Post-traumatic stress disorder and its comorbidities in children and adolescents: cognitive phenotypes, treatment, and mechanisms of improvement

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Abstract

Post-traumatic stress disorder (PTSD) is a mental health condition which develops as a reaction to trauma and involves intrusion symptoms such as flashbacks or nightmares, avoidance of trauma-related thoughts or stimuli in the environment, and alterations in arousal or reactivity such as aggression, hypervigilance, or difficulty sleeping. Complex PTSD is a new diagnosis which requires the same core PTSD symptoms alongside emotional dysregulation, relationship difficulties, and negative self-concept.

Cognitive models of PTSD have been developed to understand the condition and aid in intervention development. Gold-standard treatments for PTSD in youth address cognitive-behavioural factors described in the cognitive models. These include trauma-focused cognitive-behavioural therapy (e.g. cognitive therapy for PTSD) and eye movement desensitisation and reprocessing.

This thesis explores the phenotype of youth with PTSD following exposure to multiple traumas using between-groups analyses to identify cognitive-behavioural and psychosocial factors associated with Complex PTSD and hearing voices. Response rates amongst youth for gold-standard PTSD treatments are synthesised in a systematic review and meta-analysis using a novel method to impute response to delineate percentages of participants exhibiting different response levels.

Finally, mediation analysis is conducted to determine whether change in cognitive-behavioural factors over the course of treatment mediates the effect of cognitive therapy for PTSD on PTSD symptom reduction. Responders (defined by 50% reduction in PTSD symptoms) and non-responders are compared to identify psychosocial and cognitive-behavioural mechanisms associated with positive treatment outcomes.

The findings demonstrate that this population has complex needs including comorbidity of mental health difficulties and elevated scores on numerous cognitive-behavioural and psychosocial factors. Change in cognitive-behavioural factors over the course of treatment were predictive of PTSD symptoms at follow-up and responder

status, although formal mediation analysis did not identify any factors which met mediation criteria. These findings support the use of gold-standard treatments whilst also highlighting that improvements are possible.

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Contents

1. Introduction

Post-traumatic stress disorder (PTSD) is a mental health condition which develops in some people after exposure to traumatic events. Since its introduction as a diagnosis, research has aimed to understand the phenotype of individuals presenting with PTSD, the underlying mechanisms driving PTSD symptoms, and how best PTSD should be treated.

When applying these research questions to the paediatric population, it must be considered whether the hypothesised phenotypes and models are applicable for children and adolescents, and importantly the efficacy of treatments in the younger population. In particular, there is a lack of pragmatic research in paediatric populations exposed to repeated trauma, a group vulnerable to greater complexity and additional comorbidities. This thesis aims to present an overview of the phenotype of young people with a PTSD diagnosis following exposure to multiple traumatic events and the mechanisms by which said young people experience improvement in PTSD symptoms over the course of treatment. Data from the DECRYPT trial will be used to explore these research questions. In addition, a systematic review and meta-analysis will present data pertaining to the efficacy of treatments for PTSD in the paediatric population in order to establish how effective gold-standard treatments for PTSD are for children and adolescents, and specifically the exact proportion of young people exhibiting response to these treatments.

1.1. Post-traumatic stress disorder

1.1.1. Diagnostic criteria

For an individual to meet criteria for a diagnosis of PTSD, the International Classification of Diseases, 11th Revision (ICD-11; World Health Organization (2019), requires exposure to an extremely threatening or horrific event or series of events followed by symptoms related to re-experiencing (e.g. flashbacks), avoidance behaviours, and persistent perceptions of heightened current threat. These symptoms must last for several weeks and be associated with a significant impairment in a range of areas such as personal, family, social, educational, and occupational functioning.

Meanwhile, the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5; American Psychiatric Association (2013), primarily used in the US, states the criteria for a PTSD diagnosis to require exposure (direct or indirect) to a traumatic event in the form of death, threatened death, actual or threatened serious injury, or actual or threatened sexual violence. This is followed by intrusion symptoms such as flashbacks or nightmares, avoidance of trauma-related thoughts or stimuli in the environment, negative alterations in cognition and mood, and alterations in arousal or reactivity such as aggression, hypervigilance, or difficulty sleeping. These symptoms must last for more than one month and result in distress or functional impairment in order to meet the criteria for a diagnosis of PTSD.

The main difference between the ICD-11 and DSM-5 criteria is that the DSM-5 criteria includes the additional symptoms cluster of negative alterations in cognition and mood, requiring individuals to experience two of the seven listed symptoms: inability to

remember an important aspect/s of the traumatic event(s), persistent exaggerated negative beliefs about oneself or the world, persistent distorted cognitions relating to the trauma, a persistent negative emotional state (experiencing emotions such as fear, anger, guilt, or shame), a markedly diminished interest in activities including hobbies, work, and socialising, feelings of detachment from others, and a persistent inability to experience positive emotions. A further contrast between the diagnostic criteria is that the ICD-11 is broader in terms of the definition of a traumatic event whilst the DSM-5 provides specific examples, and is less specific in defining the requisite period of time symptoms must be experienced for to warrant a diagnosis, requiring 'several weeks' compared to the one month specified by the DSM-5. The present thesis adopts the DSM-5 criteria, with discussion of the ICD-11 criteria included where pertinent.

1.1.2. Conceptualisation as a disorder of memory

PTSD has previously been conceptualised as a disorder of memory; memories of traumatic events were proposed to remain in the active memory storage system whilst individuals try to integrate and store them, resulting in intrusions in the form of flashbacks or nightmares as the memory storage system attempts processing (Horowitz, 1975). Following this, a dual memory processing system was proposed (Brewin, Dalgleish, & Joseph, 1996; Brewin, Gregory, Lipton, & Burgess, 2010) comprising sensory-bound representations (S-reps), situationally accessible memories which are perceptual representations of emotional states and sensory details, and contextualised representations (C-reps), verbally accessible memories which are higher level contextual representations of events. The intrusion symptoms of PTSD are hypothesised

to be the result of very strong S-reps reflecting the intensity of traumatic experiences, whilst C-reps pertaining to traumatic events are relatively weak (or potentially missing entirely) due to a breakdown in cognitive processing during the trauma or as a result of loose associations between the S-reps and C-reps.

The most widely accepted conceptualisation of PTSD at present is the cognitive model (Ehlers & Clark, 2000), which shares some elements with the Brewin et al. (1996) dual representation model but combines this processing of trauma memories with additional cognitive factors, thought control strategies, and behaviours.

1.1.3. Cognitive model

The cognitive model of PTSD (Ehlers & Clark, 2000) explains the core experience of PTSD as being a sense of serious current threat that endures even though the trauma itself is in the past. This sense of threat may be physical (feeling unsafe) or psychological (feeling a failure) and is driven by 3 processes: negative trauma appraisals, the nature of trauma memories, and safety-seeking strategies.

Negative trauma appraisals are excessively negative meanings that are ascribed to the traumatic event or its consequences (e.g. feeling damaged). Following a traumatic event, people can develop a variety of negative explanations around the event and their role in it which cause the traumatic event to be perceived as having global implications rather than being a discrete, time-limited event (Ehlers & Clark, 2000).

Trauma memories are thought to be processed in a predominantly sensory 'data-driven' way, so are poorly elaborated and lack context within other memories. This

means that when triggered, people struggle to access other information that could correct threatening impressions or negative beliefs they had at the time, linking intrusion symptoms to the negative trauma-related appraisals. In addition, powerful conditioning during the trauma, alongside a lack of contextualisation, means trauma memories and associated emotions become easily and unpredictably triggered by sensory cues matching those encountered at the time of the trauma, adding to the sense of current threat.

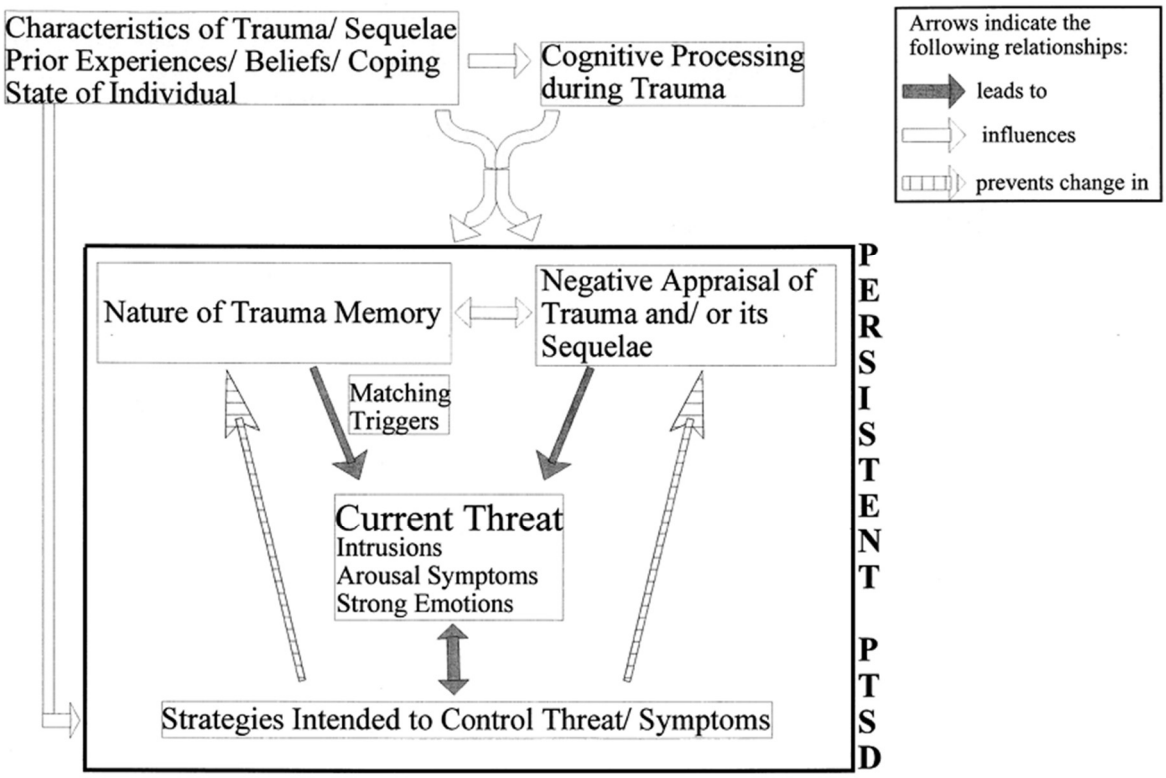
Safety-seeking strategies are cognitive and behavioural methods intended to reduce the sense of threat which inadvertently maintain the problem by directly increasing PTSD symptoms or the sense of threat being experienced. Avoidance and suppression of memories or reminders of the trauma can lead to a rebound effect characterised by more intrusions and safety-seeking behaviours such as avoidance of a particular environment or scenario and rumination prevent a person from elaborating and contextualising their trauma memories and disconfirming or reappraising negative trauma-related appraisals. All of these strategies can also contribute to excessive vigilance which may increase the heightened sense of current threat through increasing attention paid to potentially ambiguous signs of threat.

Beyond these core components of the cognitive model, there are additional factors which may be relevant to an individual's development and experience of PTSD symptoms. For example, factors prior to the traumatic event (e.g. previous traumas, low self-esteem) and characteristics of the traumatic event itself (e.g. period of time, resulting injury or loss of consciousness) may impact the cognitive processing of trauma

memories, leading to a focus on sensory rather than conceptual processing and the subsequent dominance of S-reps compared to C-reps, or influence the trauma-related appraisals, for example through trauma consequences leading to a perception of the world as dangerous or as oneself as damaged.

1.1.3.1. Figure 1. A cognitive model of PTSD

Note. Figure taken from Ehlers and Clark (2000).



1.2. PTSD in youth

1.2.1. Evidence for the cognitive model of PTSD

Exposure to traumatic events is common in childhood, with previous research estimating that 31.1% of children and adolescents in England and Wales experience a traumatic event prior to the age of 18 (Lewis et al., 2019) and that 61% of 13-17-year-olds in the US are exposed to traumatic events (McLaughlin et al., 2013). A meta-analysis

estimated the prevalence of PTSD in trauma-exposed children and adolescents less than 19 years old to be 15.9% (95% CI 11.5-21.5), and found that boys exposed to non-interpersonal trauma were least at risk whilst the highest rate was observed in girls exposed to interpersonal trauma (Alisic et al., 2014).

There is a range of empirical evidence supporting the relevance of the cognitive model of PTSD in youth. For example, in a prospective longitudinal follow-up study recruiting child and adolescent survivors of physical assaults and motor vehicle accidents, negative trauma-related appraisals were identified as a mediator between posttraumatic stress symptoms measured at two to four weeks post-trauma and at six months post-trauma (Meiser-Stedman, Dalgleish, Glucksman, Yule, & Smith, 2009). In addition, a meta-analysis revealed a large effect size when assessing the relationship between negative appraisals and PTSD symptoms in children and adolescents (Mitchell, Brennan, Curran, Hanna, & Dyer, 2017), supporting that appraisals play a role in the development and maintenance in posttraumatic stress symptoms in youth.

In addition, in a study recruiting children aged 7-16 years after they experienced injury resulting in hospital treatment, self-reported sensory, fragmented, and disorganised trauma memory characteristics predicted posttraumatic stress symptoms measured eight weeks later (McKinnon, Brewer, Meiser-Stedman, & Nixon, 2017). This supports the hypothesised poor elaboration of trauma memories from the cognitive model for PTSD.

The third component of the cognitive model, strategies intended to control the threat and symptoms, has received less research in youth than the other components,

although the recent development of a safety-seeking behaviour scale (Alberici et al., 2018) may help to address this. In a recent case series in the UK assessing cognitive therapy for PTSD (CT-PTSD) in nine participants aged 8 to 17 years, a large effect size was observed when comparing safety behaviours measured at baseline and posttreatment, supporting that reduction of safety behaviours is a mechanism which is addressed through treatments based on the cognitive model for PTSD. These strategies also encompass other dysfunctional behaviours such as rumination, which was found to be predictive of later PTSD symptoms in a prospective longitudinal study of 10-16-year-olds with PTSD (Meiser-Stedman et al., 2014).

However, whilst there is evidence supporting different aspects of the cognitive model, it should be noted that prospective longitudinal data does not provide indisputable evidence that the cognitive model entirely explains PTSD in youth. There is the possibility that additional factors beyond the cognitive model may contribute towards the development and maintenance of PTSD symptoms.

1.2.2. Comorbidities

Children and adolescents who develop PTSD have been shown to be particularly vulnerable to other psychopathological difficulties such as depression, conduct disorder, and alcohol dependency, as demonstrated in a comprehensive epidemiological study (Lewis et al., 2019). In addition, an increasing number of traumatic events appears to have a dose-dependent relationship with comorbid diagnoses. McLaughlin et al. (2013) demonstrated increasing percentages of children with anxiety, depression, or behavioural diagnoses as the number of experienced traumatic events

increased in a representative population sample of children aged 9 to 13 years who were assessed yearly until the age of 16; this pattern was most pronounced for depression diagnoses. However, the datapoints were limited to one, two, three, and four or more traumatic events; in the context of young people exposed to multiple and repeated traumas, it is possible that the number is far greater than four, limiting the generalisability of this finding to this group. Furthermore, research investigating the link between less common psychopathology and PTSD in youth is lacking. For example, Arseneault et al. (2011) established that symptoms of psychosis at age 12 were more likely to be reported by children who experienced maltreatment and Anketell et al. (2010) found that 50% of participants in an adult sample with PTSD reported hearing voices, a phenomenon which has not been explored in the paediatric population. This suggests that mental health difficulties experienced by people exposed to trauma could be wide-ranging across various types of psychopathology, and further research should seek to better understand the presentations of these young people with trauma exposure.

In terms of behaviours, the epidemiological study above also found that people under the age of 18 with lifetime PTSD had high rates of risk events for self-harm, suicide attempts, and violent offences (Lewis et al., 2019). Similarly, previous research has found that PTSD symptoms (specifically reexperiencing and avoidance) mediate the relationship between childhood sexual abuse and non-suicidal self-injury in a sample of adolescents aged 12 to 19 years. This demonstrates the need to address PTSD symptoms through treatment in order to reduce such behaviours.

Understanding the comorbid psychopathology and behavioural difficulties experienced by youth with a PTSD diagnosis and how these link to trauma characteristics as well as cognitive-behavioural and psychosocial factors is key in characterising the phenotype and difficulties faced by these individuals. Identification of comorbidities which are common in youth and the factors associated with these difficulties could aid in the development of transdiagnostic treatments to improve patient outcomes.

1.3. Complex PTSD

1.3.1. Diagnosis

More recently, complex PTSD (CPTSD) has been proposed as a new diagnosis and included in the ICD-11 (World Health Organization, 2019). The criteria for CPTSD diagnosis comprise all of the symptoms for PTSD discussed above as well as complex symptoms pertaining to disturbances in self-organisation. The three main facets of this disturbance are affective dysregulation (difficulty managing emotional responses), difficulties in sustaining relationships, and negative self-concept (persistent negative believes about oneself). The ICD-11 states that CPTSD typically occurs following exposure to chronic, repeated traumatic events, and that 'exposure to repeated traumas, especially in early development, is associated with a greater risk of developing CPTSD'.

CPTSD has been linked to cases of multiple and sustained traumatic events (Brewin et al., 2017; Cloitre et al., 2009), as well as greater functional impairment when comparing individuals who meet criteria for PTSD with those who meet criteria for CPTSD (Brewin et al., 2017). However, this diagnosis has received little attention in children and

adolescents who have exposure to trauma. This is a particularly important research area for young people who have had a range of difficult experiences, as it may inform how best to treat and support them.

1.3.2. Complex PTSD in youth

Previous research which sought to validate the existence of CPTSD in youth using latent class analysis found a 40.6% prevalence rate in children and adolescents who had posttraumatic stress symptoms following exposure to at least one traumatic event (Sachser, Keller, & Goldbeck, 2017). Furthermore, research conducted in a sample of young people exposed to a single incident trauma found that one third of those who met the criteria for ICD-11 PTSD met the criteria for a diagnosis of CPTSD (Elliott et al., 2021), a relatively high prevalence given that CPTSD is hypothesised to be associated with multiple traumas.

In addition, research has been conducted to investigate factors which may be related to CPTSD symptoms. A systematic review found that CPTSD in adults is associated with younger age, interpersonal trauma in childhood, and interpersonal trauma in adulthood (Karatzias, Murphy, et al., 2019). Furthermore, CPTSD in adolescence has been demonstrated to be associated with financial difficulties and conflict in the home, school problems, and a lack of social support (Daniunaite et al., 2021), and disturbances in self-organisation have been demonstrated to be common in adolescents exposed to sexual trauma (Villalta et al., 2020). These findings provide some support for CPTSD being linked to experience of multiple traumatic events, as hypothesised, as conflict in the home may indicated repeated traumas. In addition,

Karatzias, Murphy, et al. (2019) found that meeting criteria for either PTSD or CPTSD was associated with increased risk of suicidality, whilst CPTSD alone was associated with increased risk of experiencing major depressive disorder and generalised anxiety disorder symptoms. This suggests that CPTSD may be related to a range of comorbid mental health difficulties, and also raises the question as to whether it is a distinct diagnosis or could be conceptualised as PTSD with additional comorbidity.

Research aiming to evaluate the CPTSD diagnosis has included latent class and latent profile analyses (Cloitre, Garvert, Brewin, Bryant, & Maercker, 2013; Sachser, Keller, et al., 2017), but it is a possibility that the findings supporting the distinction between the disorders are an artefact of the methodology forcing a categorical separation. This is supported by replication of latent class and latent profile analyses which found that graphical inspection of scatterplots did not support clear separation of patients meeting criteria for PTSD and CPTSD (Achterhof, Huntjens, Meewisse, & Kiers, 2019). It has been suggested that the CPTSD category may simply be indicative of greater severity rather than an entirely separate disorder, and that dimensional models may better reflect the psychopathology of people exposed to trauma (Resick et al., 2012).

1.4. Psychological interventions for PTSD

Psychological interventions are treatments which target the mental processes underlying mental health conditions and aim to help individuals better manage their thoughts and behaviours in order to improve wellbeing. Psychological interventions are recommended by multiple treatment guidelines as the first-line treatment for children and adolescents presenting with PTSD. This includes the International Society for

Traumatic Stress Studies (Forbes, Bisson, Monson, & Berliner, 2019), the American Academy for Child and Adolescent Psychiatry (Cohen et al., 2010), the Australian National Health and Research Guidelines (Phelps et al., 2022), and the UK National Institute for Health and Care Excellence guidelines (National Institute for Health and Care Excellence, 2018). Trauma-focused cognitive behavioural therapy (TF-CBT) is a PTSD treatment with a range of different manuals and approaches including the manual proposed by Cohen and Mannarino (2008), cognitive therapy for PTSD (CT-PTSD) (Ehlers, Clark, Hackmann, McManus, & Fennell, 2005), narrative exposure therapy (M. Schauer, Neuner, & Elbert, 2011), prolonged exposure therapy (Foa, Hembree, & Rothbaum, 2007), and cognitive processing therapy (Resick, Monson, & Chard, 2016). Cognitive therapy for PTSD (CT-PTSD) was developed based on the cognitive model, and aims to:

1. Modify negative appraisals of the trauma and its sequelae.
2. Reduce intrusion symptoms through contextualising the trauma memories and identifying triggers.
3. Reduce cognitive and behavioural safety-seeking strategies which contribute to the sense of current threat or prevent appraisals from being updated or memories from being processed.

The three phases of TF-CBT are stabilisation, trauma narration and processing, and integration and consolidation (Cohen & Mannarino, 2015), although there is variation between different manuals. Stabilisation refers to the early treatment phase which aims to help individuals feel safe and emotionally regulated. This occurs prior to conducting the processing of trauma memories through creating a trauma narrative which can be

written, drawn, or otherwise constructed e.g. audio narrative or the use of figurines. This typically includes the event that happened, sensory memories from the event, and thoughts and feelings experienced by the individual during and after the traumatic event. The final 'integration and consolidation' phase refers to integration of the trauma memories into the individual's life story and consolidation of the skills and coping strategies developed through therapy.

The delivery of TF-CBT in children and adolescents has been manualised using the PRACTICE framework (Cohen, Mannarino, & Deblinger, 2016). This refers to the eight core components: Psychoeducation, Relaxation skills, Affective modulation, Cognitive coping, Trauma narrative, In vivo mastery, Conjoint child-parent sessions, and Enhancing safety. The first four components are designed to achieve stabilisation prior to development of the trauma narrative and exposure to trauma reminders using in vivo mastery, and the enhancing safety component aims to support the integration and consolidation phase of therapy. When using TF-CBT in children and adolescents, adaptations can be made to ensure age-appropriateness such as adjusting language and activities, for example through using storytelling or play figures for constructing the trauma narrative or using games and play to teach relevant skills (Cohen & Mannarino, 2017).

The presence of a parent or caregiver during the delivery of TF-CBT for children and adolescents has been investigated in previous research. In a meta-analysis assessing psychological treatments for PTSD in youth aged up to 25 years (Gutermann et al., 2016), the involvement of caregivers during treatment was identified as being

associated with a significantly larger effect size (and thus reduction in PTSD symptoms) compared with treatments conducted without caregivers present. Furthermore, a more recent systematic review and meta-analysis was conducted by synthesising (quasi-) randomised controlled trials and efficacy trials of psychotherapeutic or psychological interventions in participants aged up to 21 years (Szota, Schulte, & Christiansen, 2023). Analyses comparing treatments with and without caregiver involvement demonstrated significant effect sizes at posttreatment for child-reported PTSD, depression, and anxiety symptoms, as well as parent-reported PTSD and internalising symptoms, supporting the recommendation of incorporating caregiver involvement in psychological therapies for youth with a PTSD diagnosis. However, an individual participant meta-analysis of studies in trauma-exposed young people aged 6-18 years did not find any evidence for a moderating effect of caregiver involvement on PTSD symptoms at posttreatment (de Haan et al., 2024), indicating that further research should seek to confirm whether caregiver involvement is beneficial for children and adolescents with PTSD.

A further consideration is the effectiveness of TF-CBT in children and adolescents who meet the criteria for a diagnosis of complex PTSD. In the same article which reported the latent class analyses aiming to validate complex PTSD as a diagnostic category in youth, the researchers established that whilst both the PTSD and complex PTSD groups showed a large effect size in reduction of posttraumatic stress symptoms from baseline to posttreatment in the randomised controlled trial comparing TF-CBT to waitlist, the complex PTSD group exhibited significantly worse posttraumatic stress symptoms at posttreatment, as measured using the Clinician-administered PTSD Scale for Children

and Adolescents (CAPS-CA). This suggests that TF-CBT may be better suited to young people who meet the criteria for PTSD, and that treatment for children and adolescents who present with added complexity may benefit from additional development to improve the effects. However, further research should be conducted to establish whether the differential effect persists in further trials. However, the same trial demonstrated that TF-CBT generated medium to large effect sizes in reducing symptoms of disturbances in self-organisation, the triad of additional symptoms required for a complex PTSD diagnosis, providing some support for the impact of TF-CBT on the additional difficulties experienced by youth who meet criteria for complex PTSD.

1.4.1. Eye movement desensitisation and reprocessing

Eye movement desensitization and reprocessing (EMDR) is another psychological treatment endorsed by treatment guidelines. NICE recommend the use of EMDR for adults with PTSD if they have a preference to receive EMDR or if TF-CBT is not suitable or available, whilst for young people under the age of 18, EMDR is recommended as a second-line treatment for individuals who do not respond to or engage with TF-CBT.

