding clinical practice guidelines (CPGs), recommendations are based on the best available evidence as well as input from the relevant stakeholders (e.g., healthcare providers/ organization, clinicians, and patient organisations). CPGs are designed to support healthcare providers in service provision planning, and clinicians and their patients in decision making about treatment. Three of the most influential CPGs for pediatric PTSD are published by the National Institute for Health and Clinical Excellence (NICE, 2018), the International Society for Traumatic Stress Studies (ISTSS, 2019) and the World Health Organization (WHO, 2013). Table 6.2 provides and overview of the recommendations of the CPGs for pediatric PTSD published by these organizations. The guidelines of the American Psychological Association (APA, 2017) provided recommendations only for adults and are therefore not listed in Table 6.2. For persistent PTSD in children and young people, both NICE and ISTSS recommend trauma-focused CBT interventions, including prolonged exposure (PE), TF-CBT, and cognitive therapy (CT) for PTSD as first-line treatments. However, there are remarkable differences between the different international treatment guidelines with respect to the recommendations for EMDR therapy. ISTSS (2019) strongly recommends EMDR therapy for children and adolescents. NICE (2018) has a conditional recommendation only to use EMDR therapy if youngsters do not respond to trauma-focused CBT or do not engage with trauma-focused CBT. One important factor that likely contributed to the discrepancy between the ISTSS and NICE CPGs recommendations regarding EMDR are the evidence they were willing to consider when the guidelines were drafted (Dominguez & Lee, 2019). NICE had stricter inclusion criteria for treatment studies, setting the minimum number of participants per treatment condition, a minimum percentage of participants fulfilling the diagnostic criteria for PTSD, and for having clinically significant PTSD symptoms indicated by mean baseline scores above threshold on a validated scale, and the (un)ability to extract



**Table 6.2: Summary of guideline recommendations on treatment for pediatric PTSD**

| ISTSS (2019) | NICE (2018) | APA (2017) | WHO (2013) |
|---|---|---|---|
| Strong recommendations for TF-CBT and EMDR | Recommendation for TF-CBT, conditional recommendation for EMDR | Not assessed | Individual or group cognitive behavioral therapy (CBT) with a trauma focus or EMDR should be considered |

*Note*. APA, American Psychological Association; ISTSS, International Society for Traumatic Stress Studies; NICE, National Institute for Health Care Excellence; TF-CBT, trauma-focused cognitive behavioral therapy; WHO, World Health Organization.

necessary data. As a consequence, NICE included only four of the eight available RCTs on EMDR therapy at that time (Ahmad & Sundelin-Wahlsten, 2008; Diehle et al., 2015; de Roos et al., 2017; Soberman et al., 2002).

In conclusion, reviews and meta-analysis generally find trauma-focused CBT and EMDR similarly efficacious treatments for pediatric PTSD, albeit these empirical findings are not always reflected in clinical practice guidelines. Trauma-focused CBT remains the most frequently recommended, first-line treatment. This is unfortunate because not every child or adolescent with PTSD responds to this approach and EMDR is an efficacious treatment. In addition, there is evidence, albeit preliminary, that EMDR may be more efficient (i.e., achieving clinically meaningful gains in fewer treatment sessions) than trauma-focused CBT (discussed in detail in the next section). If more CPGs for pediatric PTSD are to recommend EMDR therapy as a (co)first-line treatment, there needs to be more methodologically rigourous RCTs of EMDR therapy for pediatric PTSD, including comparative trials with trauma-focused CBT. The current thesis aims to address this need.

## Relative efficiency of trauma-focused treatment in pediatric PTSD

Given the need for efficient use of healthcare resources, length of trauma treatments for youth is an important topic. How many sessions are necessary to achieve clinical efficacy? Trials of individual trauma-focused CBT typically involve 12–14 sessions of 60–90 minutes length (Dorsey et al., 2017), although some studies have tested briefer versions (eight sessions; Diehle et al., 2015). Both RCTs in this thesis (Chapter 2 and 3) yield novel and clinically relevant findings in that significant decreases in PTSD and comorbid symptoms were achieved in fewer and shorter treatment sessions (mean range 3.2 to 5.4 sessions, 45 to 60 minutes in length), which is about half the number of sessions of individual, trauma-focused CBT protocols required to achieve similar effects. Of course, the various forms of trauma-focused CBT differ in the number of treatment components and sessions (see Table 1.1 in the introduction of this thesis). For example, the multi-component TF-CBT protocol developed by Cohen and colleagues (2004), originally developed for youth who had been exposed to chronic sexual abuse, has well described components prior to exposure and cognitive processing, such as psychoeducation, relaxation, affective modulation and cognitive coping (PRAC components). Logically, deploying extra components will take more sessions to complete treatment. To this end, the apparent efficiency of EMDR therapy may reflect the fact that it discard components that may not be specifically necessary for recovery of pediatric PTSD tied to a single traumatic event, such as relaxation, and training of emotion regulation and cognitive coping skills. Still, the duration of EMDR can vary,

depending upon on the number of traumatic memories that need to be reprocessed to decrease symptoms. If the disturbance, or emotional charge, of all relevant trauma memories has become neutral (SUD = 0), the therapy is completed. In summary, as EMDR therapy does not include the extensive training in emotion-regulation strategies and cognitive components found in other evidence-based trauma approaches, and is not tied to a fixed number of session, it appears to be a highly efficient form of therapy for pediatric PTSD, at least for youth with symptoms tied to a single traumatic event.

Underlying the interest about the length of existing treatment protocols for pediatric PTSD is the practical, economic, and perhaps also ethical, issue of identifying the core elements within existing trauma methods to maximize therapeutic benefit and raise the standard of care (Dorsey et al., 2017; Steinberg et al., 2019). To date, research with the aim identifying core elements in trauma treatment protocols for youth is scarce. To identify core elements in TF-CBT, Deblinger and colleagues (2011) examined the differential effects with or without the trauma narrative component in eight versus 16 sessions in children aged four to 11 years ($N = 210$). Both TF-CBT conditions were effective, however the eight-session condition that included the trauma narrative component seemed to be the most effective and efficient means of reducing children's general anxiety, abuse-related fears and the abuse-specific distress in parents. Regarding PTSD symptoms, the addition of eight extra sessions yielded a decrease in approximately one PTSD symptom. With regard to EMDR therapy the interest and search to shorten treatment did not lead to component analyses for EMDR on pediatric PTSD as yet. To date, the full standard protocol with adaptations for children and adolescents is followed, partly due to the need to demonstrate the effectiveness of Shapiro's eight-phase protocol applied to this target group. Nevertheless in the future, it is important to increase the knowledge about core elements of both trauma-focused CBT and EMDR, so that children's treatment plan can be tailored and treatment can be shortened.