EMDR involves recalling the traumatic event(s) aloud whilst engaging in an action which causes bilateral stimulation of the brain, typically eye movements. The initial phases of EMDR are history taking (assessing suitability and formulating a treatment plan), preparation (build therapeutic alliance and teach self-regulation strategies), and assessment of the target memory and associated negative appraisals. These are followed by the desensitisation phase whereby the patient focuses on the traumatic memory during bilateral stimulation, and the installation phase in which positive beliefs

are strengthened to replace negative beliefs. A body scan is conducted to assess and process any distressing sensations linked to the traumatic memories, and the therapist ensures the individual is stable before ending a session. The therapist then continues to evaluate progress after each session.

1.4.2. Research in paediatric populations

Trauma-focused cognitive behavioural therapy (TF-CBT) has been demonstrated as effective in treating children and adolescents with PTSD compared to active and passive control conditions (Hoppen, Meiser-Stedman, Jensen, Birkeland, & Morina, 2023; Mavranezouli et al., 2020). For example, in a seminal randomised controlled trial in the US comparing TF-CBT to child-centred therapy (a non-directive play-based treatment with a focus on the therapeutic relationship) in children aged 8 to 14 years who had a PTSD diagnosis following sexual abuse (Cohen, Deblinger, Mannarino, & Steer, 2004), children assigned to TF-CBT showed a significantly greater improvement on child-reported measures of PTSD and depression symptoms and a parent-reported measure assessing externalising and internalising behaviours (e.g. depression, anxiety, social problems, aggressive behaviour, problems with attention).

Relative to TF-CBT, there are fewer trials assessing EMDR, and there is a particular lack of trials using an active control condition, as demonstrated by a recent meta-analysis (Hoppen et al., 2023) which reported five trials comparing EMDR with passive control conditions, four of which were single-event trauma trials. Four trials compared EMDR to active controls, but three of these used other psychological therapies such as TF-CBT as the control condition and the fourth used standard care which may also

incorporate psychological therapies, demonstrating a lack of evidence comparing EMDR with non-psychological therapies. In addition, there was a lack of trials assessing medium or long-term follow-up for EMDR, with most trials completing assessments at posttreatments or within three months of the posttreatment timepoint, reducing the evidence for long-term efficacy of EMDR in youth. A further consideration is that many trials focus on young people exposed to single traumas, meaning that children and adolescents with experience of multiple or repeated traumas are underserved when it comes to understanding their psychopathological presentation and response to treatment.

However, despite the wide-ranging mental health difficulties faced by young people exposed to traumatic events and the evidence demonstrating effectiveness of treatments recommended by treatment guidelines for youth with a PTSD diagnosis, research suggests that only approximately one in five young people with a PTSD diagnosis in the UK access support from a mental health professional (Lewis et al., 2019). This appears to indicate a gap between the evidence base and real-world practice of trauma-informed therapies delivered for children and adolescents with PTSD.

1.5. Remaining questions

Despite the research discussed, there are still a number of questions to be addressed when considering the aetiology and treatment of PTSD in children and adolescents. First of these is that whilst the cognitive model for PTSD has been demonstrated as relevant in children and adolescents through support from research assessing trauma memory quality and negative trauma appraisals, little research has

been conducted on the association between safety-seeking behaviours and PTSD symptomatology in youth, perhaps due to the previous lack of an appropriate scale for measuring this. Demonstration of the importance of thought control strategies and avoidance behaviours could be used to support and further develop the use of psychological therapies such as TF-CBT.

Furthermore, TF-CBT and EMDR have been demonstrated as effective in children and adolescents with a diagnosis of PTSD, but given the evidence-practice gap, there remains a question of how to convey this effectiveness more clearly. Similarly, further research into how TF-CBT brings about effect, for example through using the newly developed Child Safety Behavior Scale, could improve understanding of the underlying mechanisms driving PTSD symptoms in youth and aid in further development of treatments to improve effectiveness.

An additional area to consider is the aetiology of complex PTSD in young people. As a new diagnosis, and given its inclusion in the ICD-11 but not the DSM-5, there is not yet conclusive evidence to warrant the use of a separate diagnosis in youth. Whilst some view it as a useful diagnosis and have linked it to the experience of multiple traumatic events, evidence has been presented to suggest that individuals with exposure to single traumas can also meet the necessary diagnostic criteria, and there is an argument that complex PTSD could be encapsulated through a diagnosis of PTSD with additional comorbidities or difficulties. Research into children meeting the complex PTSD criteria will allow these arguments to be evaluated and assess whether the complex PTSD

diagnosis is useful as a category for youth in diagnosis and treatment of those exposed to trauma.

Up until now, a large proportion of research has been conducted in young people exposed to discrete, single traumatic events such as a motor vehicle accident or assault, with many trials excluding potential participants if they have experience of multiple traumatic events. However, this doesn't reflect a large proportion of 'real world' children and adolescents who have experienced multiple traumatic events, particularly looked after children and those who live in conflict zones. These young people exposed to multiple, and in some cases, sustained traumatic events have been underrepresented in research, leading to limited understanding of their presentations and additional difficulties they may face beyond PTSD. Therefore, the process of only including children exposed to single traumas potentially excludes those who have the most to gain from receiving therapy for PTSD and means that findings don't reflect the efficacy of therapies for children who may have more complex presentations, with multiple additional comorbidities. There is a need for pragmatic research to be conducted which demonstrates the effectiveness of therapies for a wider range of children and adolescents and can be implemented in real world settings.

1.6. The DECRYPT trial

The DECRYPT trial (Delivery of Cognitive Therapy to Young People after Trauma, (Allen et al., 2021)) aimed to address a number of questions outlined above and provides a key source of data for this thesis. Whilst previous studies have investigated the treatment of PTSD in young people, these have involved highly specialist research clinics

which are unfortunately not representative of the treatment offered in front-line NHS settings. Therefore, DECRYPT was a phase II randomised controlled trial in which young people with exposure to multiple traumas and a PTSD diagnosis received cognitive therapy for PTSD (CT-PTSD) in a standard clinical setting to compare this treatment to treatment as usual.

Despite the vulnerability of children exposed to traumatic experiences, no studies have been conducted in the UK to assess the treatment of young people with PTSD who have experienced multiple traumas. Where studies have been conducted in relation to young people with PTSD, they have typically been delivered in highly specialist research clinics by 'expert' therapists and have also excluded young people with exposure to more than one traumatic experience. Therefore, DECRYPT is the first study of its kind investigating the treatment of multiple trauma exposure in children and adolescents in the UK.

A pilot study suggested that CT-PTSD is acceptable to the proposed population (young people with multiple traumas), and results in significant PTSD symptom improvement (C. Smith et al., 2025). Therefore, DECRYPT involved the delivery of CT-PTSD to young people with exposure to multiple traumas in frontline NHS settings to ensure the feasibility of implementation of subsequent recommendations brought about by the results of the trial.

The research question for the DECRYPT trial was: is CT-PTSD, delivered in standard clinical settings, an effective treatment for 8-17-year-old youth with PTSD following multiple traumas, relative to treatment as usual? There were also a range of

secondary aims for DECRYPT reflecting the selection of a broad variety of questionnaire measures and interviews used for data gathering over the course of the RCT. These include whether CT-PTSD elicits improvements in outcomes such as anxiety and depression, how non-PTSD mental health symptoms relate to PTSD symptoms and treatment outcomes, and investigation of how CT-PTSD brings about clinical improvement. The main trial found that CT-PTSD was superior to TAU when comparing CRIES-8 scores between the groups at the 11-month post-randomisation timepoint, and CT-PTSD was also found to be superior to TAU in a mixed-effect model incorporating all timepoints, but the primary outcome comparing the groups on CRIES-8 scores at posttreatment (approximately 5-6 months after randomisation) was not significant.

1.7. Aims of the present thesis

The present thesis uses data from the DECRYPT trial to investigate the phenotype and mechanisms of change for children and adolescents with a PTSD diagnosis following exposure to multiple traumatic events, in order to improve understanding of the presentation and treatment of this group. Specifically, the research aimed to evaluate the applicability of the CPTSD diagnosis to this population and factors which may be associated with meeting criteria for CPTSD. In addition, a further aim was to assess the prevalence of less common psychopathology (specifically hearing voices) within the sample, to extend the findings beyond just PTSD and CPTSD diagnoses to characterise the psychopathological presentation of young people participating in the trial. The analysis of change mechanisms over the course of treatment also allows for evaluation and discussion of the applicability of the cognitive model to paediatric PTSD, and

specifically whether the cognitive model provides a good framework on which to base treatment. In addition, a systematic review and meta-analysis assessing psychological treatments (TF-CBT and EMDR) for PTSD in youth provides data on the proportion of children and adolescents experiencing different levels of improvement in PTSD symptoms over the course of treatment. This provides tangible figures regarding the proportion of youth for whom gold-standard treatments are effective and hence accommodates assessment of the efficacy of TF-CBT and EMDR.

2. Characteristics of Complex PTSD in Young People with Posttraumatic Stress Disorder (PTSD) following Multiple Trauma Exposure

Note: This chapter has been published in The Journal of Child Psychology and Psychiatry (Lofthouse et al., 2023); see Supplementary Materials.

2.1. Abstract

Objective: To investigate how trauma characteristics, comorbid psychopathology, and cognitive and social factors experienced by children and adolescents with a PTSD diagnosis following exposure to multiple traumatic events differs between those who meet the criteria for complex PTSD (CPTSD) and those who do not.

Method: The present research used baseline data from the DECRYPT trial (Allen et al., 2021). Participants (n = 120) were aged 8-17 years and had exposure to multiple traumas and a PTSD diagnosis. The data collected comprised self-report and parent/caregiver-report questionnaires and interviews. Three primary analyses were conducted, comparing number of trauma types, prevalence of sexual trauma, and prevalence of intrafamilial abuse between the CPTSD and PTSD-only groups. A range of comorbid psychopathology and cognitive and social factors were compared between the groups in an exploratory secondary analysis. All analyses were pre-registered.

Results: The CPTSD group (n = 72, 60%) had a significantly higher frequency of sexual trauma than the PTSD-only group (n = 48, 40%). The groups did not significantly

differ on number of trauma types or prevalence of intrafamilial abuse. From the secondary analysis, the CPTSD group were found to have significantly higher scores on measures of negative post-traumatic cognitions, depression, and panic. These results were replicated in correlation analyses using a continuous measure of CPTSD symptoms.

Conclusions: A large proportion of youth exposed to multiple traumatic events met criteria for CPTSD. Sexual trauma appears to be related to CPTSD symptoms. Youth with CPTSD appear to have greater severity of comorbid depression and panic symptoms, as well as more negative post-traumatic cognitions. Further investigation could focus on the directionality and mechanisms for these associations.

2.2. Background

Post-traumatic stress disorder (PTSD) is a reaction to trauma which has comorbidity with other mental health difficulties (Lewis et al., 2019) and is associated with a range of outcomes related to overall functioning. The new diagnosis of complex post-traumatic stress disorder (CPTSD), introduced in the ICD-11 (World Health Organization, 2019), requires disturbances of self-organisation (DSO) comprising emotion dysregulation, negative self-perception, and relationship disturbances as well as the core PTSD symptoms of re-experiencing, avoidance, and a sense of heightened current threat. This diagnosis is related to wider complexity comprising symptoms outside the remit of current PTSD diagnosis or potentially specific trauma characteristics. Research into CPTSD is important for improving the understanding and effective treatment of people who have been exposed to trauma.

Previous research validating the CPTSD diagnosis using latent class analysis found a 40.6% prevalence rate of CPTSD in children and adolescents exhibiting posttraumatic stress symptoms after exposure to one or more traumatic events (Sachser, Keller, et al., 2017). Research into treatment of youth with CPTSD has demonstrated that trauma-focused CBT, the treatment recommended by National Institute for Health and Care Excellence (NICE) guidelines (NICE, 2018), is effective in reducing PTSD symptoms in young people with CPTSD, but that these individuals end treatment with significantly greater PTSD symptoms than PTSD-only individuals (Sachser, Keller, et al., 2017).

As a relatively new diagnosis, research into CPTSD could be useful to better understand the phenotype and experience of trauma-exposed youth. The ICD-11 states that CPTSD typically occurs ‘after exposure to chronic, repeated traumatic events’, and

that ‘exposure to repeated traumas, especially in early development, is associated with a greater risk of developing CPTSD’. However, Elliott et al. (2021) found that in a sample of young people exposed to a *single* incident trauma, of those who met the criteria for ICD-11 PTSD, one third met the full CPTSD criteria, demonstrating a reasonably high prevalence. Therefore, investigation of how the frequency of traumatic events influences CPTSD onset in youth is necessary.

A further area which may be relevant to consider is how specific trauma types may be related to CPTSD symptoms. Villalta et al. (2020) demonstrated that disturbances in self-organisation are frequent in adolescents exposed to sexual trauma, suggesting that sexual trauma may be associated with a greater risk of developing CPTSD symptoms. In addition, Daniunaite et al. (2021) found that CPTSD in adolescence is associated with family problems (financial difficulties and conflict in the home, school problems, and a lack of social support) and a systematic review by Karatzias, Hyland, et al. (2019) demonstrated that CPTSD is associated with younger age, interpersonal trauma in childhood, and interpersonal trauma in adulthood. These findings imply that interpersonal trauma may be more associated with CPTSD than other trauma types. Specifically, intrafamilial abuse (witnessing or experiencing abuse within the family environment) could be linked to CPTSD as it can be a marker of *repeated* traumatic events, although little research has thus far been conducted in young people to explore the effects of interpersonal trauma within the family.

In addition to trauma characteristics, a CPTSD diagnosis could be associated with comorbid psychopathology and a number of cognitive and social factors. Karatzias,

Hyland, et al. (2019) found in their systematic review that those with CPTSD are more likely to endorse symptoms of major depressive disorder and generalised anxiety disorder and that both PTSD and CPTSD increased likelihood of suicidality. Furthermore, Karatzias et al. (2018) used logistic regression analysis to demonstrate that negative trauma-related cognitions about the self was the most important factor in CPTSD diagnosis. This aligns with the cognitive model of PTSD (Ehlers & Clark, 2000), whereby negative appraisals are central in maintaining a sense of current threat, contributing to PTSD symptoms. Other aspects of the cognitive model, such as safety-seeking behaviours ('strategies intended to control threat/symptoms', Ehlers and Clark (2000)) may also be related to CPTSD diagnosis.

The present study aimed to investigate how trauma characteristics in young people exposed to multiple traumatic events are related to CPTSD diagnosis, in order to better understand potential risk factors for this increased complexity. We identified three possible characteristics of trauma exposure to consider on the basis of ICD-11 criteria for CPTSD and previous research, comprising number of trauma types, exposure to sexual trauma, and exposure to intrafamilial abuse. Number of trauma types was selected as a primary outcome due to reduced variability compared to total trauma frequency, which was included as a secondary outcome variable. Furthermore, the present research also explored how a range of comorbid psychopathology and cognitive and social factors, selected based on the cognitive model of PTSD (Ehlers & Clark, 2000) and the ICD-11 criteria for CPTSD, might differ between the CPTSD and PTSD-only groups. Elucidating the comorbidities and phenotype of young people who meet the

criteria for CPTSD could inform better treatment for these individuals through addressing specific comorbid symptoms or underlying mechanisms found to be associated with CPTSD.

Our primary hypotheses were that the CPTSD group would have a significantly higher number of trauma types and significantly higher prevalence of sexual trauma and intrafamilial abuse. Our secondary hypothesis was that the CPTSD group would have significantly higher scores than the PTSD-only group on measures of comorbid psychopathology and cognitive and social factors.

2.3. Method

2.3.1. Design

The present study was a cross-sectional design comprising of analysis of the baseline data from the Delivery of Cognitive Therapy for Young People after Trauma (DECRYPT) trial (Allen et al., 2021), a randomised controlled trial of cognitive therapy for PTSD in youth exposed to multiple traumatic stressors. Measures were selected from the battery of self-report and parent/caregiver-report interviews and questionnaires to assess number of trauma types, prevalence of sexual trauma, and prevalence of intrafamilial abuse for the primary analysis. For the secondary analysis, measures assessing dissociation, depression, anxiety, irritability, trauma memory quality, safety behaviours, and social support were identified. Hypotheses were pre-registered on the Open Science Framework (https://osf.io/chx7s/).

2.3.2. Ethical Considerations

Ethical approval for the DECRYPT trial was provided by UK Health Research Authority Research Ethics Committee (East of England–Cambridge South, 16/EE/0233). For participants aged under 16 years, informed consent was provided by parents and caregivers, and the child or young person was also asked to give their assent. Participants aged 16 years or older could provide informed consent without their parent or caregiver.

2.3.3. Participants

One hundred and twenty participants were included in this analysis; this sample size was determined by a power calculation for the primary outcome of the DECRYPT trial. Participants were drawn from Child and Adolescent Mental Health Services (CAMHS) and Youth Services in Cambridgeshire, Cardiff, Essex, Hertfordshire, Kent, Norfolk, South London and Suffolk. Inclusion criteria required participants to be aged 8-17 years with a diagnosis of PTSD (as defined by DSM-5 and diagnosed using the CPSS-I-5, Child PTSD Symptom Scale – Interview version, Foa, Asnaani, Zang, Capaldi, and Yeh (2018)) following multiple trauma exposure, and to have a score equal to or greater than 17 on the Child Revised Impact of Events Scale, 8-item version (CRIES-8, Perrin, Meiser-Stedman, and Smith (2005)). Six potential participants were excluded due to having a score below 17 on the CRIES-8, prior to administering the CPSS-I-5. Exclusion criteria were a change of prescribed psychiatric medication within the past two months, PTSD symptoms relating exclusively to one trauma, pervasive developmental or neurodevelopmental disorder, intellectual disability, another primary psychiatric diagnosis or clinical need warranting treatment ahead of PTSD (e.g. psychosis), inability

to speak English, ongoing exposure to threat, strong likelihood of being unable to complete treatment (e.g., imminent house move), or history of organic brain damage. Table 1 contains the demographic and trauma history data for the sample.

At baseline, participants completed a battery of interviews and questionnaires in an appointment lasting 60-90 minutes, with further appointments made available if required. See Allen et al. (2021) for full procedure information. Interviews and questionnaires relevant for the present study are described below.

2.3.4. Table 1. Sample demographic characteristics

	Whole Sample (*n* = 120)		CPTSD Sample (*n* = 72)		PTSD-only Sample (*n* = 48)	
Age in years, mean (*SD*)	14.9	(2.5)	15.5	(2.2)	14.1	(2.7)
Sex, *n* (%)						
Male	33	(27.5)	14	(19.4)	19	(39.6)
Female	87	(72.5)	58	(80.6)	29	(60.4)
Ethnicity, *n* (%)						
White (any background)	97	(80.8)	59	(81.9)	38	(79.2)
Black (any background)	9	(7.5)	4	(5.6)	5	(10.4)
Asian (any background)	2	(1.7)	2	(2.8)	0	(0.0)
Mixed (any background)	11	(9.2)	7	(9.7)	4	(8.3)
Any other ethnic group	1	(0.8)	0	(0.0)	1	(2.1)
Traumatic Experiences, *n* (%)						
Natural disaster	3	(2.5)	2	(2.8)	1	(2.1)
Accident	34	(28.3)	21	(29.2)	13	(27.1)
Robbed	10	(8.3)	5	(6.9)	5	(10.4)
Physical abuse inside family	57	(47.5)	32	(44.4)	25	(52.1)
Physical abuse outside family	57	(47.5)	36	(50.0)	21	(43.8)
Witnessed physical abuse inside family	66	(55)	37	(51.4)	29	(60.4)
Witnessed physical abuse outside family	53	(44.2)	34	(47.2)	19	(39.6)
Inappropriate sexual contact	36	(30)	30	(41.7)	6	(12.5)
Someone forcing/pressuring sex	30	(25)	25	(34.7)	5	(10.4)
Sudden death/injury of a close person	55	(45.8)	35	(48.6)	20	(41.7)
Attacked, stabbed, shot at, or hurt badly	13	(10.8)	10	(13.9)	3	(6.3)
Witnessed someone attacked, stabbed, shot at, or hurt badly	35	(29.2)	22	(30.6)	13	(27.1)
Medical procedure	29	(24.2)	19	(26.4)	10	(20.8)
Exposure to war	0	(0.0)	0	(0.0)	0	(0.0)
Other	83	(69.2)	49	(68.1)	34	(70.8)
Number of Trauma Types, mean (SD)	4.7	(2.2)	5.0	(2.3)	4.3	(1.9)

2.3.5. Measures

2.3.5.1. Complex PTSD Screen

In order to establish whether participants met the criteria for CPTSD, as defined by ICD-11 (World Health Organization, 2019), a three-item self-report structured interview was conducted. When the DECRYPT trial was designed, the ICD-11 was not yet published so the interview was devised by the DECRYPT trial team (see Appendix S1) based on draft criteria for CPTSD. The three interview items correspond to the three DSO symptoms defined in ICD-11: affective dysregulation, negative self-concept, and difficulties in sustaining relationships. Each item had one introductory question assessing the overall symptom, with optional follow-up questions for positive responses. Each of the three DSO symptoms was assessed on a five-point Likert-type scale from zero ('Not at all') to four ('Six or more times a week/almost always'), consistent with the CPSS-I-5, with scores above zero sufficient for endorsement of a symptom. Participants met criteria for CPTSD if they endorsed all three DSO symptoms.

2.3.5.2. Child Complex PTSD Checklist

The Child Complex PTSD Checklist (see Appendix S2) is a 12-item self-report measure which assesses the three DSO symptoms of CPTSD, comprising negative self-concept, interpersonal difficulties, and affect dysregulation. Each item is rated on a four-point Likert-type scale from zero ('Never') to three (almost always). The measure was developed based on preliminary drafts of ICD-11 in 2016 and has been demonstrated to have good internal consistency (Hiller, Meiser-Stedman, Elliott, Banting, & Halligan, 2021).

2.3.5.3. Child and Adolescent Trauma Screen (CATS)

The CATS (Sachser, Berliner, et al., 2017) has self-report and caregiver-report versions, both of which were employed in the present study as a structured interview. For the present research, the first 15 items pertaining to trauma history were analysed; these list 14 different trauma types and an open answer question to accommodate any non-listed trauma types, with the participant asked to indicate if they have experienced each event as a yes or no question; caregivers were asked the same with regards to the young person in their care. These data, alongside qualitative description of traumatic events, were used to establish the prevalence of sexual trauma (items 8 and 9) and intrafamilial abuse (items 4 and 6).

2.3.5.4. Children's Revised Impact of Event Scale, 8-item version (CRIES-8)

The CRIES-8 (Perrin et al., 2005) is a self-report questionnaire measure assessing frequency of post-traumatic stress symptoms over the preceding seven days. It has good face, construct, predictive, and criterion validity (Perrin et al., 2005; Stallard, Velleman, & Baldwin, 1999).

2.3.5.5. Post-Traumatic Cognitions Inventory – Child version (CPTCI)

The Post-Traumatic Cognitions Inventory – Child version (Meiser-Stedman, Smith, et al., 2009) is a 25-item self-report questionnaire which assesses appraisals of traumatic experiences in the preceding two weeks. The measure has good internal consistency, test-retest reliability, convergent validity, and discriminative validity (Meiser-Stedman, Smith, et al., 2009).

2.3.5.6. Revised Child Anxiety and Depression Scale (RCADS)

The Revised Child Anxiety and Depression Scale (RCADS) (Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000) is a 47-item self-report questionnaire assessing symptoms in the preceding two weeks corresponding to anxiety disorders and depression in young people. The measure has good internal consistency (Kösters, Chinapaw, Zwaanswijk, van der Wal, & Koot, 2015), test-retest reliability, and convergent validity (Chorpita et al., 2000).

2.3.5.7. Child PTSD Symptom Scale – Interview Version (CPSS-I-5)

The Child PTSD Symptom Scale – Interview Version (Foa, Asnaani, Zang, Capaldi, & Yeh, 2018) is a 27-item semi-structured self-report interview assessing DSM-5 PTSD symptoms. Foa et al. (2018) demonstrated that the interview has excellent internal consistency, reliability, and validity. The present study used the final 7 items which assess impairment of experienced symptoms on daily functioning.

2.3.5.8. Dissociation Screen

The dissociation screen used in the present study is a two-item self-report interview assessing the presence of depersonalisation ('Have you felt as if you were outside your body?') and derealisation ('Have you felt as if things around you weren't real?') measured on a five-point Likert-type scale from 'Not at all' to 'Six or more times a week/almost always', see Appendix S3.

2.3.5.9. Strengths and Difficulties Questionnaire (SDQ)

The Strengths and Difficulties Questionnaire (Goodman, 1997) is a 25-item caregiver-report measure assessing emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behaviour, with

each of these scales comprised of five items. The first four scales (comprised of 20 items), excluding prosocial behaviour, are used to calculate a total difficulties score, which was employed in the present study. The total difficulties score has acceptable test-retest reliability (Bergström & Baviskar, 2021), and sufficient convergent, discriminant, and criterion validity (Vugteveen, de Bildt, Theunissen, Reijneveld, & Timmerman, 2021).

2.3.5.10. Affective Reactivity Index – Child version (ARI-C)

The Affective Reactivity Index – Child version (Stringaris et al., 2012) is a seven-item self-report measure of irritability, which asks participants to rate irritability symptoms compared to others of the same age (e.g. 'I am easily annoyed by others').

2.3.5.11. Trauma Memory Quality Questionnaire (TMQQ)

The TMQQ (Meiser-Stedman, Smith, Yule, & Dalgleish, 2007) is an 11-item self-report questionnaire which assesses the current characteristics of trauma memories; particularly the extent to which they are composed of sensory elements. The measure has good internal consistency, criterion validity, and convergent validity (Meiser-Stedman et al., 2007). Higher scores indicate more sensory-based and fragmented memories.