## Predictors and moderators of pediatric PTSD



The second aim of this thesis was to identify predictors and moderators of treatment outcome for pediatric PTSD. Identifying predictors can aid in the process of tailoring a particular treatment to enhance its effectiveness, whereas identifying essential moderators of treatment outcomes can improve precision in treatment matching (Holmes et al., 2018). In Chapter 4 predictors and moderators of pediatric PTSD outcomes for EMDR therapy and CBWT were explored and reported, using data from the RCT described in Chapter 3. Both treatments were evaluated in individual, child-focused formats without separate interventions or

sessions for parents. An important finding of the predictor analyses was that the severity of parental psychopathology was associated with poorer outcomes in EMDR and CBWT. Given that parental psychopathology is associated with more severe PTSD symptomatology in the child (Trickey, Siddaway, Meiser-Stedman, Serpell, & Field, 2012), higher levels of parental psychopathology may have served as a proxy for their child's pre-treatment symptom severity, which may partly explain why parental symptoms predicted poorer outcomes for the child in both treatments. It is also possible that higher levels of parental psychopathology predicted poorer outcomes in their child's treatment because parental psychopathology somehow influence the child's level of symptoms, possibly through child being continuously exposed to their parents distress and/or changes in the traumatized parents behaviors towards the child (Lambert, Holzer, & Hasbrun, 2014; Leen-Feldner et al., 2013). For example, Christie and colleagues (2019) found that parental PTSD was associated with increased levels of parenting stress, negative effects on parenting satisfaction, parent-child relationships and more frequent use of negative parenting practices like hostility, overprotection or inconsistent discipline. Parental distress and negative parenting practices have also been identified as an important risk factor for the severity and persistence of child PTSD symptoms (Cobham, McDermott, Haslam, & Sanders, 2016). While further trials are needed evaluating whether parental PTSD symptoms/distress predicts outcomes in their child's treatment, the present results suggest several clinical implications. First, parents who present a child for treatment of PTSD should be screened for their own PTSD symptoms, and parenting distress and where appropriate, either referred for separate treatment or some (parallel) sessions offered to reduce PTSD and parenting distress. There are several options to intervene. Given the changeability of parenting practices, interventions aimed at improving parental skills and the parent-child relationship are common and appreciated in clinical practice. However, the available evidence for the relative benefits of including parent-focused interventions or sessions in treatment for pediatric PTSD is quite mixed. Silverman et al. (2008) found that caretaker involvement in treatments for pediatric PTSD showed similar effects as child-only treatments. More recently, Gutermann et al. (2016) found that pediatric PTSD interventions that included interventions/session for parents yielded larger effect sizes than for child-only treatments. Regarding the relationship between parenting behavior and youth PTSD symptoms, associations seem to be rather small. In a review and meta-analysis, Williamson et al. (2017; $N = 4{,}010$) found that negative parenting behaviors accounted for only 5.3% of the variance in childhood PTSD symptoms. In addition, the direction of the effects was unclear, meaning that the question whether negative parenting elicits child symptoms or vice versa, remains unknown. In that light, offering extra parent guidance and skills training for more symptomatic parents to improve child PTSD outcome, might be not a logical investment for all cases.

A more innovative option to reduce parental psychopathology, and therefore, hopefully enhancing outcomes in their child's treatment, would be to offer the parent a few (separate) sessions of EMDR therapy before their child begins treatment. De Vries and Kuiper (2017) found that chronic parenting stress may result from negative parental memories that were not adaptively processed. These findings suggest that it might be possible to screen parents of children with PTSD for the presence of negatively valenced memories having to do with the traumatic event their child has experienced, or specific negative memories of parenting their child in the aftermath of the trauma. If identified, it may be worthwhile to offer parents a brief course of EMDR therapy (1–5 sessions) aimed at processing these negative parenting-specific memories. Although evidence for the use of EMDR in this manner is still lacking, this type of treatment is regularly done already in clinical practice. If delivered, EMDR therapy for 'parental' memories may preferably be conducted by the therapist of the child or a colleague therapist working in the same institution, for easy transfer of information and prevention of unnecessary treatment delay. If effective, the parental symptomatology will decrease and the parent will be more emotionally available, to support their child during and after trauma treatment. The present findings for parental psychopathology predicting poorer outcomes in their child's treatment suggests that further research is needed to examine whether 'direct' reduction of parental stress will lead to a decrease of parental psychopathology and can thereby lead to enhancing outcome of evidence-based trauma treatment for pediatric PTSD. Also, it is important to remember that while parental psychopathology predicted poorer outcomes in the trial comparing EMDR and CBWT, both treatments yielded extremely high rates of recovery (90–100%) from the primary PTSD diagnosis, and moderate to large effect sizes for child- and parent-reported comorbidity. Thus, for the moment, it appears that any decision to involve parents in treatment will need to be done on an individual, needs-based assessment.

Research on moderators of treatment outcomes provides important information that may be used by practitioners to maximize treatment effectiveness for children and adolescents with PTSD by allocating children to the treatment with the largest chance of success. Research on this topic is in its infancy, and most of the work has been exploratory in nature (Taylor, Graham, & Weems, 2015; Trickey et al., 2012). The results of our moderator analysis showed that for children with more severe self-reported PTSD symptoms, those in EMDR therapy improved more than those in CBWT, with the opposite being true for children and parents with a less severe clinical profile. However, these moderator effects of the significant variables were time-limited, as they were primarily significant for the pre- to post-treatment interval. Due to the large rates of diagnostic remission and symptom change in the original trial (> 90%) and brevity (< 4 hours) of both treatments, we concluded that these

findings encourage a focus on implementation and enhancing delivery of both evidence based trauma treatments for children and adolescents with (single event) PTSD, rather than focusing on tailoring and giving a certain treatment to a specific group of children. Delivery of EMDR therapy and CWBT can be enhanced by training and supervising more professionals and motivating children and families to start trauma treatment by providing information about PTSD, effectiveness and brevity of these trauma treatments.

In conclusion, based on the available evidence, the important and urgent question raised in youth mental health as to which trauma treatment works best for whom, unfortunately cannot be answered yet. Further studies are needed that are designed and powered to undertake moderator analyses, i.e., they need to involve randomization to at least two active treatment conditions and repeated assessment of outcome variables, before and during treatment, and for several intervals after treatment is completed. Potential moderators should be examined relative to each other, in a multivariate fashion. In addition, it is important for future trials investigating moderators to include patient subgroups for whom matching of treatment to presentation may be particularly relevant. For example, studies are needed that examine potential outcome moderators in children and adolescents with PTSD symptoms tied to multiple traumas, with complex PTSD, with different forms of comorbidity, and for those with parents who do or do not have significant symptoms of PTSD or distress. Besides the recommendation to include standard predictor, mediator and moderator variables in RCTs, meta-analyses of individual participant data (IPD) should be conducted. This type of meta-analysis estimates aggregate effect sizes using IPD from RCTs and provides the most reliable and least biased means of addressing questions that have not been satisfactorily resolved by individual clinical trials (Riley, Lambert, & Abo-Zaid, 2010). Meanwhile, clinicians can use more pragmatic criteria to select a specific trauma treatment for a child, and consider factors such as the availability of specific treatment, the expertise of the therapist or the preference of the child or parent. The good news is, there are no bad choices. Trauma treatment in pediatric PTSD is effective and cost effective (Manavrezouli et al., 2020). Therefore, enhancing delivery is of utmost importance to prevent chronicity and long-term consequences of trauma exposure.

## Effect of a trauma-focused approach beyond pediatric PTSD

The final aim of this thesis was to test the effects of trauma-focused treatment beyond pediatric PTSD, and we did that by testing the preliminary effectiveness of EMDR therapy for major depressive disorder (MDD) in adolescents. The insight that trauma is a common risk factor affecting onset and course of this mental health condition, and the limited

effectiveness, high drop-out and relapse rates of current treatments for MDD, were the reason to start the open trial described in this thesis (Chapter 5). The results of this brief trauma-focused intervention are promising and suggest that EMDR therapy can be both effective and safe for adolescents with MDD. These findings are consistent with positive findings for EMDR in adults with MDD (Malandrone, Carletto, Hase, Hofmann, & Ostacoli, 2019; Matthijssen et al., 2020). In our trial, the partly remission of adolescent MDD in the intention to treat sample (50% of the intention to treat sample still fulfilled the diagnostic criteria) suggest that there is room for improvement. A trauma-focused approach can be a first step in treatment, after which other interventions, can be added to address remaining symptoms on an as-needed basis. Future randomized controlled studies are required to establish effectivity of trauma-focused approaches for youth with MDD.