2.3.5.12. Child Safety Behaviour Scale (CSBS)

The Child Safety Behaviour Scale (Alberici et al., 2018) is a 13-item self-report questionnaire designed to assess safety behaviours conducted over the past two weeks. The items can be divided into two subscales comprising hypervigilance and suppression.

The measure has excellent internal consistency and good discriminant validity and specificity (Alberici et al., 2018).

2.3.5.13. Multidimensional Scale of Perceived Social Support (MSPSS)

The Multidimensional Scale of Perceived Social Support (Zimet, Dahlem, Zimet, & Farley, 1988) is a 12-item self-report questionnaire measuring a participant's perceptions of support from family, friends, and a significant other. The measure has good internal reliability (Zimet et al., 1988) and good convergent and discriminative validity (De Maria, Vellone, Durante, Biagioli, & Matarese, 2018).

2.3.5.14. McLean Screening Instrument for Borderline Personality Disorder (MSI)

The McLean Screening Instrument (Zanarini et al., 2003) is a 10-item parent/guardian-report interview assessing symptoms of DSM-4 borderline personality disorder (BPD), in which items are rated on a dichotomous scale of present or absent. The measure has good sensitivity, specificity, reliability, and validity (Zanarini et al., 2003). A cut-off of 7 is commonly used in screening for BPD.

2.3.5.15. Mood and Feelings Questionnaire – Suicidal Ideation (MFQ-SI)

The Mood and Feelings Questionnaire – Suicidal Ideation subset is a self-report 4-item questionnaire developed by Hammerton, Zammit, Potter, Thapar, and Collishaw (2014), as a composite of relevant items from the full Mood and Feelings Questionnaire (Angold & Costello, 1987). Hammerton et al. (2014) demonstrated that this composite has reasonable validity.

2.3.6. Data Analysis

The sample size was predetermined by the DECRYPT trial. For the current study, a post-hoc power analysis conducted using G*Power version 3.1.9.7 (Faul, Erdfelder, Lang, & Buchner, 2007) indicated that two groups (n = 48 and n = 72) with a significance criterion of α = .05 for a test of means comparisons would have 80% power to detect an effect size (standardised mean difference) of .47. Statistical analysis was conducted using IBM SPSS Statistics Version 28 (IBM Corp., 2021). Data were assessed for assumptions of normality, skewness, and kurtosis. The normality of the score distribution on each measure was assessed using the Kolmogorov-Smirnov Test.

Demographic data were compared between the CPTSD and PTSD-only groups. For the categorical variables (ethnicity and sex), chi-square tests were conducted. A Mann-Whitney test was conducted to compare the ages of the groups.

The scores for number of trauma types, total trauma frequency, CRIES-8, SDQ, ARI-C, total RCADS, Dissociation, MSI (BPD), CSBS suppression subscale, CPSS impairment, and Suicidal Ideation did not meet the normality assumption. For the number of trauma types, CRIES-8, ARI-C, Dissociation, MSI (BPD), CPSS Impairment, and Suicidal Ideation scores, no adequate transformations could be found; therefore, non-parametric Mann-Whitney tests were conducted for these variables. The scores for the SDQ, total RCADS, and CSBS suppression subscale met the normality assumption after a square root transformation, and the total trauma frequency met the normality assumption after a log transformation, allowing parametric tests to be conducted as planned. Independent samples t-tests were conducted to compare the CPTSD and non-CPTSD groups on scores for the following variables: total trauma frequency, CPTCI,

RCADS total and subscales (depression, panic, generalised anxiety disorder), SDQ, TMQQ, CSBS subscales (hypervigilance and suppression), and MSPSS. Prevalence of sexual trauma and intrafamilial abuse was compared between the CPTSD and PTSD-only groups using chi-square tests due to the categorical nature of these variables.

Corrections were applied to adjust for multiple comparisons. For the primary analysis (number of trauma types, sexual trauma prevalence, intrafamilial abuse prevalence), a Bonferroni correction was applied. For the exploratory secondary analysis comprising all other variables, a Holm-Bonferroni correction was applied.

Levene's test for equal variances was conducted for all t-tests; this was not significant and equal variances were assumed unless otherwise specified. Cohen's d effect sizes were calculated for all between groups analyses, with effects sizes for dichotomous factors (e.g., sex, trauma type) converted from odds ratios to Cohen's d to allow easy comparison between variables.

In order to confirm that the CPTSD self-report questionnaire assessed the intended CPTSD symptoms, a t-test was conducted to compare the CPTSD and PTSD-only groups (as defined using the CPTSD diagnostic interview) on the CPTSD questionnaire scores. As expected, the CPTSD group had a significantly higher score on the CPTSD questionnaire (M = 26.2, SD = 7.02) than the PTSD only group (M = 20.2, SD = 7.58), $p < .001$, *Cohen's d* = .825.

Correlation analyses were then conducted using the Complex PTSD checklist and all of the trauma characteristics, psychopathological, cognitive, and social variables. A Holm-Bonferroni correction was applied.

2.4. Results

2.4.1. Descriptive Statistics

Table 2 contains descriptive statistics of all measures included in the present study. Seventy two of 120 participants (60%) met the criteria for CPTSD with the remaining 48 meeting criteria for PTSD. In the PTSD-only group, one participant (2.1%) had zero DSO symptoms, six participants (12.5%) had one DSO symptom, and 41 participants (85.4%) had two DSO symptoms. The distribution of scores for the CPTSD questionnaire measure are reported in the Supplementary Material, Figure S1.

2.4.2. Table 2. Descriptive Statistics for All Measures

Measure	*n*	*M*	*SD*	Range	Cronbach's α
Trauma characteristics					
Sexual trauma	120	N=50[a]	41.7%[a]		
Number of trauma types	120	4.7	2.2	1-11	.47
Intrafamilial abuse	120	N=90[a]	75.0%[a]		
Negative post-traumatic cognitions (CPTCI)	118	73.6	15.9	26-100	.94
Depression (RCADS)	120	19.5	6.2	2-30	.83
Panic (RCADS)	120	14.4	7.1	0-27	.91
Dissociation	120	6.87	2.5	3-12	.73
Generalised Anxiety Disorder (RCADS)	120	12.0	3.93	2-18	.78
Safety behaviours – Suppression subscale (CSBS)	115	17.8	3.6	7-24	.69
Strengths and Difficulties Questionnaire (SDQ)	94	21.5	6.1	9-35	.66
Impairment (CPSS)	119	4.6	1.3	1-7	.48
PTSD symptoms (CRIES-8)	120	31.6	6.0	17-40	.66
Trauma memory quality (TMQQ)	120	31.8	5.5	17-44	.73
Safety behaviours – hypervigilance subscale (CSBS)	114	17.8	5.2	7-28	.83
Suicidal ideation (MFQ-SI)	119	4.8	2.7	0-8	.86
Social support (MSPSS)	119	57.8	13.4	17-84	.82
Trauma frequency	120	152.3	653.2	0-6110	.46
Borderline personality disorder traits (MSI)	98	6.3	2.4	0-10	.71
Irritability (ARI-C)	120	7.9	4.2	0-14	.94

Note: CRIES-8 = Child Revised Impact of Events Scale; CPTCI – Post-Traumatic Cognitions Inventory, Child version; RCADS = Revised Child Anxiety and Depression Scale; SDQ = Strengths and Difficulties Questionnaire; ARI-C = Affective Reactivity Index – Child version; TMQQ = Trauma Memory Quality Questionnaire; CSBS = Child Safety Behaviour Scale; MSPSS = Multidimensional Scale of Perceived Social Support.

[a] Sexual trauma and CPTSD diagnosis are categorical variables, so the frequencies and percentages for these variables are reported here.

2.4.3. Demographic Analyses

There was no significant difference between the CPTSD and PTSD-only groups on ethnicity (p = .542). There was a significant difference between the groups on age (p = .008), with a higher mean age for the CPTSD group (M = 15.5, SD = 2.20) than for the PTSD-only group (M = 14.1, SD = 2.72). There was also a significant difference in the sex distribution of the groups (p = .016), with a greater proportion of females in the CPTSD group (80.6%) than in the PTSD-only group (60.4%).

2.4.4. Primary Analyses

Table 3 contains mean scores differentiated by group. With respect to number of trauma types, a Mann-Whitney test indicated that despite the CPTSD group having a higher mean score, there was no significant difference between the CPTSD group and the PTSD-only group (p = .344; *Cohen's d* = .37). A chi-square test indicated a significant difference between prevalence of sexual trauma in the CPTSD and PTSD-only groups, (p < .001, Bonferroni correction required p =. 0167; *Cohen's d* = .83). 54.2% of the CPTSD group had experienced sexual trauma, compared to 20.8% of the PTSD-only group. There was no significant relationship between CPTSD and intrafamilial abuse (p = .28; *Cohen's d* = .32).

A logistic regression was performed to assess the effect of sexual trauma on CPTSD diagnosis whilst controlling for PTSD symptom severity (CRIES-8 score), see Supplementary Material Table S4. Sexual trauma remained a significant predictor of CPTSD diagnosis (p<.001) after controlling for PTSD symptom severity; the model found that participants exposed to sexual trauma were 4.5 times more likely to have a CPTSD diagnosis than those not exposed to sexual trauma.

2.4.5. Secondary Analyses

For mean scores on secondary measures, see Table 3. The CPTSD group endorsed our measure of negative trauma-related cognitions (the CPTCI) more strongly than the PTSD-only group ($p < .001$; *Cohen's d* = .69). The CPTSD group also had a significantly higher score on the RCADS depression subscale ($p < .001$; *Cohen's d* = .73) and the RCADS panic disorder subscale ($p = .002$; *Cohen's d* = .54) than the PTSD-only group. There were no significant differences between the CPTSD and PTSD-only groups on the other secondary measures.

A one-way analysis of covariance was conducted to assess whether the significant results from the secondary analysis remained after controlling for PTSD symptom severity (CRIES-8 scores). There was still a significant difference between the groups on negative trauma related cognitions ($F(1, 115)=10.1$, $p=.002$), RCADS depression ($F(1, 117)=12.5$, $p<.001$), and RCADS panic disorder ($F(1, 117)=7.1$, $p=.009$) when controlling for PTSD symptom severity.

2.4.6. Table 3. Between Groups Analysis for Primary and Secondary Outcomes

Measure	CPTSD group *(n=72), m (SD)*	PTSD-only group *(n=48), m (SD)*	Test Statistic	*p*	Effect Size (*Cohen's d* unless specified)
Primary Analysis					
Sexual trauma[a]	39 (54.2%)	10 (20.8%)	$\chi^2 = 13.2$	**< .001**	.828
Number of trauma types	5.0 (2.3)	4.3 (1.9)	$U = 1553.5$	.344	.173
Intrafamilial abuse[a]	51 (70.8%)	39 (81.3%)	$\chi^2 = 1.7$	.197	.319
Secondary Analysis					
Trauma frequency	209.2 (827.8)	66.9 (180.7)	$t = 0.27$	.788	.051
Psychopathology					
Depression (RCADS)	21.2 (5.6)	16.9 (6.3)	$t = 3.9$	**< .001**	.731
Panic (RCADS)	16.0 (6.5)	12.0 (7.4)	$t = 3.2$	**.002**	.587
Dissociation	7.3 (2.5)	6.1 (2.4)	$U = 1246.0$	.009	.489
Generalised Anxiety Disorder (RCADS)	12.6 (4.0)	11.1 (3.7)	$t = 2.1$	.037	.393
Parent-reported emotional difficulties (SDQ)	22.5 (5.7)	20.3 (6.5)	$t = 1.8$	.072	.379
Impairment (CPSS)	4.9 (1.1)	4.2 (1.5)	$U = 1376.5$	.076	.330
PTSD symptoms (CRIES-8)	32.3 (5.9)	30.5 (6.0)	$U = 1401.0$	.078	.326
Suicidal ideation (MFQ-SI)	5.2 (2.6)	4.3 (2.7)	$U = 1480.5$	.22	.226
Borderline personality disorder traits (MSI)	6.5 (2.0)	5.9 (2.9)	$U = 1159.0$	.902	.025
Irritability (ARI-C)	7.9 (4.2)	7.9 (4.2)	$U = 1722.5$	.976	.005
Cognitive and Social Factors					
Negative post-traumatic cognitions (CPTCI)	77.8 (14.6)	67.4 (16.0)	$t = 3.7$	**< .001**	.686
Safety behaviours – Suppression subscale (CSBS)	12.6 (3.6)	10.8 (3.4)	$t = 2.1$	.04	.393
Trauma memory quality (TMQQ)	32.5 (5.1)	30.7 (6.0)	$t = 1.7$	.095	.313
Safety behaviours – hypervigilance subscale (CSBS)	11.3 (5.3)	10.3 (5.0)	$t = 1.3$	.208	.240
Social support (MSPSS)	56.8 (13.8)	59.4 (12.7)	$t = 1.1$	.285	.201

Note: Significant results depicted in bold. A Bonferroni correction was applied for the three primary analyses and a Holm-Bonferroni correction was applied for the secondary analysis. CPTCI – Post-Traumatic Cognitions Inventory, Child version; CRIES-8 = Child Revised Impact of Events Scale; TMQQ = Trauma Memory Quality Questionnaire; RCADS = Revised Child Anxiety and Depression Scale; CSBS = Child Safety Behaviour Scale; SDQ = Strengths and Difficulties Questionnaire; ARI-C = Affective Reactivity Index – Child version; MSPSS = Multidimensional Scale of Perceived Social Support.

[a] Categorical variables so frequencies rather than means are reported.

2.4.7. Correlation Analysis

See Table 4 for the full correlation analysis. CPTSD symptoms as assessed by the self-report questionnaire measure were found to have large correlations (r>.5) with negative trauma-related cognitions (CPTCI), depression (RCADS), panic (RCADS), suicidal ideation (MFQ-SI), dissociation, and PTSD symptoms (CRIES-8); medium correlations (r>.3) with generalised anxiety (RCADS), suppression (CSBS), trauma memory quality (TMQQ), and borderline personality disorder traits (MSI); small correlations (r>.1) with irritability, parent-reported emotional difficulties, and sexual trauma.

The pattern of correlation analyses remained broadly the same when controlling for PTSD symptom severity (CRIES-8 score), see Supplementary Materials Table S1.

2.4.8. Table 4. Correlation Analysis for Primary and Secondary Outcomes

Measure	*n*	*r*	95% Confidence Interval	*p*
Trauma Characteristics				
Sexual trauma*	120	.241	.064 - .403	**.008**
Number of trauma types	120	.159	.023 - .368	.083
Intrafamilial abuse*	120	.073	-.107 - .249	.426
Trauma frequency	120	.111	-.070 – 2.84	.229
Psychopathology				
Depression (RCADS)	120	.621	.497 - .720	**< .001**
Suicidal ideation (MFQ-SI)	119	.551	.412 - .665	**< .001**
PTSD symptoms (CRIES-8)	120	.517	.373 - .638	**< .001**
Panic (RCADS)	120	.509	.363 - .531	**< .001**
Dissociation	120	.516	.372 - .637	**< .001**
Generalised Anxiety Disorder (RCADS)	120	.443	.287 - .577	**< .001**
Impairment (CPSS)	119	.374	.208 - .519	**< .001**
Borderline personality disorder traits (MSI)	98	.347	.159 - .510	**< .001**
Irritability (ARI-C)	120	.286	.112 - .442	**.002**
Parent-report emotional difficulties (SDQ)	94	.279	.081 - .456	**.006**
Cognitive and Social Factors				
Negative post-traumatic cognitions (CPTCI)	118	.637	.516 - .734	**< .001**
Safety behaviours, suppression (CSBS)	115	.486	.333 - .615	**< .001**
Trauma memory quality (TMQQ)	120	.395	.232 - .536	**< .001**
Social support (MSPSS)	119	-.191	-.358 - -.011	.038
Safety behaviours, hypervigilance (CSBS)	114	.151	-.034 - .326	.108

Note: Significant results depicted in bold. A Holm-Bonferroni correction was applied.

2.5. Discussion

The present study is a novel investigation of the presentation of CPTSD in children and adolescents with a PTSD diagnosis following multiple trauma exposure. The CPTSD and PTSD-only groups were compared on trauma characteristics, comorbid psychopathology, and cognitive and social factors. The CPTSD group had a significantly higher prevalence of sexual trauma and significantly higher scores on measures of negative trauma-related cognitions, depression, and panic.

First, the prevalence of CPTSD within this sample is higher than rates reported by other studies; 72 of 120 participants (60%) met the criteria for CPTSD compared to 40.6% found by Sachser, Keller, et al. (2017) in latent class analysis of a sample of youth exposed to at least one traumatic event with at least medium severity of posttraumatic stress symptoms. This difference may be due to the requirement for multiple traumas as well as high PTSD symptom severity scores in the present sample, potentially contributing to greater complexity and higher rates of CPTSD. Furthermore, the high rates of subthreshold DSO symptoms (97.9% of PTSD-only group endorsing at least one symptom) show that these are experienced by a majority of young people with a PTSD diagnosis, consistent with Elliott et al. (2021), who found that 90% of participants meeting PTSD criteria also endorsed at least one DSO symptom.

Primary analyses comprising between-groups comparisons showed that the CPTSD group had a significantly higher prevalence of sexual trauma than the PTSD-only group. This is consistent with Cloitre et al. (2019), where childhood sexual abuse by caregivers was associated with risk for CPTSD in adults. However, the other two primary hypotheses were not confirmed. There was no significant difference between the CPTSD

and PTSD-only groups on number of trauma types or prevalence of intrafamilial abuse. The lack of significant difference for number of trauma types echoes the finding of Daniunaite et al. (2021), although the lack of difference in intrafamilial abuse prevalent does not replicate their finding that CPTSD was associated with family problems such as financial difficulties and conflicts in the home. However, it should be noted that the number of trauma types was high for both groups (M = 5.0 for CPTSD group; M = 4.3 for PTSD-only group) relative to similar samples such as Jensen et al. (2014).

The secondary analyses showed that the CPTSD group scored significantly higher on measures of negative post-traumatic cognitions, symptoms of depression, and symptoms of panic. The finding for negative post-traumatic cognitions is consistent with Karatzias et al. (2018), who used logistic regression analysis to establish negative trauma-related cognitions about the self were the most important factor in predicting CPTSD diagnosis in adults. However, given that negative self-concept is a symptom of CPTSD, it is possible that this is related to, or overlaps with, negative post-traumatic cognitions, causing the significant difference between the groups. Furthermore, the findings for depression and panic are supported by Karatzias, Hyland, et al. (2019), in which adults with CPTSD were more likely to endorse symptoms for major depressive disorder and generalised anxiety disorder. It is feasible that these features are transdiagnostic, whereby negative self-concept seen in CPTSD could feed into symptoms of depression, whilst emotional dysregulation, also a feature of CPTSD, could contribute to symptoms of panic.

Correlational analyses using the continuous questionnaire self-report measure of CPTSD symptoms replicated the results from the primary and secondary analyses with all of the factors identified in the between-groups analyses producing significant correlations, as well as some factors which were non-significant in the between-groups analyses producing significant correlations.

A further finding of note was the difference in age and sex distribution of the CPTSD and PTSD-only groups. The CPTSD group was found to be significantly older and contain a significantly higher proportion of females than the non-complex group. The finding for age is not consistent with Karatzias, Hyland, et al. (2019), who found that younger age was associated with CPTSD in an adult sample. One explanation for the difference in sex distribution may be that females are more likely to experience or report sexual trauma (Finkelhor, Shattuck, Turner, & Hamby, 2014), which significantly differed between the groups in the primary analysis. This may also relate to the difference in mean ages, as sexual trauma may be more likely to be disclosed as young people enter puberty and gain more independence.

An additional consideration is the range of comorbid psychopathology and cognitive and social factors which were *not* found to significantly differ between the CPTSD and PTSD-only groups. The lack of significant difference for social support is surprising given the relationship difficulties symptom of CPTSD. Similarly, irritability produced a small, significant correlation with CPTSD symptoms but was not found to significantly differ in the between groups analysis, despite its apparent relation to the DSO symptom of affect regulation. PTSD symptom severity had a large correlation with

the CPTSD questionnaire measure but was not significant in the between-groups analyses, although this may be attributed to the high scores for the entire sample and thus a potential ceiling effect.

This research could have clinical implications. It has shown that sexual trauma specifically may be associated with greater complexity in children and adolescents. In addition, the CPTSD group having higher scores on post-traumatic negative cognitions suggests that this may be an important treatment target for multiple trauma-exposed young people, consistent with a recent systematic review which demonstrated that negative posttraumatic cognitions was the most consistent mediator or mechanism of change in PTSD treatments (Alpert, Shotwell Tabke, Cole, Lee, & Sloan, 2023).

The present research had various strengths and limitations. The study design and hypotheses were pre-registered and a correction for multiple comparisons was used to ensure methodological rigour. Both the CPTSD and PTSD-only groups being comprised of youth with a PTSD diagnosis following exposure to multiple traumatic events allowed for a robust comparison, although there was the possibility for ceiling effects given the large proportion of the PTSD-only group endorsing two DSO symptoms, and the elevated scores on psychopathology measures. The sample size was determined by the DECRYPT trial, meaning that whilst adequately powered, only medium-sized effects could be detected. In addition, most of the sample was female, which is comparable to other examples of PTSD research (Sachser & Goldbeck, 2016). A further consideration is the lack of validated diagnostic interviews available to assess CPTSD in youth. The additional interview items used in the present research were designed to be consistent with the

CPSS-I-5 (an interview designed for DSM-5 PTSD, not ICD-11 PTSD or CPTSD); further research should aim to validate these supplementary interview items or other CPTSD diagnostic measures, in order to expand on the CPTSD self-report questionnaires now available (Haselgruber, Sölva, & Lueger-Schuster, 2020; Meiser-Stedman et al., 2017; Sachser et al., 2022).

Further research could be useful to better understand risk factors for CPTSD and the relationships linking CPTSD with psychopathological symptoms and cognitive and social factors. The cross-sectional design of the present research means that a longitudinal design affording exploration of causal relationships could develop these findings further. In addition, repeating similar analyses in an adult sample may be useful to know whether developmental stages influence these relationships. Given the higher mean age of the CPTSD group, examining psychometrics of CPTSD and PTSD measures across age groups in youth could elucidate this finding. Furthermore, investigating how CPTSD symptoms influence treatment course of PTSD could have important clinical implications.

In conclusion, this research has demonstrated that in youth with exposure to multiple traumatic events, CPTSD diagnosis is associated with only selected aspects of trauma history, namely sexual trauma. Youth with CPTSD were also shown to have more negative post-traumatic cognitions and more severe symptoms of depression and panic.

3. Voice Hearing in Young People with Posttraumatic Stress Disorder (PTSD) following Multiple Trauma Exposure

Note: This chapter has been published in the European Journal of Psychotraumatology (Lofthouse et al., 2024); see Supplementary Materials.

3.1. Abstract

Background: PTSD is comorbid with a number of other mental health difficulties and the link between voice hearing and PTSD has been explored in adult samples.

Objective: To compare the trauma history, symptomatology, and cognitive phenotypes of children and adolescents with a PTSD diagnosis following exposure to multiple traumatic events presenting with voice hearing with those who do not report hearing voices.

Methods: Participants (n=120) were aged 8-17 years and had PTSD following exposure to multiple traumas. Three primary analyses were conducted, comparing PTSD symptom severity, prevalence of sexual trauma, and level of negative post-traumatic cognitions between the voice hearing and non-voice hearing groups. A range of mental health and cognitive-behavioural factors were considered in exploratory secondary analyses. All analyses were pre-registered.

Results: The voice hearing group (n=50) scored significantly higher than the non-voice hearing group (n=70) for negative post-traumatic cognitions, but not PTSD symptom severity or prevalence of sexual trauma. In secondary analyses, the voice hearing group had significantly more sensory-based and fragmented memories and

significantly higher scores for panic symptoms than the non-voice hearing group. When participants whose voices were not distinguishable from intrusions or flashbacks were removed from the voice hearing group in a sensitivity analysis, the voice hearing group (n=29) scored significantly higher on negative post-traumatic cognitions and trauma memory quality, with similar effect sizes to the original analysis.

Conclusions: Voice hearing is common among youth exposed to multiple traumas with PTSD and is related to cognitive mechanisms proposed to underpin PTSD (appraisals, memory quality) and more panic symptoms. Further research should seek to investigate the underlying mechanisms and directionality for these relationships.

3.2. Background

Post-traumatic stress disorder (PTSD) is a possible reaction to trauma which is associated with a range of poor outcomes related to quality of life and overall functioning, as well as comorbidity with other mental health difficulties (Lewis et al., 2019). Research into symptoms which are comorbid to PTSD is key for the understanding and effective treatment of people who have been exposed to trauma.

PTSD is frequently comorbid with depression (Angelakis & Nixon, 2015; O'Donnell, Creamer, & Pattison, 2004) and anxiety disorders (Hubbard, Realmuto, Northwood, & Masten, 1995) but research into comorbid voice hearing is limited. Hearing voices is common in the general population (Watkins, 2008) and can cause significant distress. Voice hearing is defined by Longden, Madill, and Waterman (2012) as 'a percept-like experience in the absence of appropriate stimulus, which manifests as a human vocalization, which is experienced in a conscious state and is not induced by organic or state-dependent circumstances'. As voices are experienced as originating outside of oneself, voice hearing can be a dissociative phenomenon. Alternatively, voice hearing may be a 'psychotic-like experience' as it could be an auditory hallucination, which are classified as a feature of psychotic disorders (DSM-5; (American Psychiatric Association, 2013). Psychotic-like experiences are a broader category encompassing 'subtle, subclinical hallucinations and delusions which are quite common in general population' (Remberk, 2017). Dissociative and psychotic voices may overlap, with differences characterised by the features of the voices and comorbid symptoms (Ross, 2020).