The renewed insight that unprocessed traumatic memories (not only criterion A events) play an important role in the development and maintenance of certain mental health conditions has clinical implications (e.g., Shapiro, 2018). Therefore, during the process of diagnosis and treatment planning, screening for symptom related distressing memories is pivotal. It is assumed that, if identified, children and adults will be responsive to trauma-focused treatments, such as EMDR therapy, when memories of these events are targeted and resolved. For mental health conditions beyond PTSD, EMDR therapy seems to be feasible to implement, due to its rationale (a direct relationship between symptoms and disturbing memories), structure and compactness of method. The evidence for EMDR therapy's effectiveness as a treatment for other disorders, like MDD, bipolar disorder, anxiety disorder, chronic pain, obsessive compulsive disorder, substance abuse disorder and psychosis is steadily growing (Maxfield, 2019; Matthijssen et al., 2020). This mainly holds true for adults and to a far much lesser extent for youth. For example, in a recent meta-analysis of EMDR trials (adults and youth) for mental health conditions other than PTSD, evidence of efficacy was found particular in the area of phobias and test anxiety,but further high quality RCTs are needed before conclusions can be drawn (Cuijpers, van Veen, Sijbrandij, Yoder, & Cristea, 2020). As stated, for EMDR therapy in children and adolescents, the effects are supported by limited research results, albeit research into the effect of a trauma-focused approach beyond PTSD is starting to get underway. More than ten years ago de Roos and de Jongh (2008) published a case series of four children (broad age range from 3–15 years) in the area of specific phobias. They all received EMDR therapy for their near choking experiences. After one or two sessions, children or parents reported that the eating pattern normalized, and that the weight increased. The children felt more energetic, were happier, less rebellious and behaved more independent. Besides the open trial of EMDR for adolescent MDD described in this thesis (Chapter 5), two other EMDR studies

with depressed adolescents have been conducted (Bae, Kim, & Park, 2008, case study; Tang, Yang, Yen, & Liu, 2015, nonrandomized controlled trial), both showing remission of depressive symptoms within a small number of sessions (range 3–7). In the area of somatic complaints, Maroufi and colleagues (2016) compared one session of EMDR to a single neutral interview with 56 adolescents patients with acute pain after abdominal surgery in an RCT. Compared to the control condition, adolescents receiving a single session of EMDR experienced a significant reduction in pain. Furthermore, a case description is published, involving an adolescent with chronic regional pain syndrome who experienced significant pain reduction after processing disturbing memories related to medical experiences and pain after five sessions (90 minutes) of EMDR (Gauvry, Lesta, Alonso, & Pallia, 2013). For youth with behavior problems and negative self-image, three RCTs (Scheck, Schaeffer, & Gillette, 1998; Soberman et al., 2002; Wanders, Serra, & de Jongh, 2008) have yielded mixed results, possibly due to a low number of EMDR sessions (range 2–4). As with adults, further studies of high methodological quality with childen and adolescents are warranted to determine the efficacy of EMDR in mental health conditions beyond PTSD.

## Future directions in the treatment of pediatric PTSD

In general, more rigorous studies are necessary that involve dismantling multi-component interventions to identify core (i.e., effective) treatment elements and to determine who should be present in treatment (e.g., youth only, youth and parents). "Another challenge for the field is to determine the optimal time point and 'dose' at which to deliver treatment" (Dorsey et al., 2017). Being able to determine what works best for whom, and why and how treatment exert their effects, will require studies involving large samples, repeated assessment (including session-by-session during treatment), and multiple measures of moderators and mediators of treatment outcome. In addition, more research is needed to determine effectiveness and the relative efficacy of the available trauma-focused PTSD treatments for several traumatized subgroups where scientific research is still in its infancy.

One of these under-researched sub-groups is very young children with posttraumatic reactions including those with the new preschool subtype of PTSD identified in the DSM-5. Developments in trauma focused interventions for preschoolers have lagged behind progress made with older children and adolescents. One of the reasons for this delay is that validated diagnostic interviews and questionnaires were lacking and that diagnostic criteria for PTSD (DSM-IV) were too strict. The new DSM-5 based PTSD classification for children of 6 years and younger provides developmentally appropriate criteria that may facilitate identification of children in need of intervention, and can stimulate building an

empirical base for the treatment of very young children with PTSD (De Young, Kenardy, Cobham, & Kimble, 2011; Smith et al., 2019). Given the negative and deteriorating effect of PTSD if left untreated, there is also a need for effective treatment for infants, toddlers and preschoolers (Meiser-Stedman, Smith, Yule, Glucksman, & Dalgleish, 2017). However, adaptations to the standard trauma-focused CBT protocols need to be made. This may include a greater involvement of caregivers, behavioral management training for caregivers, developmental adaptations in the construction of trauma narratives, and skills teaching in emotion regulation for children (see Scheeringa, 2016). Regarding EMDR therapy, the standard protocol can be used for children and adolescents from the age of four years. For children below four years of age, an EMDR protocol with age appropriate adaptations has been developed (Lovett, 1999, 2015; de Roos & Beer, 2017). With regard to research in the area of treatment of young children with PTSD, until now, a few trials of trauma-focused therapies with preschoolers have been conducted. One pilot RCT evaluated the effectiveness of developmentally adapted TF-CBT in 64 children, aged three to six year old with PTSD symptoms (Scheeringa, Weems, Cohen, Amaya-Jackson, & Guthrie, 2011). The results demonstrated a large effect size compared to wait-list, and treatment gains were maintained at the 6-month follow-up. Furthermore, publications of case examples show promising findings (Goodall et al., 2017; Scheeringa et al., 2007), however further adaptation and evaluation of the treatment protocols for very young children with PTSD is warranted (Smith et al., 2019).

Another patient subgroup that deserves attention from studies aimed at evaluating the relative efficacy of different trauma-focused treatments, is children and adolescents with Complex PTSD (CPTSD), which is now officially recognized with a distinct classification in the eleventh edition of the International Classification of Diseases (ICD-11; Maercker et al., 2013). CPTSD involves exposure to severe, repeated, or prolonged traumatic events, along with core DSM-5 PTSD symptoms (i.e., reexperiencing, avoidance, negative alterations in mood and cognition and hyperarousal), as well as a number of additional symptoms including disturbances of affect, self and interpersonal relationships (World Health Organization, 2018). With the introduction of the classification CPTSD in the ICD-11, the validity of the PTSD/CPTSD distinction has become an important topic. The key question is whether enduring symptoms in the domains of affect, self and interpersonal relationships are just an indication of a severe form of PTSD or imply a qualitatively distinct disorder (Bryant, 2012; Resick et al., 2012; Kotov et al., 2017). A furthermore question is whether these extra symptoms require the addition of new treatment elements. In particular, for individuals with significant affect dysregulation in addition to the core symptoms of PTSD, the need for an initial stabilisation phase involving training in emotion regulation skills before starting

trauma-focused interventions has been questioned (De Jongh et al., 2016). The authors suggest that such phased approaches run the risk that effective intervention for PTSD will be delayed, thus increasing the risk of drop-out and poorer outcomes. Emotion regulation difficulties may be a symptom of PTSD that will improve after an effective trauma treatment, rather than needing additional intervention. To date, only a few studies have addressed the efficacy of trauma-focused treatments for children and adolescents with CPTSD, partly due to the lack of a suitable and validated questionnaire of this condition. Sachser, Keller, and Goldbeck (2017), using previous trial data (Goldbeck, Muche, Sachser, Tutus, & Rosner, 2016), found that children who met criteria for CPTSD responded as well to TF-CBT as do children diagnosed with 'classic' PTSD. However, it is important to note that in addition to memory-focused work, TF-CBT included already affect regulation skills teaching, so that in a way this method could be considered as a phase based approach. For EMDR therapy, the evidence for the effect in youngsters after having experienced interpersonal trauma and suffering from severe PTSD and comorbidity is absent. Given the restricted number of studies to date, evaluation of treatment of CPTSD in children and adolescents is necessary. Another trend is the use of (intensive) trauma-focused therapy without a stabilisation phase. Adult studies have found that CPTSD responds very well to this treatment approach (Voorendonk, de Jongh, Roozendaal, & van Minnen, 2020). However, when delivered in the traditional weekly session format, dropout rate is high (range 30 to 62%; Ragsdale, Watkins, Sherrill, Zwiebach, & Rothbaum, 2020). Reasons for this high percentage of attrition are varied but include barriers to care such as avoidance behavior, part of the PTSD symptomatology. During the last decade, intensive empirically supported treatments for PTSD have emerged for adults and youngsters, to increase retention and to accommodate more rapid recovery from symptoms of PTSD. These intensive or 'massed' treatments provide a dose of evidence-based trauma treatment within a condensed time frame (e.g., 1-, 2-, or 3-weeks treatment formats), including one or more first-line PTSD treatments and additional services for example physical exercise, psychoeducation, or sessions with family members (Van Woudenberg et al., 2018). Findings from a systematic review based on 11 studies that included intensive outpatients programs for adults (Sciarrino, Warnecke, & Teng, 2020) were supportive of the notion that intensive delivery of trauma treatment can be an effective alternative to standard delivery and contributes to improved treatment response (large weighted mean effect of treatment, $d = 1.57$), and reduced treatment drop out (5.5% pooled dropout rate across studies). For youth, only one study (Hendriks et al., 2017) reported on an intensive prolonged exposure therapy programme, and evaluated the effectiveness hereof among 10 adolescent having experienced multiple interpersonal trauma and suffering from severe PTSD and comorbidity. The results showed that PTSD symptoms declined and that

40% of the adolescents reached diagnostic remission of their PTSD status from baseline to post treatment and 80% from baseline to follow-up at 3 and 6 months. Importantly, no adverse events nor drop out occurred. So far, no studies on the effect of intensive EMDR therapy for youth with severe/complex PTSD have been published. Given the deteriorating and longstanding effects of (severe) or complex PTSD, there is an urgency to develop and implement evidence-based PTSD treatment in an intensive format, to improve treatment retention and enhance outcome in a limited time frame.

The final suggestion for future research, concerns the cost-effectiveness of trauma-focused treatments for children and adolescents. In cost-effectiveness studies, the costs of a treatment as well as the clinical outcomes are compared to an alternative intervention in order to determine which treatment yield better outcomes and results in lower costs (Beecham, 2014). Given the need for efficient use of healthcare resources, knowledge about cost-effectiveness of trauma-focused treatments is important to support decisions on resource-allocation by policymakers, health insurers, and care-providers to improve individual, societal and economic wellbeing. However, economic evaluation of trauma-focused interventions for child and adolescent has lagged behind the adult field. To date, publications on cost-effectiveness in the pediatric trauma field has shown that either individual or group TF-CBT is more cost-effective than waitlist (Shearer et al., 2018), treatment as usual (Aas, Iversen, Holt, Ormhaug, & Jensen, 2019; Mihalopoulos et al., 2015) or counselling (Gospodarevskaya & Segal, 2012). Recently, Mavranezouli et al. (2020) published a study on cost-effectiveness in a broad range of psychological interventions for pediatric PTSD. The economic analysis evaluated 10 psychological interventions including TF-CBT, EMDR therapy, family therapy, parent training, play therapy, and supportive counseling. The conclusion of their analysis was that individual forms of TF-CBT were cost-effective in the treatment of pediatric PTSD. EMDR therapy received a middle cost-effectiveness ranking, whereas the analysis showed that family therapy and supportive counselling were unlikely to be cost-effective compared to other interventions. Clearly, well-conducted research examining the long-term clinical and cost-effectiveness is needed to build a sound evidence base to inform decisions on how to efficiently use resources to treat children and adolescents with PTSD.



## Conclusions

The findings in this thesis demonstrated that the treatment of pediatric PTSD in children and adolescents with a brief trauma-focused approach (up to a maximum of six sessions) was effective and efficient and showed generalization of the positive effects to a broad range

of comorbid symptoms, even if no interventions were addressed to these symptoms. Of possible predictors of child PTSD outcome, parental psychopathology has been found to be a consistent factor in literature, leading to poorer child PTSD outcomes, just as described in this thesis. Therefore, it is important to assess parental psychopathology when children are referred for trauma-focused treatment, and offer interventions for parents, if indicated. The time limited effect of moderator variables in our trial and the effectiveness and brevity of the trauma treatments that were tested, suggests to focus on implementation hereof and to increase availability of these treatments so that children with PTSD or subclinical PTSD can be treated in time and when needed. Finally, a trauma-focused approach for adolescents with major depressive disorder was effective in reducing symptoms of depression and comorbidity. If disturbing memories of negative events are underlying and maintaining the child's symptomatology, trauma focused treatment to resolve these memories might be a logical first step in the treatment. Residual (comorbid) symptoms can be targeted afterwards as a second step, after having identified the maintaining factors and having selected effective treatment to influence these factors. Following this sequence of targeted interventions seems also interesting from a cost-effectiveness point of view.

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# 7

## Summary

## Samenvatting (Summary in Dutch)

## SUMMARY

The purpose of the present thesis was to increase the knowledge and to strengthen the evidence base of psychological treatment for specific trauma-related conditions, like pediatric PTSD, in children aged 8 to18 years, and for eye movement desensitization and reprocessing (EMDR) therapy specifically.

**Chapter 1** presents an introduction into this research topic. Many children are exposed to adverse events during childhood and at risk for developing post-traumatic stress disorder (PTSD) and a range of other disorders. Although a significant minority of the exposed youth will develop PTSD, the prognosis for spontaneous recovery after 6 months of PTSD without adequate treatment is poor. Due to the high number of traumatized children, the severity, chronicity and long-term consequences of trauma-exposure, effective treatment is needed. Fortunately, in the last decades several standardized individual trauma treatment protocols, mainly trauma-focused cognitive behavioral therapy (TF-CBT) and EMDR therapy have been developed and made available for traumatized children and adolescents diagnosed with PTSD. Research on the efficacy of both methods is growing of which the trauma-focused CBT protocols, consisting of a variety of procedures and techniques, are the most thoroughly investigated and have the strongest empirical support. Besides the focus on treatment efficacy in pediatric PTSD, an important question for clinical practice is what factors predict treatment outcome and which treatment works best for whom (moderation). Knowledge of predictors and moderators of child PTSD outcome can help in the process of personalizing a specific treatment to enhance its efficacy for a specific child or family when insufficiently responding to first line, evidence based trauma treatments. More generally, there is a renewed insight that unresolved traumatic memories can play an important role in the development and maintenance of other mental health conditions beyond PTSD. This knowledge formed the basis of our research project on adolescents with major depressive disorder, that attempted to answer the question whether a trauma-focused intervention such as EMDR therapy, directed at processing disturbing negative memories could reduce depressive symptoms and comorbidity. Accordingly, the research discussed in this thesis consists of three parts. First, we determined the relative efficacy and efficiency of three trauma-focused treatment methods, i.e., cognitive behavioral therapy (CBT), cognitive behavioral writing therapy (CBWT) and EMDR therapy, in reducing the severity of PTSD symptoms and comorbidity. Secondly, we identified predictors and moderators of PTSD outcomes based on the data obtained from the RCT comparing CBWT and EMDR. And finally we examined the effectiveness and feasibility of a trauma-focused approach (i.e., EMDR therapy) for major depressive disorder (MDD) in adolescents.