Psychotic-like experiences are common, reported by approximately 60% of young people (Laurens, Hobbs, Sunderland, Green, & Mould, 2012; Laurens et al., 2007). Armando et al. (2010) found that psychotic-like experiences in adolescents and young adults (aged 15-26 years) were associated with distress, depression, and poor functioning. When considering research into trauma and psychosis in children, Arseneault et al. (2011) found that children who experienced maltreatment were more likely to report psychotic symptoms at age 12 than children who did not experience maltreatment and Kelleher et al. (2013) observed a bidirectional relationship between childhood trauma and psychosis in a prospective cohort study. Furthermore, Bloomfield et al. (2020) found a relationship between developmental trauma (defined as experiences including emotional, sexual, or physical abuse in childhood or adolescence) and psychosis symptoms during adulthood, which was mediated by dissociation, emotional dysregulation, and PTSD symptoms. However, research investigating the specific link between voice hearing and PTSD has thus far been limited to adult samples; Anketell et al. (2010) found that voice hearing in an adult sample with PTSD diagnosis had a prevalence of 50%.

The present research focused on the experience of voice hearing specifically (rather than the broader category of auditory hallucinations or psychotic-like experiences), because it is a clearly defined and easily measurable construct which may be distressing and clinically meaningful, even in the absence of a psychotic episode or dissociation. However, it is important to consider the potential confound between voice hearing and re-experiencing symptoms of PTSD, as intrusions and flashbacks may

include experiencing voices related to traumatic events, therefore warranting identification of voice hearing occurring in the absence of re-experiencing symptoms. Hardy et al. (2005) found that in a trauma-exposed adult sample with a diagnosis of nonaffective psychosis, 57.5% of participants had identifiable associations between hallucinations and traumatic experiences, established by assessing the themes and content of the hallucinations in relation to reported traumas. This suggests that there is an overlap between hallucinations and PTSD symptoms, but that it may be possible to distinguish between trauma-related and non-trauma related hallucinations.

Fundamental questions around the nature of voice hearing in youth with PTSD – including not only its prevalence but also its correlates and potential underlying mechanisms – need to be addressed. In light of previous findings, we identified three mechanisms of primary importance to consider. First, given the association between PTSD and a broader range of mental health outcomes (Lewis et al., 2019), the relationship between PTSD severity and voice hearing warrants exploration. Andrew, Gray, and Snowden (2008) compared psychiatric and non-psychiatric voice hearers (distinguished by negative and positive appraisals of voice hearing, respectively) and found that current trauma symptoms were a significant predictor of beliefs about voices, suggesting a link between these experiences. Second, trauma *type* may be a key factor in the development of voice hearing. In the study by Andrew et al. (2008), the psychiatric voice hearing group reported a significantly higher level of childhood sexual abuse, with no significant difference between the groups in number of trauma types experienced, which suggests that sexual trauma specifically may be related to the symptom of hearing

voices. Third, trauma-related appraisals warrant consideration. Anilmis et al. (2015) demonstrated that negative self-beliefs mediate the relationship between the psychological impact of victimisation and psychotic-like experiences in children aged 8-14 years.

Further to PTSD symptom severity, trauma type, and negative cognitions, there are a range of other psychopathological and cognitive-behavioural factors which could be related to the experience of hearing voices. Psychopathological factors may include complex PTSD (World Health Organization, 2019), dissociation (Longden et al., 2012), depression, anxiety, (Lewis et al., 2019) and irritability (Zhang, Sami, & Meiser-Stedman, 2022). Cognitive-behavioural factors of interest include trauma memory quality (Meiser-Stedman, Dalgleish, Yule, & Smith, 2012), safety-seeking behaviours (Alberici et al., 2018), and perceived social support (Daniunaite et al., 2021).

The present study investigated how hearing voices is related to trauma experiences, psychopathological symptom severity, and cognitive-behavioural factors in young people (aged 8-17 years) diagnosed with PTSD following multiple trauma exposure. For the primary analysis, voice hearing and non-voice hearing groups were compared on PTSD symptom severity, sexual trauma prevalence, and negative trauma-related cognitions. Exploratory secondary analyses were conducted comparing these groups on a range of variables covering other psychopathological (i.e. complex PTSD, dissociation, depression, anxiety, and irritability) and cognitive-behavioural (i.e. trauma memory quality, safety-seeking behaviours, and perceived social support) factors.

Our primary hypotheses were that the voice hearing group would have significantly higher scores than the non-voice hearing group on PTSD symptom severity and negative cognitions and a significantly higher rate of sexual trauma. Our secondary exploratory hypothesis was that the voice hearing group would have significantly higher scores than the non-voice hearing groups on other measures of psychopathological and cognitive-behavioural factors.

3.3. Methods

3.3.1. Design

The present study was a cross-sectional design comprising of analysis of the baseline data from the Delivery of Cognitive Therapy for Young People after Trauma (DECRYPT) trial (Allen et al., 2021), a randomised controlled trial of cognitive therapy for PTSD in youth exposed to multiple traumatic stressors. Measures were selected from the battery of self-report and parent/caregiver-report interviews and questionnaires to assess PTSD symptom severity, prevalence of sexual trauma, and negative post-traumatic cognitions for the primary analysis. For the secondary analysis, measures assessing dissociation, depression, anxiety, irritability, trauma memory quality, safety behaviours, and social support were identified. These analyses were pre-registered on the Open Science Framework (https://osf.io/q85rz/).

3.3.2. Ethical Considerations

Ethical approval for the DECRYPT trial was provided by UK Health Research Authority Research Ethics Committee (East of England–Cambridge South, 16/EE/0233). For participants aged under 16 years, informed consent was provided by parents and

caregivers, and the child or young person was also asked to give their assent. Participants aged 16 years or older could provide informed consent without their parent or caregiver.

3.3.3. Participants

The sample size of 120 participants was determined by the primary outcome of the DECRYPT trial (Allen et al., 2021). Participants were drawn from Child and Adolescent Mental Health Services (CAMHS) and Youth Services in Cambridgeshire, Cardiff, Essex, Hertfordshire, Kent, Norfolk, South London, and Suffolk. Inclusion criteria required participants to be aged 8-17 years with a diagnosis of PTSD (as defined by DSM-5 and diagnosed using the CPSS-I-5, Child PTSD Symptom Scale – Interview version, Foa et al. (2018)) following multiple trauma exposure, and to have a score equal to or greater than 17 on the Child Revised Impact of Events Scale, 8-item version (Perrin et al., 2005). All participants also met ICD-11 criteria for PTSD. Exclusion criteria were a change of prescribed psychiatric medication within the past two months, PTSD symptoms relating exclusively to one trauma, pervasive developmental or neurodevelopmental disorder, intellectual disability, another primary psychiatric diagnosis or clinical need warranting treatment ahead of PTSD (e.g. psychosis), inability to speak English, ongoing exposure to threat, strong likelihood of being unable to complete treatment (e.g., imminent house move), or history of organic brain damage. Table 5 contains the demographic and trauma history data for the sample.

3.3.4. Table 5. Sample demographic characteristics

	Whole Sample *n* = 120	Voice Hearing Sample (*n* = 50)	Non-Voice Hearing Sample (*n* = 70)
Age in years, mean (*SD*)	14.9 (2.5)	15.1 (2.3)	14.8 (2.7)
Gender, *n* (%)			
Male	33 (27.5)	12 (24.0)	21 (30.0)
Female	87 (72.5)	38 (76.0)	49 (70.0)
Ethnicity, *n* (%)			
White (any background)	96 (80.0)	42 (84.0)	55 (78.5)
Black (any background)	9 (7.5)	1 (2.0)	8 (11.4)
Asian (any background)	2 (1.7)	1 (2.0)	1 (1.4)
Mixed (any background)	11 (9.2)	5 (10.0)	6 (8.6)
Any other ethnic group	1 (0.8)	1 (2.0)	0 (0.0)
Ethnicity not stated	1 (0.8)	0 (0.0)	0 (0.0)
Traumatic Experiences, *n* (%)			
Natural disaster	3 (2.5)	2 (4.0)	1 (1.4)
Accident	34 (28.3)	17 (34.0)	17 (24.3)
Robbed	10 (8.3)	5 (10.0)	5 (7.1)
Physical abuse inside family	57 (47.5)	25 (50.0)	32 (45.7)
Physical abuse outside family	57 (47.5)	24 (48.0)	33 (47.1)
Witnessed physical abuse inside family	66 (55)	32 (64.0)	34 (48.6)
Witnessed physical abuse outside family	53 (44.2)	24 (48.0)	29 (41.4)
Inappropriate sexual contact	36 (30)	19 (38.0)	17 (24.3)
Someone forcing/pressuring sex	30 (25)	15 (30.0)	15 (21.4)
Sudden death/injury of a close person	55 (45.8)	23 (46.0)	32 (45.7)
Attacked, stabbed, shot at, or hurt badly	13 (10.8)	7 (14.0)	6 (8.6)
Witnessed someone attacked, stabbed, shot at, or hurt badly	35 (29.2)	15 (30.0)	20 (28.6)
Medical procedure	29 (24.2)	17 (34.0)	12 (17.1)
Exposure to war	0 (0.0)	0 (0.0)	1 (1.4)
Other	83 (69.2)	32 (64.0)	51 (72.9)
Number of Trauma Types, mean (SD)	4.7 (2.2)	5.1 (2.2)	4.3 (2.11)

3.3.5. Measures

3.3.5.1. Voice Hearing Interview

The voice hearing interview is a child-report structured interview comprised of six items, four of which were taken from the Unusual Experiences Questionnaire (UEQ) (Anilmis et al., 2015; Laurens et al., 2012). The UEQ has good internal consistency (Laurens et al., 2012). The question establishing the presence of voices ('Have you ever heard voices that other people could not hear?') was measured on a three-point Likert-type scale from 'Not true' to 'Certainly true'. The other three items concerning the frequency, distress, and impairment related to hearing voices were assessed on a four-point Likert-type scale from 'Not at all' to 'A great deal'. Two additional items were included to explore how the voices relate to trauma and PTSD symptoms ('Were these voices of the people that attacked you?' and 'Were these voices part of your intrusive thoughts or flashbacks?'). These were measured on a three-point Likert-type scale from 'Not true' to 'Certainly true'. In addition, interviewers completed an open response item clarifying the nature and content of voices.

Participants were included in the voice hearing group if they endorsed hearing at least one voice in the preceding two weeks. A sensitivity analysis was conducted whereby information from the two items linking voices to PTSD symptoms and the open response item regarding the content of voices were analysed to exclude participants from the voice hearing group whose voices appeared to be exclusively flashback or intrusion related, or any participants with insufficient information to establish this. Two authors (KL and RMS) independently reviewed the voice content open response item and disagreements were discussed at a consensus meeting to reach full agreement.

3.3.5.2. Children's Revised Impact of Event Scale, 8-item version (CRIES-8)

The CRIES-8 (Perrin et al., 2005) is a self-report questionnaire measure assessing frequency of post-traumatic stress symptoms over the preceding seven days. It has good face, construct, predictive, and criterion validity (Perrin et al., 2005; Stallard et al., 1999).

3.3.5.3. Child and Adolescent Trauma Screen (CATS)

The CATS (Sachser, Berliner, et al., 2017) has self-report and caregiver-report versions, both of which were employed in the present study as a structured interview. For the present research, the first 15 items pertaining to trauma history were analysed; these list 14 different trauma types and an open answer question to accommodate any non-listed trauma types, with the participant asked to indicate if they have experienced each event as a yes or no question; caregivers were asked the same with regards to the young person in their care. One of the participant or their parent/caregiver needed to endorse a sexual trauma for the participant to meet the sexual trauma criterion.

3.3.5.4. Post-Traumatic Cognitions Inventory – Child version (CPTCI)

The CPTCI (Meiser-Stedman, Smith, et al., 2009) is a 25-item self-report questionnaire assessing negative appraisals over the preceding two weeks of one or more of a participant's traumatic experiences. The scale comprises two subscales, a sense of 'permanent and disturbing change' and a sense of being a 'fragile person in a scary world'. The measure has good internal consistency, test-retest reliability, convergent validity, and discriminative validity (Meiser-Stedman, Smith, et al., 2009).

3.3.5.5. Complex PTSD Interview

To establish whether participants met the criteria for complex PTSD, as defined by ICD-11 (World Health Organization, 2019), a three-item self-report structured

diagnostic interview was conducted. The interview was devised by the DECRYPT trial team (see Appendix S1) based on ICD-11 draft criteria (World Health Organization, 2019). The three interview items correspond to the three disturbances in self-organisation (DSO) symptoms defined in ICD-11: affective dysregulation, negative self-concept, and difficulties in sustaining relationships. Each item had one introductory question assessing the overall symptom, with optional follow-up questions for positive responses. Each of the three DSO symptoms was assessed on a five-point Likert-type scale from zero ('Not at all') to four ('Six or more times a week/almost always'), consistent with the CPSS-I-5.

3.3.5.6. Revised Child Anxiety and Depression Scale (RCADS)

The RCADS (Chorpita et al., 2000) is a 47-item self-report questionnaire assessing symptoms in the preceding two weeks corresponding to anxiety disorders and depression in young people. The measure has good internal consistency (Kösters et al., 2015), test-retest reliability, and convergent validity (Chorpita et al., 2000).

3.3.5.7. Dissociation

Dissociation was measured using a three-item questionnaire assessing symptoms experienced during the preceding two weeks. Items were scored on a four-point Likert-type scale from 'Not at all or only one time' to 'Five or more times a week/almost always'.

Additionally, a two-item self-report structured interview assessing the presence of depersonalisation ('Have you felt as if you were outside your body?') and derealisation ('Have you felt as if things around you weren't real?') measured on a five-point Likert-type

scale from ‘Not at all’ to ‘Six or more times a week/almost always’ was used to identify participants meeting the criteria for the dissociative subtype of PTSD to accommodate sensitivity analyses. Participants scoring above 0 on either depersonalisation or derealisation met the criteria for the dissociative subtype of PTSD.

3.3.5.8. Strengths and Difficulties Questionnaire (SDQ)

The SDQ (Goodman, 1997) is a 25-item caregiver-report measure assessing emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behaviour, with each scale comprised of five items. The first four scales (20 items), excluding prosocial behaviour, are used to calculate a total difficulties score, used in the present research. The total difficulties score has acceptable test-retest reliability (Bergström & Baviskar, 2021), and sufficient convergent, discriminant, and criterion validity (Vugteveen et al., 2021).

3.3.5.9. Affective Reactivity Index – Child version (ARI-C)

The ARI-C (Stringaris et al., 2012) is a seven-item self-report measure of irritability which asks participants to rate irritability symptoms compared to others of the same age (e.g. ‘I am easily annoyed by others’).

3.3.5.10. Trauma Memory Quality Questionnaire (TMQQ)

The TMQQ (Meiser-Stedman et al., 2007) is an 11-item self-report questionnaire which assesses the current characteristics of trauma memories; particularly the extent to which they are composed of sensory elements. The measure has good internal consistency, criterion validity, and convergent validity (Meiser-Stedman et al., 2007). Higher scores indicate more sensory-based and fragmented memories.

3.3.5.11. Child Safety Behaviour Scale (CSBS)

The CSBS (Alberici et al., 2018) is a 13-item self-report questionnaire assessing safety behaviours (strategies employed to prevent a dreaded outcome, (Salkovskis, Clark, Hackmann, Wells, & Gelder, 1999) over the past two weeks. The measure has excellent internal consistency and good discriminant validity and specificity (Alberici et al., 2018).

3.3.5.12. Multidimensional Scale of Perceived Social Support (MSPSS)

The MSPSS (Zimet et al., 1988) is a 12-item self-report questionnaire measuring a participant's perceptions of support from family, friends, and a significant other. The measure has good internal reliability (Zimet et al., 1988) and good convergent and discriminative validity (De Maria et al., 2018).

3.3.6. Data Analysis

The sample size was predetermined by the DECRYPT trial. A power analysis conducted using G*Power version 3.1.9.7 (Faul et al., 2007) indicated that two groups (n = 50 and n = 70) with a significance criterion of $\alpha = .05$ for a test of means comparisons would have 80% power to detect an effect size (standardised mean difference) of .52. Statistical analysis was conducted using IBM SPSS Statistics Version 28 (IBM Corp., 2021). Data were assessed for assumptions of normality, skewness, and kurtosis (see Supplementary Material Table S2). The scores for the CRIES-8, SDQ, ARI-C, total RCADS, and Dissociation did not meet the normality assumption. For the CRIES-8, ARI-C, and Dissociation scores, no adequate transformations could be found; therefore, non-parametric Mann-Whitney tests were conducted for these variables. The scores for the SDQ and total RCADS met the normality assumption after a square root transformation,

allowing parametric tests to be conducted as planned. Independent samples t-tests were conducted to compare the voice hearing and non-voice hearing groups on scores for the following variables: CRIES-8, CPTCI, RCADS total and subscales (depression, panic, generalised anxiety disorder), SDQ, TMQQ, CSBS-13, and MSPSS. Prevalence of sexual trauma and complex PTSD diagnosis were compared between the voice hearing and non-voice hearing groups using chi-square tests due to the categorical nature of these variables. Corrections were applied to adjust for multiple comparisons. For the primary analysis (CRIES-8 score, sexual trauma prevalence, and CPTCI score), a Bonferroni correction was applied. For the exploratory secondary analysis comprising all other variables, a Holm-Bonferroni correction was applied.

Levene's test for equal variances was conducted for all t-tests; this was not significant and equal variances were assumed unless otherwise specified. Cohen's d effect sizes were calculated.

3.4. Results

3.4.1. Descriptive Statistics

The sample comprised 120 participants, mean age 14.9 years (*SD* 2.5 years), 72.5% female, 96% white. Table 6 contains descriptive statistics of all measures. Fifty of 120 participants (41.6%) reported hearing voices in the preceding two weeks. Table 7 contains statistics regarding the characteristics of voices.

3.4.2. Table 6. Descriptive Statistics for All Measures

Measure	*n*	*M*	*SD*	Range	Cronbach's α
PTSD symptoms (CRIES-8)	120	31.6	6.00	17-40	.66

Negative cognitions (CPTCI)	118	73.6	15.9	26-100	.94
RCADS total score	120	82.1	24.8	20-133	.94
Anxiety (RCADS)	120	12.0	3.93	2-18	.78
Depression (RCADS)	120	19.5	6.24	2-30	.83
Panic disorder (RCADS)	120	14.4	7.12	0-27	.91
Parent-rated emotional difficulties (SDQ)	94	21.5	6.13	9-35	.66
Irritability (ARI-C)	120	7.93	4.21	0-14	.94
Memory quality (TMQQ)	120	31.8	5.50	17-44	.73
Safety behaviours (CSBS)	114	35.7	7.30	15-51	.81
Social support (MSPSS)	119	57.8	13.4	17-84	.82
Dissociation	120	6.87	2.50	3-12	.73
Sexual Trauma*	50				
Complex PTSD Diagnosis*	72				

Note: CRIES-8 = Child Revised Impact of Events Scale; CPTCI – Post-Traumatic Cognitions Inventory, Child version; RCADS = Revised Child Anxiety and Depression Scale; SDQ = Strengths and Difficulties Questionnaire; ARI-C = Affective Reactivity Index – Child version; TMQQ = Trauma Memory Quality Questionnaire; CSBS = Child Safety Behaviour Scale; MSPSS = Multidimensional Scale of Perceived Social Support.

* Sexual trauma and Complex PTSD diagnosis are categorical variables, so the frequency of each of these within the sample is reported here.

3.4.3. Table 7. Frequencies for Characteristics of Voices

Question	***n (%)***			
	Not at all	*Only a little*	*Quite a lot*	A great deal
How much has it upset you?	4 (8%)	11 (22%)	22 (44%)	13 (26%)
How hard has it made things at home or school?	7 (14%)	9 (18%)	20 (40%)	14 (28%)

Question	***n (%)***		
	Not true	*Somewhat true*	*Certainly true*
Were these the voices of the people that attacked you?	24 (48%)	9 (18%)	17 (34%)
Were these voices part of your intrusive thoughts or flashbacks?	14 (28%)	20 (40%)	15 (30%)

3.4.4. Demographic Analyses

There was no significant difference between the voice hearing and the non-voice hearing groups on mean age, mean number of trauma types, proportion of female participants, or proportion of non-white participants.

3.4.5. Primary Analyses

Table 8 contains mean scores differentiated by group. With respect to PTSD symptom severity, a Mann-Whitney test indicated that despite the voice hearing group having a higher mean score, there was no significant difference between the voice hearing group and the non-voice hearing group (p = .046; Bonferroni correction required p =. 0167; *Cohen's d* = .37). There was no significant relationship between hearing voices and sexual trauma (p = .18, *Cohen's d* = .28). With respect to negative trauma-related cognitions, an independent samples t-test was conducted. The voice hearing group scored significantly higher than the non-voice hearing group (p =.014; *Cohen's d* = .45).

3.4.6. Table 8. Between Groups Analysis for Primary and Secondary Outcomes

Measure	Voices group *(n=50), m (SD)*	No voices group *(n=70), m (SD)*	Test Statistic	*p*	Effect Size (*Cohen's d*)
Primary Analysis					
Negative cognitions (CPTCI)	**77.7 (13.1)**	**70.7 (17.2)**	***t* = 2.49**	**.014**	**.445**
PTSD symptoms (CRIES-8)	32.9 (5.07)	30.6 (6.42)	*U* = 1377.0	.046	.366
Sexual trauma*	24 (48%)	25 (35.7%)	χ^2 = 1.82	.177	.280
Secondary Analysis					
Memory quality (TMQQ)	**34.2 (4.94)**	**30.0 (5.25)**	***t* = 4.36**	**<.001**	**.807**
Panic disorder (RCADS)	**16.6 (6.20)**	**12.9 (7.36)**	***t* = 2.90**	**.004**	**.537**
RCADS total score	88.7 (22.9)	77.4 (25.2)	*t* = 2.54	.012	.470
Anxiety (RCADS)	12.9 (3.61)	11.3 (4.05)	*t* = 2.12	.036	.392
Safety behaviours (CSBS)	24.3 (6.60)	21.4 (7.60)	*t* = 2.10	.038	.397
Dissociation	7.36 (2.39)	6.51 (2.53)	*U* = 1391.5	.055	.355
Parent-rated emotional difficulties (SDQ)	22.8 (6.08)	20.6 (6.04)	*t* = 1.77	.080	.369
Depression (RCADS)	20.4 (6.23)	18.9 (6.21)	*t* = 1.35	.181	.249
Irritability (ARI-C)	8.73 (4.43)	7.36 (3.98)	*U* = 1389.5	.054	.357
Complex PTSD diagnosis*	31 (62%)	41 (58.6%)	χ^2 = 0.143	.705	.013*
Social support (MSPSS)	57.7 (14.0)	57.9 (13.0)	*t* = 0.068	.946	.013

Note: Significant results depicted in bold. A Bonferroni correction was applied for the three primary analyses and a Holm-Bonferroni correction was applied for the secondary analysis. CPTCI – Post-Traumatic Cognitions Inventory, Child version; CRIES-8 = Child Revised Impact of Events Scale; TMQQ = Trauma Memory Quality Questionnaire;

RCADS = Revised Child Anxiety and Depression Scale; CSBS = Child Safety Behaviour Scale; SDQ = Strengths and Difficulties Questionnaire; ARI-C = Affective Reactivity Index – Child version; MSPSS = Multidimensional Scale of Perceived Social Support. *Categorical variables so frequencies rather than means are reported.

3.4.7. Secondary Analyses

Significant differences were found between voice hearing and non-voice hearing on measures of trauma memory quality and panic disorder. The voice hearing group had a significantly higher TMQQ score than the non-voice hearing group, indicating more sensory-based and poorly verbalised memories, with a large effect size, *Cohen's d* = .81. The voice hearing group had a significantly higher score on the RCADS panic disorder subscale than the non-voice hearing group (*Cohen's d* = .54). There were no significant differences between the voice hearing and non-voice hearing groups on the other secondary measures.

3.4.8. Sensitivity Analyses

A sensitivity analysis was conducted in which participants whose voices did not appear to be distinguishable from intrusions or flashbacks, or with insufficient information to conclude this, were excluded from the analysis, resulting in a group of 29 participants in the voice hearing group and 70 in the non-voice hearing group (see Supplementary Material Table S3).

The full sensitivity analysis is reported in the Supplementary Material. The significant result for negative trauma-related cognitions remained significant (p = .01, *Cohen's d* = .59). Trauma memory quality remained significant (p < .001, *Cohen's d* = .82),

but the significant result for panic disorder was no longer significant (p = .025, *Cohen's d* = .50). There was no significant difference between the sensitivity analysis groups on demographic factors.

Further analyses were conducted to consider the potential confounding effect of dissociation. Logistic regression models were determined where voice hearing status was the dependent variable and the variables identified as significant (negative post-traumatic cognitions, trauma memory quality, and panic disorder) were entered as independent variables alongside dissociation score (see Supplementary Materials Tables S4 and S5). The significant results for trauma memory quality and panic disorder remained significant but negative trauma-related cognitions were not a significant predictor of voice hearing after controlling for dissociation.

Groups were compared on the proportion of participants meeting the criteria for the dissociative subtype for PTSD. 86% of participants in the voice hearing group met these criteria compared to 64% of participants in the non-voice hearing group. This was non-significant after correcting for multiple comparisons, χ^2 (1, 120) = 7.03, p = .008.

3.5. Discussion

The present study is a novel investigation of the experience of voice hearing in children and adolescents with a PTSD diagnosis following multiple trauma exposure, with comparisons made between the voice hearing and non-voice hearing groups on trauma type and psychopathological and cognitive-behavioural factors. As hypothesised, the voice hearing group scored higher on a measure of negative cognitions than the non-voice hearing group. There was no significant difference in PTSD symptom

severity or incidence of sexual trauma between the groups. However, the present study was only powered to detect medium-sized effects, and it is possible that these factors only have a small effect. From the secondary analyses, the voice hearing group had significantly worse trauma memory quality (more fragmented, sensory based, poorly verbalised memories) and significantly more severe panic symptoms than the non-voice hearing group. No significant differences were found between the groups on incidence of complex PTSD diagnosis or on measures of dissociation, depression, generalised anxiety disorder, irritability, safety behaviours, or perceived social support.

The first finding of note was the prevalence of voice hearing. Fifty of 120 participants (41.7%) endorsed at least one incidence of voice hearing in the preceding two weeks. To compare to previous research, Hodgekins et al. (2018) found that in a sample of young people aged 14 to 25 years with non-psychotic mental health difficulties (in which over 95% had experienced at least one traumatic life event), 57.5% reported hearing voices. Furthermore, most voice hearers were at least "quite a lot" upset by their experience of voice hearing. Disentangling the experience of voice hearing from trauma-related themes or PTSD symptoms was difficult, with just over half of the voice hearing group reporting that the voices they heard were those of their attackers. However, a significant proportion of voice hearers (34%) confirmed that the voices they heard did *not* form part of their re-living symptoms. This is comparable to previous research in which 27% of young people aged 15-25 years presenting with post-traumatic intrusions and hallucinations following a first episode of psychosis experienced hallucinations which were not related to their post-traumatic intrusions (Peach et al., 2021).

Between-groups comparisons found that the voice hearing group scored higher on a measure of negative cognitions than the non-voice hearing group. The importance of negative schematic beliefs in adolescents was demonstrated by Anilmis et al. (2015), who found that negative beliefs about the self and others mediated the relationship between bullying and distressing unusual experiences in a sample aged 8 to 14 years. The significance of negative cognitions aligns with the cognitive model of PTSD (Ehlers & Clark, 2000), in which negative appraisals can contribute to a sense of current threat, and also with the cognitive model of psychosis (Garety, Kuipers, Fowler, Freeman, & Bebbington, 2001), in which negative cognitions mediate the relationship between negative experiences and positive symptoms of psychosis. The significant relationship between voice hearing and negative cognitions held in the sensitivity analysis when focusing only on non-flashback voices, supporting the cognitive model of psychosis as a potential mechanism for voice hearing experiences. However, this relationship was no longer significant when controlling for symptoms of dissociation, suggesting the experience of voice hearing may be dissociative in nature. A further possibility is that experiences of voice hearing could result in more negative appraisals regarding a sense of being damaged or vulnerable, as the present research does not provide information regarding the directionality of effects.

The lack of significant difference between the groups on PTSD symptom severity replicates Anketell et al. (2010), in which adults with PTSD did not differ significantly on PTSD symptom severity when comparing those with and without auditory hallucinations. Furthermore, the lack of significant difference on incidence of sexual trauma suggests

there is not something specific about sexual trauma which contributes to the development of voice hearing, contrasting with the findings of Andrew et al. (2008).

From the secondary analyses, the voice hearing group had more severe panic symptoms and more sensory-based, poorly verbalised trauma memories. The effect for trauma memory was noteworthy in its size (d > .8), and its persistence in sensitivity analyses. These findings support that more fragmented memories and worse panic symptoms may play a role in voice hearing for trauma-exposed youth. In the Ehlers and Clark (2000) cognitive model of PTSD, the nature of the trauma memory is proposed to both influence and be influenced by negative appraisals, which were found to significantly differ between voice hearing and non-voice hearing participants in the primary analysis. Both poor memory quality and negative appraisals contribute to a sense of current threat, which may then increase the risk of voice hearing. The negative appraisals underpinning PTSD may be related to the catastrophic misinterpretations involved in the development of panic (Clark, 1986), which could worsen a sense of threat. A common mechanism may be greater attention towards bodily and cognitive phenomena, which is also reflected by aspects of panic. Alternatively, voice hearing could pre-date trauma and may increase the frequency of panic episodes and the likelihood of negative appraisals. The lack of significant difference between the voice hearing and non-voice hearing groups on the other psychopathological and cognitive factors included in the secondary analyses is also noteworthy, but this may be attributed to lack of power to detect small effects.

Hardy (2017) proposed a trauma-informed model of voices suggesting that trauma increases the risk of unhelpful emotion regulation, distorted trauma memories, and alterations to appraisals. These three vulnerability factors can lead to trauma memory intrusions (re-experiencing symptoms of PTSD) and anomalous experiences such as voice hearing. This model proposes that PTSD intrusions and hallucinations lie on a continuum of memory fragmentation following trauma. The present findings support this given the significant results for poorer trauma memory quality and negative post-traumatic appraisals.

The present research demonstrates that voice hearing within youth with PTSD following multiple trauma exposure is a common and distressing experience, so could have clinical implications as a treatment target. Screening for voice hearing, associated distress, and characteristics of voices may inform treatment for PTSD. Maddox et al. (2013) demonstrated that CBT for unusual (psychotic-like) experiences in children is effective, so incorporating these techniques into cognitive therapy for PTSD to address voice hearing may enhance treatment efficacy for young people presenting with voice hearing. Nevertheless, the present study suggests that targeting the cognitive pathways proposed in the Ehlers and Clark (2000) model of PTSD (in particular appraisals and trauma memory quality) may help to reduce voice hearing symptoms through mechanisms common to both PTSD and voice hearing. Longitudinal analysis of participants in the DECRYPT trial could compare the response of voice hearing and non-voice hearing participants to trauma-focused CBT.

The strengths and limitations of the present study should be noted. The study design was robust, with a sample comprised of young people with a PTSD diagnosis after exposure to multiple traumatic events, resulting in a powerful control group to compare with but also reducing generalisability to non-PTSD or non-trauma samples. To ensure methodological rigour, the study design and hypotheses were pre-registered and a correction for multiple comparisons was used. The robustness of the results was also confirmed using sensitivity analyses. The gender distribution was skewed towards females, but this is reflective of wider PTSD research (Meiser-Stedman et al., 2017; Sachser & Goldbeck, 2016). As the sample size was predetermined by the DECRYPT trial, the power afforded, whilst adequate, was only able to detect medium-sized effects. In addition, the dissociation questionnaire used was brief, with items selected to reflect DSM-5 depersonalisation and derealisation, and therefore covered a narrower range of dissociative symptoms relative to other measures of dissociation such as the Dissociative Experiences Scale (Bernstein, Putnam, Espírito-Santo, & Pio-Abreu, 1986; Meiser-Stedman et al., 2017), which also contains items related to dissociative identity. Similarly, a measure of psychosis would have strengthened the research by confirming whether participants experienced other symptoms consistent with psychosis beyond just voice hearing.

Several areas could be researched further to better understand the relationship between voice hearing and the identified psychopathological (panic symptoms) and cognitive (negative cognitions and trauma memory quality) factors. As the current findings involved a cross-sectional design, investigation of the underlying mechanisms

relating negative cognitions, trauma memory quality, and panic symptoms to voice hearing may be clarified through a longitudinal design to determine the direction of these relationships and whether they are interconnected. Similar research with a single-trauma PTSD group or a non-trauma group could be useful to investigate how experience or frequency of trauma may relate to voice hearing. In addition, the relationship between, and overlap of, voice hearing and flashback symptoms warrants investigation, given that these were distinct experiences for some participants but not for others. Furthermore, research distinguishing between psychotic and dissociative experiences of voice hearing may be useful for elucidating the underlying mechanisms.

In conclusion, this study has demonstrated that voice hearing occurs in a significant proportion of young people with a PTSD diagnosis following exposure to multiple traumatic events, and that voice hearing and non-voice hearing groups differ significantly with regards to negative cognitions, trauma memory quality, and panic symptoms. Future research should explore how these factors are related and investigate management of voice hearing in treatment of trauma-exposed youth.

4. Systematic Review and Meta-Analysis: Imputing response rates for first-line psychological treatments for PTSD in youth

Note: This chapter has been published in the Journal of the American Academy of Child & Adolescent Psychiatry (Lofthouse, Davies, Hodgekins, & Meiser-Stedman, 2025); see Supplementary Materials.

4.1. Abstract

Objective: Meta-analyses assessing the use of psychological therapies for PTSD in children and adolescents have demonstrated the effectiveness of these treatments with effects reported using standardised mean differences. Imputation of response rates (i.e. 50% or greater reduction in symptoms) may facilitate easier interpretation for clinicians.

Method: Data from randomised controlled trials of EMDR and TF-CBT was used to impute response rates, establishing how many patients display 50% reduction, 20% reduction, and reliable improvement and deterioration (using reliable change indices) in PTSD and depression symptoms.

Data sources and study selection (number articles reviewed and selection process): We searched four databases (MEDLINE, PsycINFO, PTSDPubs, and Web of Science) and screened 1654 records to include 57 randomised controlled trials with a total of 5113 participants comparing psychological therapies for PTSD against control conditions in youth.

Results: The proportion of youth receiving psychological therapies exhibiting a 50% reduction in PTSD symptoms was 0.46 (95% CI: 0.39-0.52), compared to 0.20 (95% CI: 0.16-0.24) for youth in control conditions. Reliable improvement was displayed by 0.53 (95% CI: 0.45-0.61) of youth receiving psychological therapies, compared to 0.25 (95% CI: 0.20-0.30) of youth in control conditions. Reliable deterioration was seen in 0.01 (95% CI: 0.01-0.02) of youth receiving psychological therapies, compared to 0.13 (95% CI: 0.08-0.20) of youth in control conditions.

Conclusion: Psychological therapies for young people with PTSD are effective and unlikely to cause deterioration. A large proportion of young people do not display meaningful reduction in PTSD symptoms.

4.2. Introduction

Trauma exposure is common in childhood, with previous research estimating that 31.1% of youth in England and Wales experience a traumatic event before the age of 18 (Lewis et al., 2019). Exposure to traumatic events is associated with negative outcomes including posttraumatic stress disorder (PTSD) (Lewis et al., 2019) and comorbid difficulties such as mood and anxiety disorders (Spinhoven, Penninx, Van Hemert, De Rooij, & Elzinga, 2014) and substance abuse (Pietrzak, Goldstein, Southwick, & Grant, 2011). PTSD symptoms include re-experiencing (trauma-related intrusions), avoidance of trauma-related memories, and hyperarousal (a sense of heightened current threat)(American Psychiatric Association, 2013; World Health Organization, 2019). Effective treatment of PTSD is important in order to reduce the burden of these symptoms as well as associated negative outcomes such as comorbid mental health difficulties (Lewis et al., 2019).

Psychological interventions, comprising trauma-focused cognitive behavioural therapy (TF-CBT) and eye movement desensitisation and reprocessing (EMDR), are recommended by multiple treatment guidelines, including the International Society for Traumatic Stress Studies (Forbes et al., 2019), the American Academy for Child and Adolescent Psychiatry (Cohen et al., 2010), the Australian National Health and Research Guidelines (Phelps et al., 2022), and the UK National Institute for Health and Care Excellence guidelines (National Institute for Health and Care Excellence, 2018) as first-line treatments for young people presenting with PTSD. TF-CBT and EMDR have been assessed by previous meta-analyses which have demonstrated their effectiveness in treating children and adolescents with PTSD compared to active and passive control

conditions (Hoppen et al., 2023; Mavranezouli et al., 2020), This supports their use as first-line treatments for young people presenting with PTSD symptoms.

Meta-analyses typically report results in terms of standardised mean differences, such as the Hedges' g statistic (Hedges, 1981) which denotes the effect size for the standardised mean difference between two groups, with adjustment for sample size. These statistics can be difficult to interpret, so Furukawa, Cipriani, Barbui, Brambilla, and Watanabe (2005) developed a method to impute response rates, i.e. dichotomous outcomes defined as the absolute number of participants meeting a specified criteria, such as a 50% reduction in symptoms, from continuous outcomes (reported as means and standard deviations). This dichotomisation reduces statistical power but produces results which are more easily interpreted by clinicians and service users in the form of absolute response rates and risk ratios, providing clear data regarding the proportions of people who experience symptoms reduction in response to a specific intervention. A further benefit is that calculating absolute response rates reduces inflation of effect sizes when psychological interventions are compared with a waitlist rather than an active control condition, as response rates are calculated separately for the participants allocated to the experimental and control conditions.

The imputation method has been employed by researchers investigating the effectiveness of treatments for mental health disorders such as depression and schizophrenia (Cuijpers et al., 2021; Samara et al., 2013). In addition, Cuijpers et al. (2024) conducted a systematic review and meta-analysis examining absolute response rate for psychotherapies across eight mental disorders in adults which found a response

rate of 38% for PTSD, demonstrating the feasibility and utility of this analysis technique. However, similar analyses have not yet been conducted for the treatment of PTSD in young people.

To address this, we conducted a systematic review and meta-analysis to impute response rates for children and adolescents receiving TF-CBT or EMDR in an RCT. We calculated response rates for 50% improvement, 20% improvement, and reliable improvement and deterioration in PTSD symptoms for experimental and control groups at posttreatment and follow-up, as well as calculating risk ratios. A range of moderators were investigated to determine whether response rate was influenced by study characteristics. This included treatment type (TF-CBT vs EMDR) and format (group vs individual), control condition (passive vs active), trauma characteristics (single vs multiple incidence; exclusively sexual trauma vs other trauma type), symptom measure (questionnaire vs interview), country (high income country vs low-middle income country), and risk of bias (low vs high). We also repeated analyses with depression symptom data where these were reported.

4.3. Method

This meta-analysis was preregistered on PROSPERO (CRD42022304592) and follows PRISMA reporting guidelines.

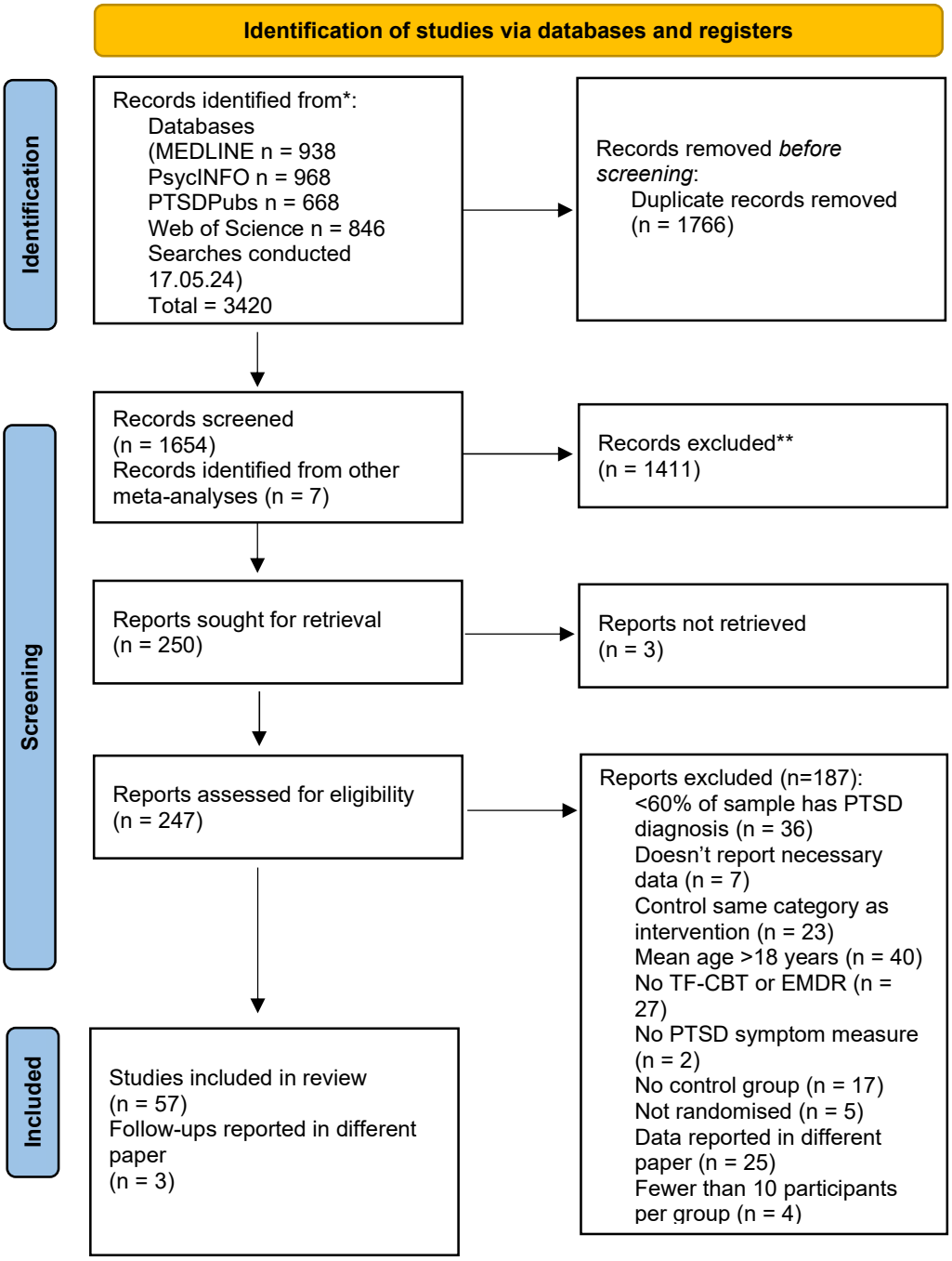
4.3.1. Search Strategy

Relevant studies were identified through systematic searches of MEDLINE, PubMed, PsycINFO, and PTSDPubs. The final search was carried out on 17th May 2024. The search strategy contained terms relating to PTSD, children and adolescents,

treatment, and randomised controlled trials (see Appendix S4, Supplementary Material).

We also checked reference lists of recent reviews. See Figure 2 for the PRISMA diagram.

4.3.2. Figure 2. PRISMA Flow Diagram



4.3.3. Selection Criteria

To be included in the analysis, studies were required to meet the following inclusion criteria: mean age of participants 18 years or below; at least 60% of participants had a PTSD diagnosis or scored above cutoff on a measure of PTSD symptoms; randomised controlled trial comparing a psychological therapy (TF-CBT or EMDR) to a control condition; at least 10 participants in each arm of the trial; a PTSD symptom measure reported at pre- and post-treatment.

4.3.4. Screening Process

The first author (KL) screened all titles and abstracts, and a second reviewer (AD) independently screened a random 10%, with 95.5% agreement. Full texts were imported and all were reviewed by KL, with a random 20% independently reviewed by AD, with 94.1% agreement. Disagreements were resolved by a third reviewer (RMS).

4.3.5. Data Extraction

All descriptive and quantitative data were extracted into a spreadsheet by KL and checked by AD.

Descriptive data extracted comprised: type of psychological therapy; type of control condition (categorised as active or passive); format of psychological therapy; single or multiple trauma sample; sexual trauma sample; country the study was conducted in (categorised as high income or low-middle income); mean age; percentage of female participants; PTSD outcome measure (categorised as interview or questionnaire).

Quantitative data extracted comprised: means and standard deviations from PTSD symptom measure at pre-treatment, post-treatment, and follow-up timepoints if

applicable, number of participants in each arm at each timepoint, and means and standard deviations from depression symptom measure where this was reported. Follow-ups were categorised as short term (follow-up one) when they took place from one to five months post-treatment or long term (follow-up two) when they took place six months or more post-treatment. If there were multiple follow-ups, the first timepoint in each follow-up window was extracted.

4.3.6. Risk of Bias Assessment

Risk of bias was assessed by the first author (KL) using items recommended by Cuijpers et al. Cuijpers, van Straten, Bohlmeijer, Hollon, and Andersson (2010). A second reviewer (AD) conducted independent assessment of 25% of studies, with an agreement of 100%. Studies were classified as low risk of bias if they met at least seven of the eight risk of bias criteria and high risk of bias if they did not.

4.3.7. Statistical Analysis

Statistical analyses were conducted using the metafor package (Viechtbauer, 2010) in R 4.3.2 (R Core Team, 2013). The method (Furukawa et al., 2005) validated by Furukawa and colleagues was used to calculate response rates. This method uses pre- and post-treatment means and standard deviations and the number of participants at post-treatment. Response rates were reported as the proportion of participants exhibiting 50% reduction, 20% reduction, reliable improvement, and reliable deterioration (Cuijpers et al., 2021) in symptoms. Reliable change indices are calculated as the change in symptom score divided by standard error of the difference, using a conservative assumption for Cronbach's alpha of 0.75 (Cuijpers et al., 2023; Jacobson &

Truax, 1991). 95% confidence intervals and 95% prediction intervals (IntHout, Ioannidis, Rovers, & Goeman, 2016) were calculated for each response rate. Risk ratios were also calculated to compare participants receiving psychological therapies with those in control conditions.

Sensitivity analyses were conducted whereby participants who were randomised but not included in the reported post-treatment or follow-up statistics in the original article were assumed to be non-responders. Heterogeneity was assessed using Cochran's Q and the I^2 statistic.

A number of moderator analyses were undertaken to see if different factors (type of trauma or therapy, measure used, setting, trial methodology) had an influence on the pooled effect size estimates. These comprised: type of psychological therapy (EMDR vs TF-CBT); trauma frequency (single vs multiple); measure type (questionnaire vs interview); psychological therapy format (group vs individual); country type (HIC vs LMIC); trauma type (exclusively sexual trauma vs other/mixed traumatic experiences); risk of bias (low vs high); control condition type (active vs passive).

4.3.8. Publication Bias

To evaluate publication bias, funnel plots and results of funnel plot asymmetry tests were inspected alongside Egger's test of intercept (Egger, Smith, Schneider, & Minder, 1997) and the trim-and-fill procedure (Duval & Tweedie, 2000) were used.

4.4. Results

4.4.1. Selection and Characteristics of Included Studies

After deletion of duplicate records, 1654 records were identified. A further seven records were identified from reference lists of relevant meta-analyses (Hoppen et al., 2023). Sixty articles met inclusion criteria, three of which provided follow-up data to other included studies, resulting in a total of 57 included studies yielding 60 comparisons (as three studies had multiple comparison arms or split data into age groups). See Figure 2 for the PRISMA flowchart detailing study selection.

The total sample size was 5,113 participants, with sample sizes for each study ranging from 20 to 640 participants. See Table 9 for full characteristics of included studies. The mean age of participants (where reported) was 12.3 years (range 2-18 years) and 55% (k=33) of studies were conducted in high income countries.

The majority of studies (k=52; 86.7%) assessed TF-CBT, with the remaining 13.3% (k=8) assessing EMDR. Treatment was on an individual basis in 56.7% (k=34) of cases, and questionnaires were used to assess PTSD symptoms in 66.7% (k=40) of studies. Active control conditions were used as the comparator in 51.7% (k=31) of studies. Participants had exposure to multiple traumatic events in 73.3% (k=44) of studies, and in 11.7% (k=7) of studies, participants exclusively had exposure to sexual trauma.

Forty studies reported data on depression symptoms, with a sample size of 1704 participants.