In **Chapter 2** we tested the efficacy and efficiency of an exposure-based cognitive behavioral therapy (CBT) and EMDR therapy in 52 children (aged 4 to 18 years) who had experienced an explosion of a fireworks factory. All children received up to 4 individual (60 minute) sessions along with up to 4 sessions of parent guidance. Blind assessment took place pre- and post-treatment and at 3-month follow-up on a variety of parent-rated and self-report measures of post-traumatic stress disorder symptomatology, depression, anxiety, and behaviour problems. The results showed that both CBT and EMDR therapy yielded large and significant within-group reductions in child- and parent-reported PTSD symptoms (within group Cohen's *d*: EMDR = 1.23/CBT = 1.06, child-reported; EMDR = 1.00/CBT = 1.38, parent-reported). Both treatments also achieved significant reductions in comorbid symptoms (i.e., anxiety, depression and behavioral; child- and parent-reported) in the moderate to large range (*d* = 0.62–1.40). No differences in efficacy were found between EMDR therapy and CBT, albeit treatment gains in EMDR therapy were reached in significantly fewer sessions (mean number of sessions: EMDR = 3.2 versus CBT = 4.0). All gains were maintained at the 3-month follow-up for both treatments. The conclusion was that standardized CBT and EMDR therapy can significantly improve functioning of disaster-exposed children with PTSD or subthreshold PTSD. The findings of this study made clear that more research was necessary and encouraged to conduct a larger trial, with a waitlist to control for spontaneous recovery, two active trauma treatments and individual trauma treatment only (without parallel parent sessions).

In **Chapter 3** we report the results of a second single-blind, randomized trial this time with three arms (*N* = 103): EMDR therapy (*n* = 43), cognitive behavior writing therapy (CBWT; *n* = 42), and wait-list (WL; *n* = 18). The WL-participants were randomly re-allocated to CWBT or EMDR after 6 weeks; follow-ups were conducted at 3 and 12 months post-treatment. Participants were treatment-seeking youth, aged 8 to 18 years, with a DSM-IV diagnosis of PTSD (or subthreshold PTSD) tied to a single trauma, who received up to six sessions of EMDR or CBWT lasting maximally 45 minutes each. The results post-treatment showed that both EMDR and CBWT yielded large and significant decreases in the severity of child- and parent-reported PTSD symptoms relative to wait-list (between group Cohen's d: EMDR = 1.27/CBWT = 1.24, child-reported; EMDR = .97/CBWT = .92, parent-reported) and significant rates of remission from PTSD diagnoses post treatment (child interview: EMDR = 92.5%/CBWT = 90.2%; parent interview: EMDR = 92.1%/CBWT = 82.9%). A slight but further gain in remission was found at the 12-month follow-up, with all (100%) of the EMDR group achieving diagnostic remission from PTSD (based on both child- and parent-interviews, separately). For the CBWT group, the PTSD remission rates at 12-months were unchanged from post-treatment. Furthermore, both treatments also showed significant

reductions relative to wait-list, in the moderate to large range (*d* = 0.39–1.03), for child- and parent-reported symptoms of depression, anxiety, behavioral problems and negative trauma-related appraisals. All gains were maintained at the 3-month and 12 month follow-up for both treatments. As in the previous study (Chapter 2), there was no difference between EMDR and CBWT, but gains in the EMDR group were reached in significantly fewer sessions than in CBWT (mean number of sessions = 4.1 sessions/140 minutes vs. 5.4 sessions/227 minutes). We concluded that EMDR and CBWT are brief trauma-focused treatments that, compared to WL, yielded equally large remission rates for PTSD and reductions in the severity of PTSD and comorbid difficulties in children and adolescents seeking treatment for PTSD tied to a single event.

Using data from this trial, **Chapter 4** reveals that, at post-treatment and 3-month follow-up, having an index trauma of sexual abuse, severe symptoms of PTSD, anxiety, depression, more comorbid disorders, negative posttraumatic beliefs, and having a parent with severe psychopathology predicted poorer PTSD-outcomes in both EMDR therapy and CBWT. For children with more severe self-reported PTSD symptoms at baseline, the (exploratory) moderator analysis showed that the EMDR group improved more than the CBWT group, with the opposite being true for children and parents with a less severe clinical profile. The most consistent finding from the predictor analyses was that parental symptomatology predicted poorer outcomes, suggesting that parents should be assessed and referred for their own treatment where indicated. The effect of the significant moderator variables was time-limited and given the large response rate (> 90%) and brevity (< 4 hours) of both treatments, the present findings suggested a focus on enhancing delivery of evidence-based trauma-focused treatments, instead of tailoring treatment for pediatric PTSD tied to a single event.

Finally, **Chapter 5** describes the findings of an open feasibility trial of EMDR with 32 adolescents, aged 12 to 18 years, suffering from mild to moderate-severe major depressive disorder (MDD). We hypothesized that reprocessing core memories related to the onset and maintenance of MDD using EMDR therapy would be associated with a significant decrease in depressive and comorbid symptoms. Treatment consisted of six weekly 60-minute individual sessions, followed by a maximum of 15 minutes meeting with the parents. Significant reductions in adolescent-reported MDD symptoms were observed at post-treatment (*d* = 0.72), with continued improvements at the 3-month follow-up (*d* = 1.11). Of the adolescents who completed treatment, 60.9% no longer met the criteria for MDD at post-treatment, rising to 69.8% at the 3-month follow-up. For the intent to treat group, 43.8% no longer met diagnostic criteria for MDD at post-treatment rising to 50% at the 3-month follow-up. In addition, significant reductions in adolescent-reported symptoms of posttraumatic

stress, anxiety, somatic complaints and behavioral symptoms were observed, with these gains also maintained at the 3-month follow-up. Furthermore, severity of post-traumatic stress reactions significantly predicted posttreatment outcome, however duration of MDD, number of comorbid disorders, or having a history of emotional abuse, emotional neglect or physical neglect were not predictive for outcome. These findings suggest that EMDR therapy is associated with a significant reduction of depressive symptoms and comorbid psychiatric problems in adolescents with mild to moderate severe MDD.

In **Chapter 6** the main findings from this thesis are summarized and recommendations for future research and clinical practice are considered. The findings in this thesis demonstrated that a brief trauma-focused approach (up to maximum of 6 sessions, up to maximum of 4 hours) for children and adolescents with pediatric PTSD tied to a single event, was effective and showed generalization of the positive effects to a broad range of comorbid symptoms, even if no interventions were addressed to these symptoms. All results were maintained on the long term (up to 1 year after treatment). Of possible predictors of child PTSD outcome, parental psychopathology has been found to be a consistent factor in literature, leading to poorer child PTSD outcomes, just as described in this thesis. Therefore, it is important to assess parental psychopathology when children are referred for trauma-focused treatment, and offer interventions for parents to reduce their symptomatology, if indicated. The effect of the significant moderator variables in our trial was limited in time (mainly from pre- to posttreatment) and based on our results, no recommendations can be made as to which trauma treatment works best for whom. Meanwhile clinicians can use more pragmatic criteria to select a specific trauma treatment for a child, and consider factors such as the availability of a specific treatment, the expertise of the therapist or the preference of the child or parent. The good news is, there are no bad choices. CBWT and EMDR therapy are both brief and very effective trauma treatments for children and adolescents. This result suggests to focus on further implementation hereof and to increase availability of these treatments so that children with PTSD or subthreshold PTSD can be treated in time and when needed. Finally, a trauma-focused approach for adolescents with major depressive disorder appeared to be effective in reducing depressive symptoms and comorbidity. If disturbing memories of negative events are underlying and maintaining the child's symptomatology, trauma-focused treatment to resolve these memories might be a logical first step in the treatment. Residual (comorbid) symptoms can be targeted afterwards as a second step, after having identified the maintaining factors and having selected evidence based treatment to influence these factors. Following this sequence of targeted interventions is also interesting from a cost-effectiveness point of view.

## Samenvatting

Het doel van dit proefschrift was het vergroten van de kennis en het versterken van de *evidence base* van psychologische behandelingen voor specifieke traumagerelateerde stoornissen, zoals PTSS, bij kinderen en jongeren van 4 tot 18 jaar en voor *eye movement desensitisation and reprocessing* (EMDR) therapie in het bijzonder.

In **hoofdstuk 1** wordt een inleiding gegeven op dit onderzoeksthema. Veel kinderen worden in hun jeugd blootgesteld aan traumatische gebeurtenissen en lopen het risico om een posttraumatische stressstoornis (PTSS) of een andere trauma-gerelateerde aandoening te ontwikkelen. Hoewel een significante minderheid van de kinderen die een traumatische gebeurtenis heeft meegemaakt PTSS zal krijgen, is de kans op spontaan herstel na 6 maanden PTSS gering. Door het hoge aantal getraumatiseerde kinderen, de ernst, de chroniciteit en de langetermijngevolgen van blootstelling aan 'trauma's is vroegtijdige en effectieve behandeling noodzakelijk. Gelukkig zijn er in de laatste decennia verschillende gestandaardiseerde traumabehandelingen voor kinderen en adolescenten met PTSS ontwikkeld en beschikbaar gekomen, met name traumagerichte cognitieve gedragstherapie (TF-CBT) en EMDR-therapie. Het aantal onderzoeken naar de effectiviteit van beide methoden groeit. De traumagerichte cognitieve gedragstherapie (CGT) protocollen, bestaande uit een verscheidenheid aan procedures en technieken, zijn het meest grondig onderzocht en hebben de sterkste empirische onderbouwing. Naast de focus op de werkzaamheid van de PTSS-behandeling bij kinderen is een belangrijke vraag voor de klinische praktijk welke factoren de PTSS-uitkomst van de behandeling voorspellen (predictoren) en welke behandeling het beste werkt voor wie (moderatoren). Kennis van predictoren en moderatoren van PTSS-uitkomsten bij kinderen kan helpen om – als er onvoldoende effect is van een *evidence-based* traumabehandeling – een behandeling te personaliseren en zo de werkzaamheid ervan voor een specifiek kind of gezin te verbeteren. Meer in het algemeen is er een hernieuwd inzicht dat onverwerkte herinneringen aan traumatische gebeurtenissen een belangrijke rol kunnen spelen bij de ontwikkeling en instandhouding van andere psychische stoornissen dan PTSS. Deze kennis vormde het uitgangspunt voor ons onderzoek bij adolescenten met een depressieve stoornis, waarbij we een antwoord proberen te geven op de vraag of een traumagerichte interventie zoals EMDR-therapie, gericht op het verwerken van emotioneel beladen herinneringen, depressieve symptomen en comorbiditeit kan verminderen. Het onderzoek dat in dit proefschrift wordt beschreven bestaat dan ook uit drie delen. Ten eerste hebben we onderzoek gedaan naar de effectiviteit en efficiëntie van drie traumabehandelingen

(traumagerichte CGT, WRITEjunior[1] en EMDR-therapie) bij het verminderen van PTSS- en comorbide symptomen. Ten tweede hebben we predictoren en moderatoren van PTSS-uitkomsten geïdentificeerd op basis van de data afkomstig van de *randomized controlled trial* (RCT) waarin het effect van WRITEjunior en EMDR-therapie vergeleken zijn. Ten slotte hebben we de effectiviteit en haalbaarheid onderzocht van een traumagerichte aanpak (d.w.z. EMDR-therapie) bij adolescenten met een depressieve stoornis (*major depressive disorder*).

In **hoofdstuk 2** vergelijken we de effectiviteit en efficiëntie van CGT en EMDR bij 52 kinderen van 4 tot 18 jaar, die een explosie van een vuurwerkfabriek hebben meegemaakt. Alle kinderen kregen maximaal 4 individuele sessies van 60 minuten. Parallel hieraan vonden maximaal 4 sessies ouderbegeleiding plaats. De metingen werden door onafhankelijke beoordelaars voor en na behandeling verricht en nog een keer bij de *follow-up* meting 3 maanden na behandeling. Kinderen en ouders vulden diverse vragenlijsten in die gericht waren op het inventariseren van posttraumatische-stressreacties, depressieve, angst- en gedragsproblemen. De resultaten laten, zowel voor CGT als voor EMDR-therapie, een significante en sterke vermindering van PTSS-symptomen zien (*within group* Cohen's *d*: EMDR = 1.23/CBT = 1.06, kind-gerapporteerd; EMDR = 1.00/CBT = 1.38, ouder-gerapporteerd). Beide behandelingen leidden ook tot een significante vermindering van comorbide symptomen (d.w.z. angst, depressie en gedrag; kind- en ouder-gerapporteerd) met een gemiddeld tot groot effect ($d$ = 0.62–1.40). Op geen van de vragenlijsten werd verschil in effectiviteit gevonden tussen EMDR-therapie en CGT, hoewel het resultaat in de EMDR-therapiegroep in significant minder sessies werd bereikt (gemiddeld aantal sessies: EMDR-therapie = 3.2 versus CGT = 4.0). De *follow-up* meting 3 maanden na de behandeling liet zien dat alle effecten gehandhaafd bleven voor beide behandelingen. De conclusie was dat toepassing van gestandaardiseerde traumagerichte CGT en EMDR-therapie het functioneren van kinderen, die PTSS (of subklinische PTSS) hebben na een ramp, significant kan verbeteren. De bevindingen van deze studie maakten duidelijk dat er meer onderzoek nodig was en moedigden aan tot de uitvoering van een grotere gerandomiseerde studie, met een wachtlijst om te controleren voor spontaan herstel, twee actieve behandelcondities en individuele behandeling zonder parallelle oudersessies.