4.4.2. Table 9. Study Characteristics

Study	Country	Sample Size	Age range in years (mean)	Ethnicity	Psychological Therapy	Therapy Format	Control Condition	Trauma Frequency	Exclusively Sexual Trauma	Follow-up timepoints	PTSD measure	Depression measure
Ahmad, Larsson, and Sundelin-Wahlsten (2007a)	Sweden	33	6-16 (9.94)	Swedish (57.6%), Other (42.4%)	EMDR	Individual	WL	Multiple	No	-	PTSS-C	-
Ahmadi, Musavi, Samim, Sadeqi, and Jobson (2022) CG	Afghanistan	78	12-18 (16)	Afghan (Hazara) (100%)	TF-CBT	Group	CG	Single	No	3m	CRIES-13	-
Ahmadi, Jobson, et al. (2023a)	Afghanistan	96	11-19 (15.96)	Afghan (100%)	TF-CBT	Group	TAU	Multiple	No	3m	CRIES-13	MFQ-SF
Ahmadi, Musavi, et al. (2023b)	Afghanistan	26	14-19 (16.7)	Afghan (100%)	TF-CBT	Group	CG	Single	No	3m	CRIES-13	MFQ-SF
Ahrens and Rexford (2002)	USA	38	15-18 (16.4)	Caucasian (60.5%), African American (26.3%, Hispanic (5.3%), Native American (5.3%), Other (2.6%)	TF-CBT	Group	WL	Multiple	No	-	PSS-SR	BDI
Auslander et al. (2017)	USA	25	12-18 (14.64)	Black (44.4%), White (22.2%), Other/Mixed (33.3%)	TF-CBT	Group	TAU	Multiple	No	3m	CPSS	CDI
Banoğlu and Korkmazlar (2022)	Turkey	61	6-15 (NR)	Syrian (100%)	EMDR	Group	WL	Multiple	No	-	CPTS-RI	MDI
Barron, Abdallah, and Heltne (2016)	Palestine	154	11-15 (13.5)	NR	TF-CBT	Group	WL	Multiple	No	-	CRIES-13	DSRS
Barron, Freitas, and Bosch (2020)	Brazil	30	8-13 (10.1)	Brazilian (100%)	TF-CBT	Group	TAU	Multiple	No	-	CRIES-13	-
Bidstrup et al. (2023)	Denmark	54	2-5 (3.46)	NR	TF-CBT	Individual	TAU	Multiple	No	12m	PEDS	-
Catani et al. (2009)	Sri Lanka	31	8-14 (11.94)	NR	TF-CBT	Individual	MED-RELAX	Multiple	No	6m	UPID	-
Chen et al. (2014)	China	20	NR (14.5)	Chinese (100%)	TF-CBT	Group	General support	Single	No	3m	CRIES-13	CES-D
Chen et al. (2014) CG	China	22	NR (14.5)	Chinese (100%)	TF-CBT	Group	CG	Single	No	3m	CRIES-13	CES-D

Study	Country	Sample Size	Age range in years (mean)	Ethnicity	Psychological Therapy	Therapy Format	Control Condition	Trauma Frequency	Exclusively Sexual Trauma	Follow-up timepoints	PTSD measure	Depression measure
Cohen, Mannarino, and Knudsen (2004)/Deblinger, Mannarino, Cohen, and Steer (2006)	USA	180	8-14 (10.76)	White (60%), African American (28%), Hispanic American (4%), Biracial (7%), Other (1%)	TF-CBT	Individual	CCT	Multiple	Yes	6m	K-SADS-PL	CDI
Cohen, Mannarino, and Knudsen (2005)	USA	82	8-15 (11.1)	Caucasian (60%), African American (37%), Biracial (2%), Hispanic (1%)	TF-CBT	Individual	NST	Multiple	Yes	6m	TSC-C	CDI
Cohen, Mannarino, and Iyengar (2011)	USA	75	7-14 (9.64)	White (55.6%), Black (33.1%), Biracial (11.3%)	TF-CBT	Individual	CCT	Multiple	No	-	K-SADS-PL	CDI
Danielson et al. (2012)	USA	28	13-17 (14.8)	African American (46%), White (37.5%), Native American (4.2%), Biracial (8.3%), Hispanic (4%)	TF-CBT	Individual	TAU	Multiple	Yes	3m & 6m	UPID	CDI
Dawson et al. (2018)	Indonesia	64	7-14 (10.7)	NR	TF-CBT	Individual	PS	Multiple	No	3m	UCLA PTSD-RI	CDI
de Roos et al. (2017) TF-CBT WL	Netherlands	60	8-18 (13.06)	NR	TF-CBT	Individual	WL	Single	No	-	CRTI	-
de Roos et al. (2017) EMDR WL	Netherlands	61	8-18 (13.06)	NR	EMDR	Individual	WL	Single	No	-	CRTI	-
Deblinger, Lippmann, and Steer (1996)	USA	68	7-13 (9.84)	Caucasian (72%), African American (20%), Hispanic (6%), Other (2%)	TF-CBT	Individual	TAU	Multiple	Yes	-	K-SADS-E	-
Dorsey et al. (2020)	Kenya & Tanzania	640	7-13 (10.62)	NR	TF-CBT	Group	TAU	Single	No	12m	CPSS	CBC
Foa, McLean, Capaldi, and Rosenfield (2013)	USA	61	13-18 (15.3)	Black (55.7%), White (18.0%), Hispanic (16.4%), Biracial (3.3%), Other/No response (6.6%)	TF-CBT	Individual	SC	Multiple	Yes	12m	CPSS-I	CDI
Gilboa-Schechtman et al. (2010)	Israel	30	12-18 (14.05)	NR	TF-CBT	Individual	TLDP-A	Single	No	6m	CPSS	BDI
Goldbeck, Muche, Sachser, Tutus, and Rosner (2016)	Germany	159	7-17 (13.03)	NR	TF-CBT	Individual	WL	Multiple	No	-	CAPS-CA	CDI
Hitchcock et al. (2021)	UK	28	3-8 (6.26)	NR	TF-CBT	Individual	TAU	Single	No	-	YC-PTSD-C	-

Study	Country	Sample Size	Age range in years (mean)	Ethnicity	Psychological Therapy	Therapy Format	Control Condition	Trauma Frequency	Exclusively Sexual Trauma	Follow-up timepoints	PTSD measure	Depression measure
Jensen et al. (2014)/Jensen, Holt, and Ormhaug (2017)	Norway	122	10-18 (15.1)	Norwegian (73.7%), Asian (10.9%), One parent Norwegian (8.3%), Western European (1.3%), Eastern European (1.3%), African (1.9%), South/Central American (1.3%), Nordic (0.6%), Other (0.6%)	TF-CBT	Individual	TAU	Multiple	No	9m	CPSS	-
Kameoka et al. (2020)	Japan	30	6-18 (13.9)	NR	TF-CBT	Individual	WL	Multiple	No	-	K-SADS-PL	DSRSC
Kaminer et al. (2023)	South Africa	75	11-19 (14.92)	Mixed race (73.3%), Black African (17.3%), White (9.3%)	TF-CBT	Individual	TAU	Multiple	No	3m	CPSS-5	BDI-II
Kemp, Drummond, and McDermott (2009)	Australia	27	6-12 (8.93)	NR	EMDR	Individual	WL	Single	No	-	CPTS-RI	CDS
King et al. (2000)	Australia	24	5-17 (11.5)	NR	TF-CBT	Individual	WL	Multiple	Yes	3m	ADIS-C	CDI
Kramer and Landolt (2014) 2-6y	Switzerland	49	2-6 (4.27)	NR	TF-CBT	Individual	TAU	Single	No	3m	PTSDSSI	-
Kramer and Landolt (2014) 7-16y	Switzerland	51	7-16 (11)	NR	TF-CBT	Individual	TAU	Single	No	3m	CAB	-
Langley, Gonzalez, Sugar, Solis, and Jaycox (2015)	USA	71	5-11 (7.65)	Hispanic (48.65%), Caucasian (27.03%), African American (17.57%), Hispanic/Caucasian (2.70%), Asian (1.35%), African American/Hispanic (1.35%), Asian/Caucasian (1.35%)	TF-CBT	Group	WL	Multiple	No	-	UCLA PTSD-RI	CDI
Layne et al. (2008)	Bosnia	127	13-18 (15.9)	NR	TF-CBT	Group	Psychoeducation	Multiple	No	4m	PTSD-RI	DSRS
Li et al. (2022)	China	87	9-12 (11)	NR	TF-CBT	Group	TAU	Multiple	No	3m	UCLA PTSD-RI-5	CDI
Li, Li, Zhang, Wang, and Qu (2023)	China	234	9-12 (10.41)	NR	TF-CBT	Group	TAU	Multiple	No	3m	UCLA PTSD-RI-5	CDI-S

Study	Country	Sample Size	Age range in years (mean)	Ethnicity	Psychological Therapy	Therapy Format	Control Condition	Trauma Frequency	Exclusively Sexual Trauma	Follow-up timepoints	PTSD measure	Depression measure
McMullen, O'Callaghan, Shannon, Black, and Eakin (2013)	DRC	48	13-17 (15.8)	NR	TF-CBT	Group	WL	Multiple	No	-	UCLA PTSD-RI	AYPA
Meentken et al. (2020)/Meentken et al. (2021)	Netherlands	65	4-15 (9.6)	Dutch (81.9%), Other Western (5.6%), Non-Western (12.5%)	EMDR	Individual	TAU	Multiple	No	6m	CRTI	-
Meiser-Stedman et al. (2017)	UK	26	8-17 (13.3)	White British (86.2%), Minority ethnicity (13.8%)	TF-CBT	Individual	WL	Single	No	-	CPTSDI	MFQ
Molero, Jarero, and Givaudan (2019)	Spain	63	13-17 (16.36)	NR	EMDR	Group	CG	Multiple	No	3m	PCL-5	HADS
Murray et al. (2015)	Zambia	257	5-18 (13.66)	Other (46.7%), Bemba (31.8%), Ngoni (21.6%)	TF-CBT	Individual	TAU	Multiple	No	-	PTSD-RI	-
O'Callaghan, McMullen, Shannon, Rafferty, and Black (2013)	DRC	46	12-17 (16.02)	NR	TF-CBT	Group	WL	Multiple	Yes	-	UCLA PTSD-RI	-
O'Callaghan, McMullen, Shannon, and Rafferty (2015)	DRC	50	8-17 (14.69)	NR	TF-CBT	Group	CFS	Multiple	No	6m	UCLA PTSD-RI	-
Osorio, Pérez, Tirado, Jarero, and Givaudan (2018)	Mexico	23	13-22 (16.71)	NR	EMDR	Group	CG	Multiple	No	3m	PCL-5	HADS
Peltonen and Kangaslampi (2019)	Finland	38	9-17 (13.2)	Iraqi (27%), Afghan (27%), Finnish (23%), Other (20%)	TF-CBT	Individual	TAU	Multiple	No	-	CRIES-13	DSRS
Pfeiffer, Sachser, Rohlmann, and Goldbeck (2018)	Germany	99	13-21 (16.96)	Afghan (45.5%), Syrian (11.1%), Gambian (10.1%), Somalian (7.1%), Iranian (7.1%), Eritrean (3.0%), Senegalese (2.0%), Iraqi (2.0%), Ethiopian (2.0%), Pakistani (2.0%), Angolan (2.0%), Other (6.1%)	TF-CBT	Group	TAU	Multiple	No	-	CATS-S	PHQ-8
Pityaratstian et al. (2015)	Thailand	36	10-15 (12.25)	NR	TF-CBT	Group	WL	Single	No	1 month	PTSD-RI	-

Study	Country	Sample Size	Age range in years (mean)	Ethnicity	Psychological Therapy	Therapy Format	Control Condition	Trauma Frequency	Exclusively Sexual Trauma	Follow-up timepoints	PTSD measure	Depression measure
Robjant et al. (2019)	DRC	88	11-22 (18)	Banyarwanda (62%), Banyarbwisha (34%), Other (3%)	TF-CBT	Individual	TAU	Multiple	No	6m	PSS-I-5	PHQ-9
Roque-Lopez et al. (2021)	Colombia	44	13-16 (14.05)	NR	EMDR	Group	TAU	Multiple	No	2m	CPSS	-
Rossouw, Yadin, Alexander, and Seedat (2018)	South Africa	63	13-18 (15.35)	Mixed parentage (69.8%), African (30.2%)	TF-CBT	Individual	SC	Single	No	3m and 6m	CPSS-I	BDI
Ruf et al. (2010)	Germany	26	7-16 (11.45)	Turkey (Kurdish) (30.8%), Balkan (23.1%), Syrian (19.2%), Chechen (11.5%), Russian (7.7%), Georgian (3.8%), German (3.8%)	TF-CBT	Individual	WL	Multiple	No	-	UCLA PTSD-RI	-
Santiago et al. (2018)	USA	52	6-10 (7.76)	Latino (55.8%), Latino/Caucasian (23.1%), White/Caucasian (5.9%), Latino/Native American (5.9%), African American/Black (3.8%), Missing (5.9%)	TF-CBT	Group	WL	Multiple	No	-	UCLA PTSD-RI	-
E. Schauer (2008)	Sri Lanka	47	11-15 (13.1)	NR	TF-CBT	Individual	MED-RELAX	Multiple	No	-	CAPS-CA	MINI KID
Scheeringa, Weems, Cohen, Amaya-Jackson, and Guthrie (2011)	USA	28	3-6 (5.3)	Black/African American (59.5%), White (35.1%), Other (5.4%)	TF-CBT	Individual	WL	Multiple	No	-	PAPA	PAPA
Schottelkorb, Doumas, and Garcia (2012)	USA	26	6-13 (9.16)	African (67.7%), Middle East (16.1%), Asian (9.7%), European (6.5%)	TF-CBT	Individual	CCPT	Multiple	No	-	UCLA PTSD Index	-
Shein-Szydlo et al. (2016)	Mexico	98	12-18 (14.89)	NR	TF-CBT	Individual	WL	Multiple	No	-	CPTS-RI	BDI
Smith et al. (2007)	UK	24	8-18 (13.69)	White British (60.5%), Black British (26.3%), Asian British (5.3%), Other (7.9%)	TF-CBT	Individual	WL	Single	No	-	CAPS-CA	DSRS
Stein et al. (2003)	USA	117	10-12 (10.95)	NR	TF-CBT	Group	WL	Multiple	No	-	CPSS	CDI

Study	Country	Sample Size	Age range in years (mean)	Ethnicity	Psychological Therapy	Therapy Format	Control Condition	Trauma Frequency	Exclusively Sexual Trauma	Follow-up timepoints	PTSD measure	Depression measure
Tol et al. (2012)	Sri Lanka	397	9-12 (11.03)	NR	TF-CBT	Group	WL	Multiple	No	-	CPSS	DSRS

Note. ADIS – C = Anxiety Disorders Interview Schedule - Child Version, AYPA = African Youth Psychosocial Assessment, BDI = Beck Depression Inventory, BDI-II = Beck Depression Inventory II, CAB = Acute Stress Checklist For Children - German Version, CAPS-CA = Clinician-Administered PTSD Scale For DSM-5-Child/Adolescent Version, CATS-S = Child And Adolescent Trauma Screen, CBC = Child Behaviour Checklist, CDI = Children's Depression Inventory, CDI-S = Children's Depression Inventory - Short Version, CDS = Children's Depression Scale, CES-D = Center For Epidemiologic Studies Depression Scale, CG = Control Group, CPTSD = Children's PTSD Inventory, CPTS-RI = Child Posttraumatic Stress Reaction Index, CRIES-13 = Child Revised Impact Of Events Scale (13 Item Version), CRTI = Revised Children's Responses To Trauma Inventory, CPSS = Child PTSD Symptom Scale, CPSS-I = Child PTSD Symptom Scale – Interview Version, DSRS = Depression Self-Rating Scale, DSRSC = Depression Self-Rating Scale For Children, HADS = Hospital Anxiety And Depression Scale, K-SADS-E = Schedule For Affective Disorders And Schizophrenia For School-Age Children - Epidemiological Version, K-SADS-PL = Schedule For Affective Disorders And Schizophrenia For School-Age Children - Present And Lifetime Version, MDI = Major Depression Inventory, MFQ-SF = Mood And Feelings Questionnaire – Short Form, MINI KID = Mini-International Neuropsychiatric Interview For Children And Adolescents, NR = Not Reported, PAPA = Preschool Age Psychiatric Assessment, PCL-5 = Posttraumatic Stress Disorder Checklist For DSM-5, PEDS = Pediatric Emotional Distress Scale, PHQ-8 = Patient Health Questionnaire 8, PSS-I-5 = PTSD Symptom Scale Interview For DSM 5, PSS-SR = PTSD Symptom Scale Self-Report, PTSD-RI = Posttraumatic Stress Disorder Reaction Index, PTSDSSI = PTSD Semi-Structured Interview And Observational Record For Infants And Young Children, PTSS-C = Posttraumatic Stress Symptom Scale For Child, TAU = Treatment As Usual, TSC-C = Trauma Symptom Checklist

For Children, UCLA PTSD-RI = UCLA Posttraumatic Stress Disorder Reaction Index, UPID = UCLA PTSD Index For DSM-IV, WL = Waitlist, YC-PTSD-C = Young Child PTSD Checklist

4.4.3. Risk of Bias

Most studies (66.7%; k=40) were classified as having high risk of bias, with scores ranging from 1 to 8 on the scale used. Risk of bias was included as a potential moderator and no significant difference was found between studies classified as low vs high risk of bias (*p*=.61).

4.4.4. Absolute Response Rates

4.4.4.1. PTSD Symptoms

4.4.4.1.1. Posttreatment

See Table 10 for absolute response rates for TF-CBT and EMDR and Table 11 for absolute response rates for control conditions. At posttreatment, 50% improvement response rates for TF-CBT and EMDR combined were .46 (95% CI: .39-.52) and for all control conditions combined were .20 (95% CI: .16-.24). Twenty-percent improvement response rates were .75 (95% CI: .70-.80) for TF-CBT and EMDR and were .48 (95% CI: .42-.53) for control conditions. Reliable improvement response rates were .53 (95% CI: .45-.61) for TF-CBT and EMDR and .25 (95% CI: .20-.30) for control conditions, whilst reliable deterioration rates were .01 (95% CI: .01-.02) for TF-CBT and EMDR and .13 (95% CI: .08-.20) for control conditions. Sensitivity analyses were conducted where dropouts were assumed to be non-responders; this resulted in a small reduction in absolute response rates (see Tables 10 and 11). See Figures 3 and 4 for the funnel plot and forest plot for 50% improvement response rates.

4.4.5. Table 10. Absolute proportion of participants showing improvement and reliable change in PTSD symptoms at post-treatment, TF-CBT and EMDR

Analysis	k	N	Proportion	95% CI	95% PI	Cochran's Q	I^2	Moderator p
50% improvement								
All	59	2480	.46	.39, .52	.09, .86	482.3***	89.1%	-
All, assume dropout are non-responders	59	2608	.43	.37, .49	.08, .82	469.4***	88.8%	-
EMDR vs TF-CBT								.08
EMDR	8	210	.30	.24, .37	.24, .37	6.68	0.02%	
TF-CBT	51	2270	.48	.41, .55	.09, .88	450.8***	90.3%	
Trauma type[1]								.91
Single	13	576	.49	.33, .65	.04, .95	102.5***	90.7%	
Multiple	38	1694	.47	.40, .55	.10, .87	348.3***	89.6%	
Measure type[1]								.16
Questionnaire	31	1549	.44	.34, .53	.05, .89	341.6***	92.5%	
Interview	20	721	.54	.45, .63	.19, .86	107.3***	82.0%	
Treatment format[1]								.16
Group	21	1243	.42	.31, .53	.04, .88	229.6***	93.4%	
Individual	30	1027	.52	.43, .60	.14, .88	191.2***	85.5%	
Country type[1]								.94
HIC	28	859	.48	.39, .57	.09, .89	217.1***	86.9%	
LMIC	23	1411	.47	.37, .58	.08, .89	232.9***	92.8%	
Trauma type[1]								.37
Sexual trauma exclusive	7	252	.55	.41, .68	.23, .84	25.4**	76.0%	
Other	44	2018	.47	.39, .54	.07, .89	418.6***	91.2%	
RoB[1]								.96
Low	19	1088	.48	.36, .59	.07, .90	171.5***	92.8%	
High	32	1182	.48	.39, .56	.09, .88	272.1***	88.1%	
20% improvement								
All	59	2480	.75	.70, .80	.34, .99	472.9***	88.6%	
All, assume dropouts are non-responders	59	2608	.71	.65, .76	.30, .98	465.1***	88.4%	
Reliable change								
All studies								
Improvement	58	2437	.53	.45, .61	.05, .98	823.8***	93.7%	
Deterioration	58	2437	.01	.01, .02	.00, .07	106.5***	47.7%	
TF-CBT only								
Improvement	50	2227	.55	.46, .64	.04, .99	797.1***	94.5%	
Deterioration	50	2227	.01	.01, .02	.00, .07	98.2***	52.6%	

Note. [1] Only using the TF-CBT studies.

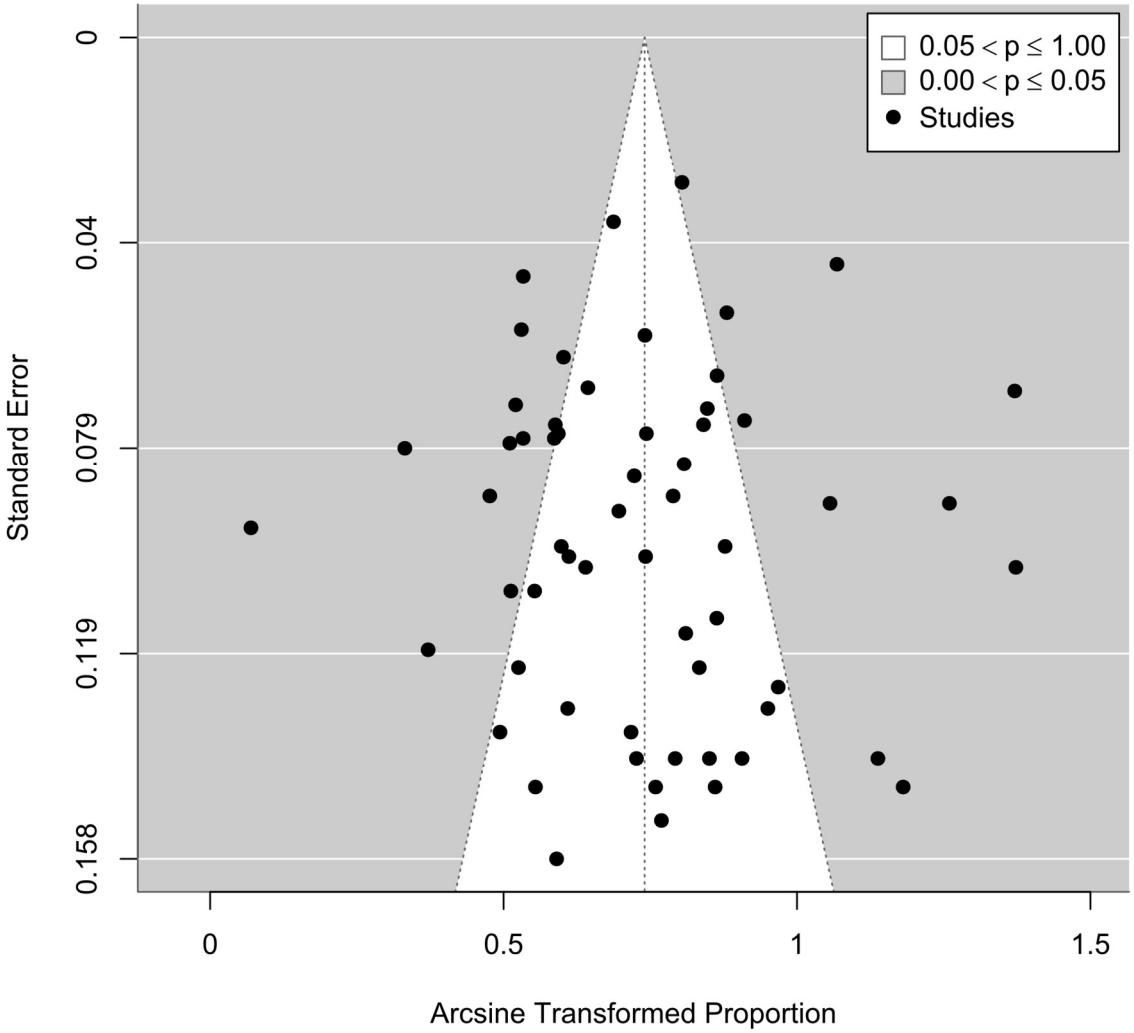
***p<.0001 **p<.001 *p<.05

4.4.6. Table 11. Absolute proportion of participants showing improvement and reliable change in PTSD symptoms at post-treatment, control conditions

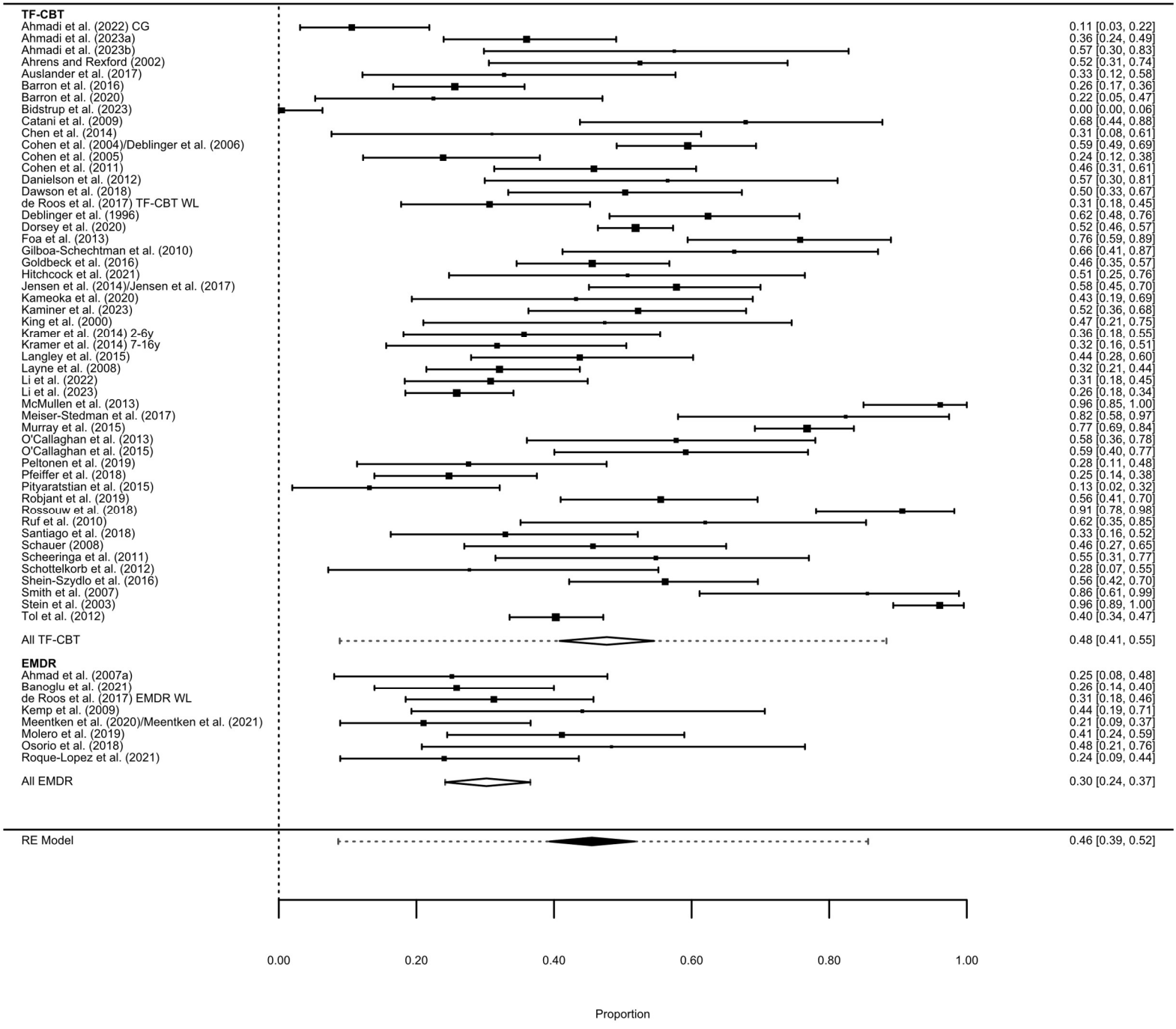
Analysis	k	N	Proportion	95% CI	95% PI	Cochran's Q	I^2	Moderator p
50% improvement								
All	60	2372	.20	.16, .24	.01, .51	307.6***	81.8%	-
All, dropouts as non-responders	60	2495	.19	.15, .23	.01, .50	343.0***	83.2%	
Active vs passive								<.0001
Active	31	1421	.28	.22, .34	.06, .58	125.9***	81.2%	
Passive	29	951	.12	.08, .16	.01, .33	133.9***	66.8%	
20% improvement								
All	60	2372	.48	.42, .53	.14, .83	357.4***	85.0%	
All, assume dropouts are non-responders	60	2495	.45	.40, .51	.11, .82	411.0***	86.7%	
Reliable change								
All studies								
Improvement	59	2340	.25	.20, .30	.01, .64	362.6***	86.6%	
Deterioration	59	2340	.13	.08, .20	.00, .77	836.5***	95.0%	
Active conditions								
Improvement	30	1389	.32	.23, .41	.01, .78	255.9***	91.2%	
Deterioration	30	1389	.07	.02, .14	.00, .57	281.4***	93.8%	
Passive conditions								
Improvement	29	951	.19	.15, .23	.05, .39	67.2***	61.3%	
Deterioration	29	951	.21	.11, .34	.00, .89	484.3***	94.7%	

***p<.0001 **p<.001 *p<.05

4.4.6.1.1.1. Figure 3. Funnel Plot for 50% Improvement in PTSD Symptoms, TF-CBT and EMDR



4.4.6.1.1.2. Figure 4. Forest Plot for 50% Improvement in PTSD Symptoms, TF-CBT and EMDR



4.4.6.1.2. Follow-up

See Table S6 for absolute response rates for TF-CBT and EMDR and Table S7 for absolute response rates for control conditions. Data for follow-up window one (one to five months after posttreatment) showed that absolute response rate for 50% improvement was similar to posttreatment: .44 (95% CI: .34-.55) for TF-CBT and EMDR and .22 (95% CI: .15-.31) for control conditions. At follow up window two (at least six months after posttreatment), response rate for 50% improvement was .59 (95% CI: .41-.76) for TF-CBT and EMDR and .43 (.29-.57) for control conditions.

4.4.6.2. Depression Symptoms

4.4.6.2.1. Posttreatment

See Table S8 for absolute response rates for TF-CBT and EMDR and Table S9 for absolute response rates for control conditions. At posttreatment, 50% improvement response rates for TF-CBT and EMDR combined were .33 (95% CI: .26-.41) and for all control conditions combined were .18 (95% CI: .13-.23). Twenty-percent improvement response rates were .60 (95% CI: .52-.68) for TF-CBT and EMDR, and were .37 (95% CI: .31-.43) for control conditions. Reliable improvement response rates were .25 (95% CI: .19-.31) for TF-CBT and EMDR and .13 (95% CI: .10-.17) for control conditions, whilst reliable deterioration rates were .02 (95% CI: .01-.03) for TF-CBT and EMDR and .10 (95% CI: .02-.21) for control conditions. Sensitivity analyses were conducted whereby dropouts were assumed to be non-responders, resulting in a small reduction in absolute response rates; see Tables S8 and S9.

4.4.6.2.2. Follow-up

See Table S10 for absolute response rates for TF-CBT and EMDR and Table S11 for absolute response rates for control conditions. Data for follow-up window one (one to five months after posttreatment) showed that absolute response rate for 50% improvement was .31 (95% CI: .14-.51) for TF-CBT and EMDR and .19 (95% CI: .10-.29) for control conditions. At follow up window two (at least six months after posttreatment), response rate for 50% improvement was .53 (95% CI: .35-.70) for TF-CBT and EMDR and .36 (.26-.46) for control conditions.

4.4.6.3. Risk Ratio

4.4.6.3.1. PTSD Symptoms

See Table 12 for risk ratio data comparing psychological therapy with control conditions at posttreatment. The risk ratio for 50% improvement was 1.55 (95% CI: 1.44-1.67) and for 20% improvement was 2.81 (95% CI: 2.40-3.29). The risk ratio for reliable improvement was 1.43 (95% CI: 1.29-1.57) and for reliable deterioration was 1.00 and non-significant (95% CI: 1.00-1.01).

See Table S12 for risk ratio data comparing psychological therapy with control conditions at follow-up. At follow-up window one (one to five months), the risk ratio for 50% improvement was 1.25 (95% CI: 1.12-1.39) and for 20% improvement was 1.48 (95% CI: 1.17-1.87). The risk ratio for reliable improvement was 1.37 (95% CI: 1.16-1.61) and for reliable deterioration was 0.97 and non-significant (95% CI: 0.92-1.01). At follow-up window two (at least six months after posttreatment), the risk ratio for 50% improvement was 1.38 (95% CI: 1.10-1.73) and for 20% improvement was 2.13 (95% CI: 1.32-3.44). The

risk ratio for reliable improvement was 1.63 (95% CI: 1.15-2.30) and for reliable deterioration was 1.00 (95% CI: 0.99-1.01).

Sensitivity analyses were conducted whereby dropouts were assumed to be non-responders, resulting in a small reduction in risk ratios, though they remained statistically significant; see tables for results.

See Figures S2 and S3 for the funnel plot and forest plot for 50% improvement risk ratio data.

4.4.7. Table 12. Risk ratio for improvement and reliable change in PTSD symptoms at post-treatment, psychological therapy (TF-CBT or EMDR) vs control

Analysis	k	N	Risk ratio	95% CI	95% PI	Risk ratio p	Cochran's Q	I^2	Moderator p
50% improvement									
All	59	4840	1.55	1.44, 1.67	0.98, 2.44	<.0001	379.1***	81.5%	-
All, dropouts as non-responders	59	5091	1.51	1.40, 1.63	0.96, 2.39	<.0001	383.6***	83.7%	-
EMDR vs TF-CBT									.16
EMDR	8	377	1.32	1.21, 1.45	1.21, 1.45	<.0001	6.74	0.0%	
TF-CBT	51	4463	1.60	1.47, 1.75	0.97, 2.65	<.0001	369.0***	84.6%	
Active vs passive[1]									.64
Active control	29	2867	1.62	1.46, 1.81	1.01, 2.60	<.0001	104.1***	75.1%	
Passive control	21	1596	1.61	1.37, 1.89	0.87, 2.96	<.0001	156.6***	90.4%	
20% improvement									
All	59	4840	2.81	2.40, 3.29	1.07, 7.41	<.0001	265.6***	80.4%	-
All, dropouts as non-responders	59	5091	2.47	2.14, 2.84	1.03, 5.93	<.0001	255.2***	80.8%	
EMDR vs TF-CBT									.33
EMDR	8	377	2.33	1.84, 2.94	1.52, 3.57	<.0001	9.4	28.9%	
TF-CBT	51	4463	2.97	2.47, 3.58	1.02, 8.65	<.0001	254.8***	83.8%	
Active vs passive[1]									.97
Active control	30	2867	2.97	2.36, 3.74	1.04, 8.51	<.0001	146.9***	81.9%	
Passive control	21	1596	3.05	2.20, 4.24	0.91, 10.24	<.0001	93.1***	86.6%	
Reliable change									
Improvement									
All	58	4765	1.43	1.29, 1.57	0.80, 2.55	<.0001	223.7***	78.6%	
EMDR vs TF-CBT									.66
EMDR	8	377	1.34	1.10, 1.62	0.87, 2.04	<.01	15.1*	50.3%	

TF-CBT	50	4388	1.45	1.30, 1.63	0.77, 2.74	<.0001	208.4***	81.9%	
Active vs passive[1]									.69
Active control	29	2792	1.42	1.23 1.64	0.77, 2.62	<.0001	115.6***	78.9%	
Passive control	21	1596	1.54	1.25, 1.90	0.72, 3.30	<.0001	85.4***	86.2%	
Deterioration									
All	58	4765	1.00	1.00, 1.01	0.99, 1.01	.88	186.1***	0.61%	
EMDR vs TF-CBT									.53
EMDR	8	377	0.73	0.57, 0.93	0.40, 1.35	.01	38.8***	92.7%	
TF-CBT	50	4388	1.00	1.00, 1.01	1.00, 1.01	.74	147.0***	0.00%	
Active vs passive[1]									.85
Active control	29	2792	1.00	0.99, 1.01	0.99, 1.01	.83	55.5*	0.33%	
Passive control	21	1596	0.84	0.76, 0.94	0.55, 1.29	<.01	91.5***	96.9%	

Note. [1] Only using the TF-CBT studies.

***p<.0001 **p<.001 *p<.05

4.4.7.1.1. Depression Symptoms

See Table S13 for risk ratio data comparing psychological therapy with control conditions at posttreatment. The risk ratio for 50% improvement was 1.18 (95% CI: 1.10-1.25) and for 20% improvement was 1.39 (95% CI: 1.25-1.55). The risk ratio for reliable improvement was 1.11 (95% CI: 1.06-1.16) and for reliable deterioration was 1.01 and non-significant (95% CI: 1.00-1.02).

See Table S14 for risk ratio data comparing psychological therapy with control conditions at follow-up. At follow-up window one (one to five months), the risk ratio for 50% improvement was 1.01 and non-significant (95% CI: 0.97-1.04) and for 20% improvement was 1.25 (95% CI: 1.04-1.52). The risk ratio for reliable improvement was 1.16 (95% CI: 1.05-1.29) and for reliable deterioration was 1.02 and non-significant (95% CI: 0.97-1.08). At follow-up window two (at least six months after posttreatment), the risk ratio for 50% improvement was 1.29 (95% CI: 1.06-1.58) and for 20% improvement was 1.58 (95% CI: 1.21-2.06). The risk ratio for reliable improvement was 1.29 (95% CI: 1.07-1.54) and for reliable deterioration was 1.00 and non-significant (95% CI: 0.99-1.02).

Sensitivity analyses were conducted whereby dropouts were assumed to be non-responders, resulting in a small reduction in risk ratios; see tables for results.

4.4.7.2. Moderator Analysis

4.4.7.2.1. PTSD Symptoms

Moderator and subgroup analyses were conducted and reported for absolute response rates in Tables 10 and 11 for posttreatment and Tables S6 and S7 for follow-up data. Moderator and subgroup analyses were also conducted for risk ratio data in Table 12 for posttreatment and Table S12 for follow-up.

No moderation effects were significant for response rates in psychological therapy conditions at posttreatment. A significant difference was found for the 50% improvement response rates in control conditions at posttreatment: active control conditions yielded a higher response rate (.28) than passive control conditions (.12; p<.0001), as would be expected. No significant differences were found for subgroup analyses of risk ratios for psychological therapies vs control conditions at posttreatment (see Table 12).

At follow-up, for most subgroup analyses there were fewer than five studies per subgroup, which is too few to accommodate subgroup comparisons (Higgins et al., 2023), but the significant difference for 50% improvement response rates in control conditions was replicated in follow-up window one (one to five months after posttreatment): active control conditions yielded a higher response rate (.29) than passive control conditions (.10; p=.0096).

4.4.7.2.2. Depression Symptoms

Subgroup analyses were conducted and reported in Tables S8-11 for absolute response rates and Tables S13 and S14 for risk ratio data. No significant differences were found for the response rates in psychological therapy conditions or control conditions at posttreatment or for subgroup analyses of risk ratios for psychological therapies vs control conditions at posttreatment.

At follow-up, groups became too small to assess the difference between subgroups.

4.4.7.3. Publication Bias

Funnel plots were inspected, and Egger's test of funnel plot asymmetry was implemented for main analyses at posttreatment.

4.4.7.3.1. PTSD

Egger's test was not significant for absolute response rates (50%, 20%, and reliable improvement) for TF-CBT and EMDR or control conditions, and for absolute rates of reliable deterioration for TF-CBT and EMDR. Egger's test suggested significant funnel plot asymmetry for absolute rates of reliable deterioration in control conditions, but the trim-and-fill procedure did not indicate that any studies were missing.

Egger's test also suggested significant funnel plot asymmetry for 50% improvement risk ratio data. Trim-and-fill procedure calculated 21 missing studies on the left side, reducing reported risk ratio from 1.54 (95% CI: 1.42-1.66) to 1.33 (95% CI: 1.21-1.47). Egger's test was significant for 20% improvement risk ratio data as well; trim-and-fill procedure calculated 19 missing studies on the left side, reducing the risk ratio from 2.76 (95% CI: 2.34-3.25) to 2.18 (95% CI: 1.82-2.62).

Egger's test indicated significant funnel plot asymmetry for reliable improvement and deterioration risk ratio data. For reliable improvement, trim-and-fill procedure indicated eight missing studies on the left side, reducing the risk ratio from 1.43 (95% CI: 1.29-1.57) to 1.38 (95% CI: 1.25-1.52). For reliable deterioration, trim-and-fill procedure indicated 21 missing studies on the right side, which did not alter the calculated risk ratio or 95% confidence intervals.

4.4.7.3.2. Depression

Egger's test was not significant for absolute response rates (50%, 20%, and reliable improvement) or reliable deterioration for TF-CBT and EMDR or control conditions.

Egger's test suggested significant funnel plot asymmetry for 50% improvement risk ratio data. Trim-and-fill procedure calculated 18 missing studies on the left side, reducing reported risk ratio from 1.18 (95% CI: 1.10-1.25) to 1.05 (95% CI: 0.97-1.14). Egger's test was significant for 20% improvement risk ratio data as well; trim-and-fill procedure calculated 16 missing studies on the left side, reducing the risk ratio from 1.39 (95% CI: 1.25-1.55) to 1.20 (95% CI: 1.06-1.37).

Egger's test indicated significant funnel plot asymmetry for reliable improvement and deterioration risk ratio data. For reliable improvement, trim-and-fill procedure indicated eight missing studies on the left side, reducing the risk ratio from 1.11 (95% CI: 1.06-1.16) to 1.04 (95% CI: 0.98-1.11). For reliable deterioration, trim-and-fill procedure indicated 11 missing studies on the right side, which did not alter the calculated risk ratio or 95% confidence intervals.

4.5. Discussion

This systematic review and meta-analysis imputed rates of response, reliable improvement, and reliable deterioration for psychological therapies used to treat children and adolescents with PTSD. The results have shown that an average of 46% of young people receiving TF-CBT or EMDR show 50% improvement in PTSD symptoms at posttreatment, compared to 20% of young people in control conditions. The risk ratio of 50% improvement comparing psychological therapy to control conditions was 1.55.

These patterns were consistent (albeit with higher percentages showing response) for 20% improvement in PTSD symptoms. They were also consistent (but with slightly lower percentages) in showing response when dropouts were included as non-responders in sensitivity analyses. When considering reliable change, 53% of young people receiving psychological therapy exhibited reliable improvement compared to 25% of young people in control conditions. One percent of young people receiving psychological therapy exhibited reliable deterioration, compared to 13% of young people in control conditions; the risk ratio when comparing TF-CBT or EMDR conditions to control conditions was non-significant, however. The comparison between TF-CBT and EMDR was non-significant for 50% symptom reduction, despite TF-CBT resulting in a greater proportion (.48, 95% CI: .41-.55) exhibiting response than EMDR (.30, 95% CI: .24-.37).

These results are consistent with the recent meta-analysis by Cuijpers et al. (Cuijpers et al., 2024), who calculated a response rate of 38% showing 50% reduction in symptoms in adults receiving psychotherapy for PTSD. The results support the use of psychological therapies as a first-line gold-standard treatment for children and adolescents presenting with PTSD and demonstrates their effectiveness over and above control conditions, even when dividing into active and passive control conditions. In addition, the rate of reliable deterioration was very low for psychological therapies, further supporting their implementation and addressing concerns regarding retraumatisation (Purnell et al., 2024). However, the results also demonstrate that a large proportion (over half) of young people do not show 50% improvement in their PTSD symptoms at posttreatment following psychological therapy. Whilst concerning, it is

important to note that there may be a floor effect where participants with mild-moderate symptoms do not show 50% improvement as their symptom score was relatively low to begin with, reducing scope for improvement. It is also possible that some participants may experience barriers outside of therapy which reduce their response. However, there is scope for further research and consideration as to how psychological therapies could be made more effective for the treatment of PTSD in youth.

As a sufficient number of studies reported depression data, we were also able to impute response rates for depression symptoms. Of those receiving psychological therapies, 33% experienced a 50% reduction in depression symptoms compared to 18% in control conditions; the risk ratio comparing psychological therapies to control conditions for 50% reduction in symptoms was small (1.18) but statistically significant. This shows that psychological therapies for PTSD go some way to improving depression symptoms, but again do not provide improvement for a large proportion of young people. Cuijpers et al. (2023) imputed response rates for psychological treatments of depression in children and adolescents and found 39% of young people exhibited 50% symptom reduction. As the results from the present study are broadly comparable to this figure, this suggests that psychological therapies for PTSD may have important transdiagnostic effects with regards to treating depression symptoms.

Publication biases for risk ratio data suggested some studies were missing, but the effect sizes remained significant after implementing the trim-and-fill procedure. As noted by the Cochrane handbook for systematic reviews (Higgins et al., 2023), this may be an artefactual effect as risk ratios are correlated with standard errors (Sterne et al.,

2011; Zwetsloot et al., 2017). This is further supported by the lack of missing studies in previous meta-analyses using Hedge's g (Hoppen & Morina, 2020). Heterogeneity was found to be high, consistent with similar meta-analyses of psychological treatments (Davis et al., 2023). However, moderator analyses did not identify any significant differences between subgroups.

The limitations of this research must be considered. Dichotomisation of the data to impute response rates does require the selection of arbitrary response rates. However, we chose 50% improvement as the main outcome to be consistent with previous research (Cuijpers et al., 2023; Cuijpers et al., 2024). This limitation was further ameliorated by exploring different levels of response (50% and 20%), as well as reliable improvement and deterioration. Furthermore, results suggest there may have been a floor effect for reliable deterioration given the low numbers reported for psychological therapies. This may have reduced the accuracy of the normal distribution assumption as these values were likely at the tail end of the theoretical distribution.

The present research also had a considerable number of strengths. It is the first systematic review and meta-analysis of its kind to impute response rates for young people receiving psychological therapy for PTSD, and the use of different levels of symptom improvement as well as reliable improvement and deterioration allow a comprehensive view of how TF-CBT and EMDR compare to control conditions. A range of subgroup analyses were conducted in order to assess if any study characteristics influenced results, and extraction and analysis of depression data allowed calculation

of response rates for depression symptoms, an important metric given its common comorbidity with PTSD (Lewis et al., 2019).

The clinical implications of this research are that psychological therapies are appropriate as the first-line treatment for children and adolescents with a diagnosis of PTSD. It is also important to note that a proportion of young people may not show large improvements in symptom reduction at posttreatment (although a majority, 75%, were found to exhibit at least 20% symptom reduction). This study provides easily interpretable response rates for clinicians and service users to consider and showcases the very low rates of deterioration in symptoms for young people receiving TF-CBT or EMDR for PTSD.

In conclusion, this meta-analysis has imputed response rates at a range of levels for psychological therapies for PTSD in children and adolescents. The results support the use of psychological therapies to treat PTSD in youth and show that these are also effective for symptoms of depression and have very low rates of reliable deterioration. However, they also show that a proportion of young people do not exhibit a 50% reduction in their symptoms at posttreatment, warranting further research.

1

5. Mediation and responder analysis in a trial of cognitive therapy for youth PTSD

5.1. Abstract

Objective: To investigate how psychopathological and cognitive-behavioural factors mediate change in post-traumatic stress disorder (PTSD) symptoms and which factors differentiate responders from non-responders in a randomised controlled trial of cognitive therapy for PTSD (CT-PTSD) in children and adolescents.

Method: Participants (N=120) were aged 8-17 years and had a PTSD diagnosis following exposure to multiple traumatic events. Participants were randomly allocated to receive CT-PTSD or treatment as usual (TAU). A mediation analysis was conducted to assess whether scores on measures of psychopathological and cognitive-behavioural factors at posttreatment (approximately 5-6 months post-randomisation) mediated the relationship between treatment arm and PTSD symptom score at 11-month post-randomisation follow-up. Responders (50%+ PTSD symptom reduction) across both treatment arms were compared with non-responders to assess how the change in a range of factors over the course of treatment predicted response status at 11-month follow-up.

Results: In the mediation analysis, post-traumatic cognitions, trauma memory quality, safety-seeking behaviours, trauma-related rumination, and self-blame at posttreatment were all found to predict PTSD symptoms at 11 months; however, no

indirect effects of cognitive therapy for PTSD were found. In the comparison of responders and non-responders, change in post-traumatic cognitions, safety-seeking behaviours, trauma memory quality, trauma-related rumination, and self-blame were all significantly associated with responder status.

Conclusions: Reasons for the lack of mediation effect are discussed. The identification of factors which were associated with PTSD symptoms in the mediation analysis and factors which differentiate between responders and non-responders highlights the importance of addressing these factors in interventions and supports the use of cognitive therapy (which incorporates components related to these factors) as a gold-standard intervention.

5.2. Introduction

Post-traumatic stress disorder (PTSD) is a reaction to trauma which is associated with a range of functioning outcomes and comorbidity with other mental health difficulties (Lewis et al., 2019). PTSD symptoms include re-experiencing (trauma-related intrusions), avoidance of trauma-related memories, and hyperarousal, a sense of heightened threat (American Psychiatric Association, 2013; World Health Organization, 2019). Exposure to traumatic events in childhood is common, with estimates at 31.1% for youth up to 18 years old in England and Wales (Lewis et al., 2019) and 61% for adolescents aged 13-17 years in the US (McLaughlin et al., 2013).

A range of treatment guidelines recommend psychological interventions as the first-line treatment for children and adolescents with PTSD. This includes the UK National Institute for Health and Care Excellence (National Institute for Health and Care Excellence, 2018), the International Society for Traumatic Stress Studies (Forbes et al., 2019), the American Academy for Child and Adolescent Psychiatry (Cohen et al., 2010), and the Australian National Health and Research Guidelines (Phelps et al., 2022). Specifically, cognitive-behavioural therapy with a trauma focus (CBT-TF) is recommended; approaches include trauma-focused cognitive-behavioural therapy (TF-CBT) (Cohen et al., 2016) and cognitive therapy for PTSD (CT-PTSD) (Ehlers et al., 2005). CT-PTSD targets modification of negative trauma-related appraisals, reduction of reexperiencing symptoms through developing a narrative account of the trauma, and removal of dysfunctional behaviours and cognitive strategies, also known as safety-seeking behaviours (Ehlers et al., 2005).

Previous research has sought to examine the efficacy of CT-PTSD in youth (Hoppen et al., 2023; Mavranezouli et al., 2020). A recent systematic review and meta-analysis found that 48% of youth receiving CT-PTSD for PTSD exhibit at least 50% reduction in PTSD symptoms, compared to 20% in young people receiving alternative treatment or allocated to a waitlist control arm (Lofthouse et al., 2025). Whilst this research indicates that CT-PTSD is effective in youth, it doesn't address the underlying mechanisms which bring about reduction in PTSD symptoms. These are important to understand in order to further develop treatments for youth with PTSD diagnoses and to support therapists in identifying the most important mechanisms to address.

A systematic review exploring mechanisms of change in psychological interventions for posttraumatic stress symptoms established that posttraumatic cognitions were identified as change mechanisms in four studies focused on children and adolescents (Kangaslampi & Peltonen, 2019). This was the case in studies with child and adolescent samples comparing forms of CT-PTSD with waitlist controls (Pfeiffer, Sachser, de Haan, Tutus, & Goldbeck, 2017; Smith et al., 2007) or treatment as usual (Jensen, Holt, Mørup Ormhaug, Fjermestad, & Wentzel-Larsen, 2018; Meiser-Stedman et al., 2017), supporting that posttraumatic cognitions are a key treatment target for children and adolescents with PTSD. However, the lack of research incorporating aspects related to trauma memory was noted in the review (Kangaslampi & Peltonen, 2019), as only one study identified this as a change mechanism (Meiser-Stedman et al., 2017), and found that pre-post changes in trauma memory quality were associated with CT-PTSD effects on posttraumatic stress symptoms.

In a recent randomised controlled trial (RCT) comparing online cognitive therapy for PTSD to waitlist control in youth aged 12-17 years with a PTSD diagnosis (n=31), an exploratory mediation analysis found that post-traumatic cognitive appraisals mediated 22% of the treatment effect, rumination mediated 11%, and trauma memory quality mediated 3% (P. Smith et al., 2025). In addition, higher scores of all three of these mediators at the midtreatment timepoint were associated with increased odds of meeting PTSD caseness at the posttreatment timepoint 10 weeks later. This indicates that cognitive appraisals, rumination, and memory quality in relation to the trauma are all important when treating PTSD symptoms in adolescents.

The presented previous research shows that investigation of factors which mediate response to therapy for PTSD in youth is important in order to understand the mechanisms by which PTSD symptoms are reduced and thus refine treatments. However, for the most part these studies have had limited power due to small sample sizes and the majority utilised a waitlist control, meaning that the results were specific to cognitive therapy for PTSD and leaving the question as to whether these mediation mechanisms operate in other treatments for PTSD in children and adolescents.

The identification of factors which predict response in terms of PTSD symptom reduction regardless of the type of treatment delivered may help to improve understanding of how PTSD symptom reduction is achieved in children and adolescents. Recent research has established that response rates for PTSD, defined as 50% reduction in PTSD symptoms, are 48% in paediatric trials assessing TF-CBT (Lofthouse et al., 2025). Comparisons of responders and non-responders may elucidate which factors are pivotal

in bringing about meaningful symptom reduction and highlight which cognitive-behavioural and psychosocial processes should be targeted in order to achieve the best outcomes. Moreover, this approach recognises that response to treatment may occur in the control condition as well as the experimental condition, particularly if the control condition contains active treatment components, and that additional factors may mediate treatment response. This approach also increases the available number of participants for analysis.