In **hoofdstuk 3** rapporteren we de resultaten van een tweede, gerandomiseerde studie, deze keer met drie armen ($N$ = 103): EMDR-therapie ($n$ = 43, WRITEjunior; $n$ = 42), en een wachtlijst (WL; $n$ = 18). De WL-deelnemers werden na de wachttijd van 6 weken opnieuw gerandomiseerd en toegewezen aan WRITEjunior of EMDR-therapie. De deelnemers,

[1] In Nederland is *cognitive behavioral writing therapy* (CBWT) bekend onder de naam WRITEjunior.

die zelf hulp zochten in verband met hun klachten, waren tussen de 8 en 18 jaar oud en gediagnosticeerd met een DSM-IV-diagnose PTSS (of subklinische PTSS) na enkelvoudige traumatisering. Zij kregen ieder maximaal 6 sessies van 45 minuten EMDR-therapie of WRITEjunior aangeboden. De resultaten na behandeling lieten, zowel bij WRITEjunior als EMDR-therapie, een grote en significante afname zien van de ernst van de PTSS-symptomatologie ten opzichte van de wachtlijstgroep (*between group* Cohen's *d*: EMDR = 1.27/WRITEjunior = 1.24 kind-gerapporteerd; EMDR = .97/WRITEjunior = .92, ouder-gerapporteerd), alsmede een hoog percentage kinderen zonder PTSS-diagnose na behandeling (EMDR-therapie = 92.5%/WRITEjunior = 90.2%, kind-interview; EMDR-therapie = 92.1%/WRITEjunior= 82.9%, ouder-interview). Verder werd voor beide traumabehandelingen een significante afname waargenomen ten opzichte van de wachtlijstgroep voor symptomen van depressie, angst, gedragsproblemen en negatieve trauma-gerelateerde cognities (*range* middelmatig tot groot; *d* = 0.39–1.03). Alle op de nameting geobserveerde effecten bleven voor beide behandelingen gehandhaafd bij de *follow-up* na 3 en 12 maanden. Bij de *follow-up* meting na 12 maanden, was zelfs een kleine verbetering te zien: alle kinderen uit de EMDR-groep (100%) waren PTSS-vrij (op basis van zowel kind- als ouderinterviews, afzonderlijk). Voor de WRITEjunior-groep waren de PTSS-remissiecijfers 12 maanden na behandeling onveranderd. Net als in de vorige studie (hoofdstuk 2) was er geen verschil in effectiviteit tussen EMDR-therapie en WRITEjunior vergeleken met WL, maar de 'winst' in de EMDR-groep werd bereikt in significant minder sessies dan bij WRITEjunior (gemiddeld aantal sessies = 4.1 sessies/140 minuten vs. 5.4 sessies/227 minuten). De belangrijkste conclusie was dat EMDR-therapie en WRITEjunior kortdurende traumagerichte behandelingen zijn die, in vergelijking met WL, even effectief zijn in het verminderen van PTSS en comorbide problemen bij kinderen en adolescenten die een enkelvoudige traumatische gebeurtenis hebben meegemaakt.

Gebruik makend van de data uit bovenstaand onderzoek laten de resultaten van de studie in **hoofdstuk 4** zien dat, voor EMDR en WRITEjunior samen, een index-trauma van seksueel misbruik, ernstige symptomen van PTSS, angst of depressie, negatieve posttraumatische overtuigingen en het hebben van meer comorbide stoornissen of een ouder met ernstige psychopathologie, voorspellers zijn van een slechtere uitkomst direct na behandeling en bij de 3-maanden *follow-up*. De meest consistente bevinding van de predictoranalyses was dat ernstige ouderlijke psychopathologie een voorspeller is van een slechter resultaat van de traumabehandeling bij het kind. Dit onderstreept het belang van screening van psychopathologie bij ouders zelf en – indien geïndiceerd – om ouders te verwijzen voor behandeling van hun eigen klachten. Voor kinderen die bij de baseline-meting ernstiger PTSS-symptomen hadden (zelfrapportage kind), liet de exploratieve moderatoranalyse een groterere afname van PTSS-symptomen zien bij de EMDR-groep dan

bij de WRITEjunior groep. Het tegenovergestelde gold voor kinderen en ouders met een minder ernstig klinisch profiel. Gezien het tijdelijke effect van de moderatorvariabelen en het grote effect (> 90% PTSS diagnosevrij) en de korte duur (< 4 uur) van beide behandelingen, suggereren de huidige bevindingen dat het belangrijk is om de beschikbaarheid en inzet van evidence-based traumagerichte behandelingen voor PTSS (na eenmalige traumatisering) te vergroten, in plaats van het 'op maat maken' van de behandeling.

Tot slot beschrijft **hoofdstuk 5** de bevindingen van een haalbaarheidsstudie van EMDR-therapie bij 32 adolescenten van 12 tot 18 jaar, die lijden aan een milde tot matig ernstige depressieve stoornis (*major depressive disorder*, MDD). We veronderstelden dat het verwerken van 'kernherinneringen', gerelateerd aan de ontwikkeling en instandhouding van een depressieve stoornis, zou leiden tot een significante afname van depressieve en daaraan gerelateerde symptomen. De behandeling bestond uit 6 wekelijkse – 60 minuten durende – individuele sessies, met aansluitend een korte nabespreking met ouders (maximaal 15 minuten). Er werd een significante afname gevonden van MDD-symptomen (zelfrapportage) na behandeling ($d$ = 0.72), met een verdere verbetering bij de *follow-up* 3 maanden na behandeling ($d$ = 1.11). Van de jongeren die de behandeling afmaakten, voldeed na EMDR-behandeling zo'n 60% niet meer aan de criteria voor MDD, oplopend tot bijna 70% bij de 3-maanden *follow-up*. In de *intention to treat* groep voldeed bijna 44% niet meer aan de diagnostische criteria voor MDD na behandeling, oplopend tot 50% bij de 3-maanden *follow-up*. Daarnaast vond significante reductie plaats in posttraumatische stress- en angstsymptomen, somatische klachten en gedragsproblemen. Deze resultaten bleven gehandhaafd bij de 3-maanden *follow-up*. De duur van de MDD, het aantal comorbide stoornissen of het hebben van een voorgeschiedenis van emotioneel misbruik, emotionele verwaarlozing of fysieke verwaarlozing waren geen voorspellers voor de uitkomst, echter de ernst van de posttraumatische stressreacties wel. Deze bevindingen suggereren dat EMDR-therapie kan leiden tot een significante reductie van depressieve symptomen en comorbide psychiatrische problemen bij adolescenten met een milde tot matig ernstige MDD.

In **hoofdstuk 6** worden de belangrijkste bevindingen uit dit proefschrift samengevat en zijn aanbevelingen voor toekomstig onderzoek en de klinische praktijk gedaan. De resultaten in dit proefschrift laten zien dat een kortdurende traumabehandeling (maximaal 6 sessies, maximaal 4 uur in totaal) effectief is bij kinderen en adolescenten met PTSS na enkelvoudige traumatisering. Deze resultaten bleven gehandhaafd op lange termijn (3 maanden en 1 jaar na behandeling). Verder generaliseerde het positieve effect van de behandeling en vond reductie plaats van een breed scala aan comorbide symptomen zonder dat de behandeling hierop was gericht. Zoals consistent in de literatuur is beschreven, en ook in dit proefschrift, is de ernst van de symptomen bij ouders een voorspeller voor een slechtere PTSS-uitkomst

na traumabehandeling van hun kind. Bij verwijzing van kinderen voor traumabehandeling is het dan ook wenselijk dat screening van ouderlijke psychopathologie plaatsvindt en – indien geïndiceerd – ook interventies voor ouders ingezet worden gericht op het verminderen van hun eigen klachten. De duur van het effect van de significante moderatorvariabelen in ons onderzoek was beperkt en op grond van onze resultaten kunnen geen aanbevelingen worden gedaan welke traumabehandeling voor wie het beste werkt. Vooralsnog kan de clinicus een specifieke traumabehandeling selecteren op pragmatische gronden, zoals beschikbaarheid van een specifieke behandeling, de expertise van de therapeut of de voorkeur van een kind of ouder. Het goede nieuws is dat er in feite geen slechte keuze is. Writejunior en EMDR-therapie zijn beide kortdurende traumabehandelingen en zeer effectief voor kinderen en adolescenten met PTSS na enkelvoudige traumatisering. Dit wijst op het belang om de beschikbaarheid en inzet van deze behandelingen nog verder te vergroten. Kinderen met (subklinische) PTSS kunnen daardoor vroegtijdig en effectief behandeld worden. Tot slot leidde een traumagerichte aanpak voor adolescenten met een depressieve stoornis (MDD) tot een significante afname van depressieve en comorbide klachten. Ongeveer de helft van de adolescenten voldeed na EMDR-therapie niet meer aan de diagnose MDD. Als emotioneel beladen herinneringen ten grondslag liggen aan de symptomatologie van een kind, kan een traumagerichte behandeling gericht op verwerking van deze herinneringen een logische eerste stap in de behandeling zijn. Bij eventuele 'restklachten' kan de therapeut na identificatie van de belangrijkste instandhoudende factoren hier een volgende interventie voor inzetten om verdere klachtreductie te realiseren. Het inzetten van traumabehandeling als eerste stap richting herstel is eveneens interessant vanuit het oogpunt van kosteneffectiviteit.

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**Chapter 2: A randomised comparison of cognitive behavioural therapy (CBT) and eye movement desensitisation and reprocessing (EMDR) in disaster-exposed children**

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**Chapter 3: Comparison of eye movement desensitization and reprocessing therapy, cognitive behavioral writing therapy, and wait-list in pediatric posttraumatic stress disorder following single-incident trauma: a multicenter randomized clinical trial**

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**Chapter 4: Predictors and moderators of treatment outcome for single incident pediatric PTSD: A multi-center randomized clinical trial**

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**Chapter 5: Effectiveness of trauma-focused treatment for adolescents with major depressive disorder**

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- *Agreed to the final version of the manuscript:* Corine Paauw, Carlijn de Roos, Judith Tummers, Ad de Jongh & Alexandra Dingemans

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# About the author

Curriculum vitae
Publications and awards

## CURRICULUM VITAE

Carlijn de Roos (1959, Naarden, the Netherlands) completed her secondary education in 1977 at the Mencia de Mendoza Lyceum (Gymnasium B) in Breda. After she graduated in Psychology at the University Leiden (1985) she obtained her registration as a psychotherapist (BIG), clinical psychologist (BIG) and psychotraumatherapist (NtVP). Since 2017, Carlijn works at the TOPGGZ trauma department of Levvel (de Bascule), Academic Centre of Child and Adolescent Psychiatry/Amsterdam UMC as a clinical psychologist, EMDR expertise coordinator and researcher. She is a consultant for several professional associations (VKJP, NVP, VEN) and an EMDR Europe accredited child and adolescent trainer. Currently, Carlijn is the chair of the Child and Adolescent Committee EMDR Europe, a member of the Editorial Board of the EMDR Journal of Practice and Research, Council of Scholars (EMDRIA), and a member of the Scientific Committee of both the Dutch EMDR Association (VEN) and the EMDR Europe Association. Her specialisation is the assessment and treatment of children and adolescents with trauma-related disorders as well as somatically insufficiently explained physical symptoms/somatic symptom disorders. She provides lectures, workshops and training in these areas nationally and internationally.

Since 1989, she focuses on developing, implementing and improving trauma treatments for children and adolescents. When she worked for the BAVO-RNO group from 1989-2000 in Rotterdam, she developed a trauma-focused cognitive behavioral therapy protocol for children and their parents together with Jeanette Eland and Rolf Kleber which is called 'opvangprotocol' in collaboration with the Institute for Psychotrauma (IVP). Observations of the positive effects of this time limited protocol in clinical practice, inspired her to start research. Once she was trained in EMDR therapy in 1998, she developed and implemented EMDR therapy for children and adolescents in the Netherlands, together with Renée Beer and in cooperation with Ad de Jongh and Erik ten Broeke. As a scientist-practitioner, it was a logical step to start research into the effectiveness and efficiency of EMDR therapy, conducted in Mediant Enschede and at the Mental Health Care Institute Rivierduinen and Lucertis, respectively. To further stimulate the implementation of evidence-based trauma treatments, Carlijn and her (management) team set up the TOPGGZ Trauma Centre for Children and Adolescents Rivierduinen. She coordinated this centre from 2004-2017, as well as the Sexual Assault Centre in South Holland from 2013-2017. In addition, she co-founded and was the chair of the board of the Dutch EMDR Association (VEN) from 2003 until the end of 2018. During this period the VEN grew from 150 to 4500 members and she had the opportunity to contribute to the continuous development of EMDR therapy, develop and safeguard high standards in its clinical application and stimulate scientific research into the

effects of EMDR therapy for a broad range of disorders. At present, EMDR therapy is widely available in the Netherlands for traumatised children, adolescents and adults of all ages.

With regard to scientific research, she has contributed to more than 20 research projects. Currently, the focus of her research projects is on reducing stress related problems in young children (aged between 0-4 years) and their parents as well as children with somatically insufficiently explained physical symptoms/somatic symptom disorders. For her contribution to research in the field of traumatized youth, Carlijn received national and international research awards such as the Jaap Christoffelspenning (2011), the EMDR Outstanding Research Award (2012), Onderzoeksprijs Vereniging EMDR Nederland (Tegenwind; 2014) and the Francine Shapiro Award in 2018.

# PUBLICATIONS AND AWARDS

## International scientific publications

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## Other publications

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## Submitted

Conijn T., de Roos, C., Vreugdenhil, H. J. I., van Dijk-Lokkart, E. M., Wijburg, F. A., & Haverman, L. Effectiveness of eye movement desensitization reprocessing therapy for traumatized parents of children with a life-limiting illness: A randomized clinical trial.

Covers, M., de Jongh, A., Huntjens, R. J. C., de Roos, C., van den Hout, M., & Bicanic, I. A. E. Early intervention with eye movement desensitization and reprocessing (EMDR) therapy to reduce the severity of post-traumatic stress symptoms in recent rape vicims: A randomized controlled trial.

De Jager, I., Vulink, N., de Roos, C., & Denys, D. EMDR therapy for misophonia: a pilot study of case series.

De Roos, C., Zijlstra, B., Perrin, S., van der Oord, S., Lucassen, S., Emmelkamp, P., & de Jongh, A. Predictors and moderators of treatment outcome for single incident pediatric PTSD: A multi-center randomized clinical trial.

Olivier, E., de Roos, C., & Bexkens, A. The effectiveness of eye movement desensitization and reprocessing in young children (age 4-8) with posttraumatic stress disorder.

## Awards

Francine Shapiro Award (EMDR Europe, 2018)
Onderzoeksprijs Vereniging EMDR Nederland (Tegenwind, 2014)
EMDR Outstanding Research Award (EMDR International Association, USA, 2012)
Jaap Christoffelspenning (Nederland, 2011)