The present study explored whether psychological factors implicated in the cognitive model of PTSD mediate response to CT-PTSD, relative to an "treatment as usual" (TAU) control condition. Moreover, we investigated whether change in a range of psychosocial and cognitive-behavioural factors over the course of treatment, age at randomisation, and measures of treatment credibility and therapeutic alliance at posttreatment predicted response (defined as 50% symptom reduction) for participants receiving any treatment. The present study used data from a highly pragmatic RCT comprising youth with a high degree of comorbid difficulties and a powerful TAU control condition where therapists were free to offer whichever psychological treatment they deemed appropriate (Meiser-Stedman et al., 2025).

5.3. Method

5.3.1. Design

The present study involved an analysis of data from the Delivery of Cognitive Therapy for Young People after Trauma (DECRYPT) trial (Allen et al., 2021; Meiser-

Stedman et al., 2025), a pragmatic RCT of CT-PTSD in youth exposed to multiple traumatic stressors. Measures were selected from the battery of self-report and parent/caregiver-report interviews and questionnaires to assess PTSD symptoms and a range of psychosocial, cognitive-behavioural, and treatment aspects thought to be relevant to the cognitive model of PTSD. The main trial found that CT-PTSD was superior to TAU on CRIES-8 scores at 11 months post-randomisation, and in a mixed-effect model incorporating all time points (p=.007); however, the primary outcome (CRIES-8 at post-treatment, approximately 5-6 months post-randomisation) was not significant.

The first part of the present study involved mediation analysis investigating the extent to which the effect of CT-PTSD compared to TAU on PTSD symptoms at 11-month follow-up (as measured by the CRIES-8, the trial primary outcome measure) was mediated by posttreatment (approximately six months post randomisation) post-traumatic cognitions, trauma memory quality, safety-seeking behaviours, social support, trauma-related rumination, self-blame, treatment credibility, and therapeutic alliance. The timepoints were selected so that the change in mediators preceded the outcome, required for showing a mediation effect (Kraemer, Stice, Kazdin, Offord, & Kupfer, 2001; Kraemer, Wilson, Fairburn, & Agras, 2002); posttreatment CRIES-8 scores were the primary endpoint for the trial.

The second analysis was a between-groups comparison in which participants were grouped by response (≥50% improvement from baseline on PTSD symptoms as measured by CRIES-8 score at 11 months), regardless of treatment arm allocation. This decision was taken as a significant proportion of participants in the TAU arm received

therapy that might be seen as an evidence-based psychological therapy for PTSD (e.g. TF-CBT or eye movement desensitisation and reprocessing) or their therapy sessions involved trauma-specific treatment components (e.g. psychoeducation, reliving, cognitive restructuring, trauma narratives). Nine participants in the TAU arm were confirmed to have received treatment involving TF-CBT on the basis of treatment components completed, however in total therapists for 19 TAU participants stated that they had used TF-CBT or CT-PTSD with their client, and a further two reported using narrative exposure therapy (NET), which might be viewed as a form of TF-CBT. Responders and non-responders were then compared using between-groups analysis of change in scores on measures of post-traumatic cognitions, trauma memory quality, safety-seeking behaviours, social support, trauma-related rumination, and self-blame from baseline to posttreatment, and treatment credibility and therapeutic alliance at posttreatment. Responders and non-responders were also compared on age at randomisation and sex.

5.3.2. Ethical Considerations

Ethical approval for the DECRYPT trial was provided by UK Health Research Authority Research Ethics Committee (East of England–Cambridge South, 16/EE/0233). For participants aged under 16 years, informed consent was provided by parents and caregivers, and the child or young person was also asked to give their assent. Participants aged 16 years or older could provide informed consent without their parent or caregiver. For participants aged below 16 years at randomisation, informed consent was obtained from a parent or caregiver alongside informed assent from the participant.

If participants were under 16 at randomisation but reached the age of 16 during the trial, they were asked to provide informed consent.

5.3.3. Participants

Data were collected for 120 participants; this sample size was determined by a power calculation for the primary outcome of the DECRYPT trial. Participants were drawn from Child and Adolescent Mental Health Services (CAMHS) and Youth Services in Cambridgeshire, Cardiff, Essex, Hertfordshire, Kent, Norfolk, South London and Suffolk. Inclusion criteria required participants to be aged 8-17 years with a diagnosis of PTSD (as defined by DSM-5 and diagnosed using the CPSS-I-5, Child PTSD Symptom Scale – Interview version, Foa, Asnaani, Zang, Capaldi, and Yeh (2018)) following multiple trauma exposure, and to have a score equal to or greater than 17 on the Child Revised Impact of Events Scale, 8-item version (CRIES-8, Perrin, Meiser-Stedman, and Smith (2005)). Exclusion criteria were a change of prescribed psychiatric medication within the past two months, PTSD symptoms relating exclusively to one trauma, pervasive developmental or neurodevelopmental disorder, intellectual disability, another primary psychiatric diagnosis or clinical need warranting treatment ahead of PTSD (e.g. psychosis), inability to speak English, ongoing exposure to threat, strong likelihood of being unable to complete treatment (e.g., imminent house move), or history of organic brain damage. Table 13 contains the demographic and trauma history data for the sample.

For the baseline assessment (conducted at randomisation), participants completed a battery of interviews and questionnaires. Participants completed a further battery of

interviews and questionnaires at mid-treatment (approximately 3 months after baseline), posttreatment (approximately 6 months after baseline), and at two follow-ups: 11 and 29 months after baseline. See Allen et al. (2021) for full procedure information. Interviews and questionnaires relevant for the present study are described below.

Participants in the TAU arm who were considered to have received CT-PTSD or any other CBT-TF were excluded from the mediation analysis. This was the case for nine participants. These participants were included in the between-groups responder vs non-responder analysis.

5.3.4. Table 13. Sample demographic characteristics

	Whole Sample (*n* = 120)	CT-PTSD Sample (*n* = 58)	TAU Sample (*n* = 62)
Age in years, mean (*SD*)	14.9 (2.5)	14.8 (2.06)	14.0 (2.8)
Sex, *n* (%)			
Male	33 (27.5)	11 (19.0)	22 (35.5)
Female	87 (72.5)	47 (81.0)	40 (64.5)
Ethnicity, *n* (%)			
White (any background)	97 (80.8)	48 (82.8)	49 (79.0)
Black (any background)	9 (7.5)	4 (6.9)	2 (3.2)
Asian (any background)	2 (1.7)	0 (0.0)	5 (8.1)
Mixed (any background)	11 (9.2)	6 (10.3)	5 (8.1)
Any other ethnic group	1 (0.8)	0 (0.0	1 (1.6)
Traumatic Experiences, *n* (%)			
Natural disaster	3 (2.5)	2 (3.4)	1 (1.6)
Accident	34 (28.3)	8 (13.8)	26 (41.9)
Robbed	10 (8.3)	5 (8.6)	5 (8.1)
Physical abuse inside family	57 (47.5)	34 (58.6)	23 (37.1)
Physical abuse outside family	57 (47.5)	24 (41.4)	33 (53.2)
Witnessed physical abuse inside family	66 (55)	33 (56.9)	33 (53.2)
Witnessed physical abuse outside family	53 (44.2)	25 (43.1)	28 (45.2)
Inappropriate sexual contact	36 (30)	20 (34.5)	28 (45.2)
Someone forcing/pressuring sex	30 (25)	17 (29.3)	13 (21.0)
Sudden death/injury of a close person	55 (45.8)	26 (44.8)	29 (46.8)
Attacked, stabbed, shot at, or hurt badly	13 (10.8)	2 (3.4)	11 (17.7)
Witnessed someone attacked, stabbed, shot at, or hurt badly	35 (29.2)	13 (22.4)	22 (35.5)
Medical procedure	29 (24.2)	16 (27.6)	13 (21.)
Exposure to war	0 (0.0)	0 (0.0)	0 (0.0)
Other	83 (69.2)	38 (65.5)	45 (72.6)
Number of Trauma Types, mean (SD)	4.7 (2.2)	4.5 (2.3)	4.8 (2.1)

5.3.5. Measures

5.3.5.1. Children's Revised Impact of Event Scale, 8-item version (CRIES-8)

The CRIES-8 (Perrin et al., 2005) is an 8-item self-report questionnaire measure assessing frequency of post-traumatic stress symptoms over the preceding seven days. It has good face, construct, predictive, and criterion validity (Perrin et al., 2005; Stallard, Velleman, & Baldwin, 1999). The CRIES-8 was the primary outcome measure in the DECRYPT trial, and efforts were made to obtain completed CRIES-8 questionnaires ahead of other measures.

5.3.5.2. Child Post-Traumatic Cognitions Inventory (CPTCI)

The Child Post-Traumatic Cognitions Inventory (Meiser-Stedman et al., 2009) is a 25-item self-report questionnaire which assesses appraisals of traumatic experiences in the preceding two weeks. The measure has good internal consistency, test-retest reliability, convergent validity, and discriminative validity (Meiser-Stedman et al., 2009).

5.3.5.3. Trauma Memory Quality Questionnaire (TMQQ)

The TMQQ (Meiser-Stedman et al., 2007) is an 11-item self-report questionnaire which assesses the current characteristics of trauma memories; particularly the extent to which they are composed of sensory elements. The measure has good internal consistency, criterion validity, and convergent validity (Meiser-Stedman et al., 2007). Higher scores indicate more sensory-based and fragmented memories.

5.3.5.4. Child Safety Behaviour Scale (CSBS)

The Child Safety Behaviour Scale (Alberici et al., 2018) is a 13-item self-report questionnaire designed to assess safety-seeking behaviours conducted over the past two weeks. The items can be divided into two subscales comprising hypervigilance and suppression. The measure has excellent internal consistency and good discriminant validity and specificity (Alberici et al., 2018).

5.3.5.5. Multidimensional Scale of Perceived Social Support (MSPSS)

The Multidimensional Scale of Perceived Social Support (Zimet, Dahlem, Zimet, & Farley, 1988) is a 12-item self-report questionnaire measuring a participant's perceptions of support from family, friends, and a significant other. The measure has good internal reliability (Zimet et al., 1988) and good convergent and discriminative validity (De Maria, Vellone, Durante, Biagioli, & Matarese, 2018).

5.3.5.6. Trauma-related rumination scale

The trauma-related rumination (TRR) scale is a 3-item self-report questionnaire measure assessing thoughts related to traumatic events over the preceding two weeks (Meiser-Stedman et al., 2014).

5.3.5.7. Self-blame scale

The self-blame (SB) scale is a 2-item self-report questionnaire measure assessing the extent to which an individual has experienced self-blame in the preceding two weeks.

5.3.5.8. Treatment credibility

Treatment credibility was measured using a 4-item questionnaire measure assessing a participant's perceptions of the treatment they received. These items were taken from an adult PTSD trial (Ehlers et al., 2003) and have been used in previous paediatric PTSD trials (Meiser-Stedman et al., 2017).

5.3.5.9. Therapeutic Alliance Scale for Children, revised (TASC-r)

The Therapeutic Alliance Scale for Children, revised (Creed & Kendall, 2005) is a 12-item questionnaire measure measuring child-report of the child-therapist alliance through assessing the affective bond and the client-therapist collaboration on therapeutic tasks.

5.3.6. Data Analysis

The sample size was predetermined by the DECRYPT trial, therefore an *a priori* power analysis was not conducted. A post-hoc power analysis conducted using G*Power version 3.1.9.7 (Faul et al., 2007) indicated that for a linear multiple regression, a sample size of n = 120 with a significance criterion of $\alpha = .05$ would have 89% power to detect an effect of size Cohen's $f^2 = 0.104$, and 47% power to detect an effect of size Cohen's $f^2 = 0.039$. The Cohen's f^2 values reflect the range of effect sizes present in the between-groups linear regression analyses.

The mediation analyses were conducted using structural equation modelling with the lavaan package (Rosseel, 2012) in R v4.4.3 (R Core Team, 2013). This allowed estimation of the a-path (the effect of treatment allocation on each theoretical mediator

at post-treatment), the b-path (the effect of each theoretical mediator on PTSD symptoms at 11 months, measured using the CRIES-8), and the total effect of treatment allocation on PTSD symptoms whilst controlling for baseline CRIES-8 scores and baseline mediator variable scores (when available) for each mediator variable. Confidence intervals for indirect effects were estimated using bootstrapping with 5,000 resamples.

For the between-groups analyses comparing responders with non-responders (where response to treatment was established when participants made a ≥50% improvement from baseline on PTSD symptoms as measured by CRIES-8 score at 11 months), change scores were calculated from baseline to post-treatment for the relevant variables. Linear regression models were conducted to examine whether responder status would account for variance in cognitive-behavioural and psychosocial factors whilst controlling for the baseline score of each variable.

Assumptions for regression were assessed. Residuals were approximately normally distributed (assessed via histogram and P-P plots) and scatterplots showed no evidence of heteroscedasticity. Multicollinearity was assessed using VIFs, all of which were lower than 2, indicating this was not a concern. In addition, residuals met the assumption of independence, assessed by the Durbin-Watson test which was between 1.5 and 2.5 for all analyses.

Sex was compared between the groups using a chi-square test.

5.3.7. Missing Data

For the mediation analysis, Full Information Maximum Likelihood estimation (FIML) was used to account for missing data. For between-groups comparisons of responders and non-responders, last observation carried forward (LOCF) was used for CRIES-8 scores; where these were missing at the 11-month follow-up assessment, posttreatment scores were used. This was the case for 21 participants. If CRIES-8 scores were missing at both posttreatment and 11-month follow-up, participants were assumed to be non-responders.

5.4. Results

Descriptive statistics for each mechanism considered in the present study, presented by arm and for the total sample, are presented in Table 14.

5.4.1. Table 14. Means and standard deviations on measures of age, PTSD symptoms, psychosocial variables, and cognitive-behavioural variables

Variable	Total sample		CT-PTSD		TAU*		Responder		Non-responder	
	n	M(SD)	n	M(SD)	n	M(SD)	n	M(SD)	n	M(SD)
Age at baseline (years)	120	14.4 (2.5)	58	14.8 (2.1)	53	13.8 (2.9)	36	13.9 (2.5)	84	14.6 (2.5)
PTSD symptoms (CRIES-8)										
Baseline	120	31.6 (6.0)	58	31.7 (5.9)	53	31.6 (5.9)	36	29.7 (6.4)	84	32.4 (5.7)
Midtreatment	82	25.9 (10.0)	40	24.1 (10.3)	35	27.7 (9.4)	28	19.0 (10.8)	54	29.5 (7.4)
Posttreatment	96	20.8 (11.5)	49	18.9 (11.6)	39	23.9 (10.7)	35	11.7 (9.6)	61	26.1 (8.9)
11-month follow-up	81	21.6 (11.6)	38	18.8 (11.1)	34	24.0 (11.8)	25	7.3 (5.7)	56	28.0 (6.9)
Post-traumatic appraisals (CPTCI)										
Baseline	118	73.6 (15.9)	56	73.3 (16.6)	53	74.8 (15.0)	34	67.2 (18.2)	84	76.2 (14.3)
Midtreatment	80	71.8 (18.2)	40	71.7 (17.9)	33	72.9 (18.5)	28	60.2 (19.0)	52	78.0 (14.5)
Posttreatment	82	64.3 (19.2)	39	63.6 (18.3)	35	66.8 (18.9)	30	52.3 (15.8)	52	71.2 (17.5)
Change (baseline-posttreatment)	80	8.4 (17.5)	37	8.6 (18.0)	35	6.7 (16.3)	28	17.9 (17.0)	52	3.3 (15.5)
Trauma memory quality (TMQQ)										
Baseline	120	30.8 (5.6)	58	30.5 (5.4)	53	31.3 (5.9)	36	28.9 (5.3)	84	31.7 (5.6)
Midtreatment	81	29.4 (6.9)	40	28.4 (7.3)	34	30.9 (6.6)	28	26.2 (7.4)	53	31.0 (6.1)
Posttreatment	83	27.2 (7.0)	39	26.7 (6.1)	36	28.6 (7.5)	30	23.5 (7.0)	53	29.3 (6.1)
Change (baseline-posttreatment)	83	2.6 (6.2)	39	2.2 (6.5)	36	1.8 (5.1)	30	4.9 (7.3)	53	1.4 (5.2)
Safety-seeking behaviours (CSBS)										
Baseline	114	35.7 (7.3)	56	35.8 (7.0)	49	36.0 (7.7)	33	33.8 (6.9)	81	36.4 (7.4)
Midtreatment	80	35.3 (8.5)	40	34.5 (9.1)	33	36.8 (8.1)	28	32.3 (8.8)	52	36.9 (8.0)
Posttreatment	81	32.2 (8.1)	39	31.3 (8.1)	34	33.9 (8.2)	30	28.0 (6.2)	51	34.7 (8.1)
Change (baseline-posttreatment)	76	3.1 (6.6)	37	4.0 (6.8)	31	1.6 (6.1)	27	6.0 (6.8)	49	1.5 (6.0)
Perceived social support (MSPSS)										
Baseline	119	57.8 (13.4)	57	56.6 (12.6)	53	57.9 (14.3)	35	59.6 (12.2)	84	57.1 (13.8)

Midtreatment	80	58.9 (16.8)	40	71.7 (17.9)	33	72.9 (18.5)	28	62.9 (18.6)	52	56.8 (15.5)
Posttreatment	81	62.2 (16.0)	39	62.9 (15.6)	34	60.9 (16.2)	30	66.5 (14.9)	51	59.8 (16.2)
Change (baseline-posttreatment)	80	-4.1 (14.8)	38	-5.4 (15.1)	34	-3.9 (14.1)	29	-7.3 (14.0)	51	-2.3 (15.1)
Trauma-related rumination (TRR)										
Baseline	118	10.2 (2.0)	56	10.0 (2.0)	53	10.4 (2.0)	34	9.8 (2.1)	84	10.4 (2.0)
Midtreatment	80	10.0 (2.0)	40	10.0 (2.1)	33	10.3 (1.8)	28	9.3 (2.2)	52	10.4 (1.8)
Posttreatment	81	8.9 (2.6)	39	8.8 (2.5)	34	9.4 (2.4)	30	7.6 (2.6)	51	9.6 (2.4)
Change (baseline-posttreatment)	79	1.3 (2.4)	37	1.0 (1.8)	34	1.0 (2.5)	28	2.3 (2.6)	51	0.7 (2.0)
Self-blame (SB)										
Baseline	118	4.7 (2.3)	56	5.1 (2.3)	53	4.4 (2.2)	34	3.8 (2.0)	84	5.1 (2.3)
Midtreatment	80	4.8 (2.2)	40	5.0 (2.3)	33	5.0 (2.2)	28	4.0 (2.1)	52	5.3 (2.2)
Posttreatment	82	4.4 (2.3)	39	4.6 (2.5)	35	4.3 (2.2)	30	3.1 (1.9)	52	5.1 (2.2)
Change (baseline-posttreatment)	80	0.5 (2.2)	37	0.8 (1.8)	35	0.1 (2.7)	28	1.1 (1.7)	52	0.2 (2.4)
Treatment credibility (TC)										
Midtreatment	80	29.2 (8.6)	40	30.0 (8.4)	33	26.9 (8.7)	28	30.3 (8.8)	52	28.6 (8.5)
Posttreatment	81	30.2 (9.8)	39	31.3 (9.7)	34	27.9 (10.2)	29	30.6 (11.1)	52	29.9 (9.1)
Therapeutic alliance (TASCR)										
Midtreatment	80	36.9 (7.5)	40	36.9 (7.9)	33	36.5 (7.6)	28	30.3 (8.8)	52	28.6 (8.5)
Posttreatment	80	37.8 (7.5)	39	37.6 (8.1)	33	37/0 (6.9)	29	38.0 (9.0)	51	37.6 (6.7)

Note. *n=9 participants excluded from TAU arm who were considered to have received some form of TF-CBT. Change scores were calculated by subtracting posttreatment scores from baseline scores. CPTCI, Children's Post-Traumatic Cognitions Inventory; CSBS, Child Safety Behaviour Scale; CT-PTSD, cognitive therapy for PTSD; MSPSS, Multidimensional Scale of Perceived Social Support; TASC-r, Therapeutic Alliance Scale for Children, revised; TAU, treatment as usual; TMQQ, Trauma Memory Quality Scale

5.4.2. Mediation analysis

See Figure 3 for a diagram depicting the mediation analysis. The a-path (from the independent variable, treatment arm, to the mediator variables as measured at posttreatment) was significant for treatment credibility (p=.033). Participants allocated to CT-PTSD rated treatment credibility higher (M=31.3, SD=9.7) than those allocated to TAU (M=29.1, SD=9.9). However, the a-path was not statistically significant for any of the other mediators investigated in the present study. This suggests that the CT-PTSD and TAU groups did not significantly differ at post-treatment on scores for post-traumatic appraisals, trauma memory quality, safety-seeking behaviours, social support, trauma-related rumination, self-blame, or therapeutic alliance.

The b-path (from the mediator variables at posttreatment to the outcome variable, CRIES-8 score, at 11-month follow-up) was significant for post-traumatic appraisals (p<.001), trauma memory quality (p=.001), safety-seeking behaviours (p=.001), trauma-related rumination (p=.001), and self-blame (p=.008). This highlights that these cognitive-behavioural factors impact subsequent PTSD symptoms.

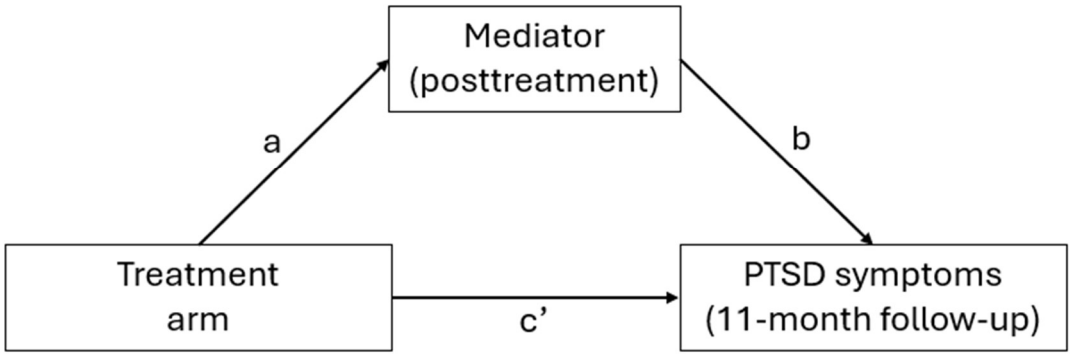
The c'-path (direct effect) from treatment arm to CRIES-8 score at 11 months) was significant in the analyses for safety-seeking behaviours (p=.038), trauma-related rumination (p=.045), self-blame (p=.034), treatment credibility (p=.015), and therapeutic alliance (p=.021).

The total effect (sum of the direct effect, c'-path, and indirect path, the product of the a- and b-paths) was significant for safety-seeking behaviours (p=.038), trauma-

related rumination (p=.045), self-blame (p=.034), treatment credibility (p=.015), and therapeutic alliance (p=.021)

No indirect effects were found. See Table 15 for proportion mediated by each mediator; safety-seeking behaviours (25.0%) and appraisals (15.4%) yielded the greatest proportions.

5.4.3. Figure 3. Mediation analysis diagram



Note. a, b, and c refer to the respective paths reported in Table 14. A positive coefficient for the a-path indicates that participants allocated to CT-PTSD had lower scores on the posttreatment mediator variable than participants allocated to treatment as usual. A positive coefficient for the b-path indicates that higher posttreatment mediator variable scores were associated with higher PTSD symptom scores (measured using the CRIES-8) at 11-month follow-up. A positive coefficient for the c'-path indicates that allocation to CT-PTSD was associated with lower PTSD symptom scores on the CRIES-8 at 11-month follow-up after controlling for the mediator variable.

5.4.4. Table 15. Percentage mediated in mediation analysis

Mediator variable (posttreatment)	a path	b path	c' path	Indirect effect	Indirect effect bootstrapped 95% CI	Percentage mediated
Post-traumatic appraisals (CPTCI)	.08	.42*	.19	0.78	-1.37, 3.34	15.4%
Trauma memory quality (TMQQ)	.07	.30*	.16	0.49	-1.44, 2.32	11.8%
Safety-seeking behaviours (CSBS)	.12	.48*	.17	1.35	-0.77, 4.40	25.0%
Perceived social support (MSPSS)	-.03	-.17	.22	0.10	-0.78, 1.78	1.9%
Trauma-related rumination (TRR)	.04	.46*	.20	0.46	-1.33, 2.98	9.2%
Self-blame (SB)	.06	.42*	.22*	0.55	-1.40, 3.16	10.0%
Treatment credibility (TC)	-.27*	.00	.26*	-0.02	-1.30, 1.91	0.2%
Therapeutic alliance (TASCR)	-.10	.04	.25*	-0.09	-1.12, 0.84	1.5%

Note. * indicates significance at the p<.05 level.

5.4.5. Responder vs non-responder analysis

The comparison of CRIES-8 scores from baseline to 11 months was used to determine responder status. Participants were defined as responders if their CRIES-8 score reduced by at least 50% from baseline to 11 months. This resulted in a group of 36 responders (22 CT-PTSD, 14 TAU) and 84 non-responders (36 CT-PTSD, 48 TAU).

See Table 16 for regression results. Responder status was associated with greater change in post-traumatic appraisals, safety-seeking behaviours, trauma memory quality, rumination and self-blame; in each case responders exhibited greater improvement from baseline to post-treatment. Beta coefficients for responder status were all greater than .345, i.e. medium in size. Change in social support was not significantly associated with responder status. There was no significant difference between the responder and non-responder groups on age at randomisation, therapeutic alliance score, or treatment credibility at posttreatment. There was a significant difference in the number of males and females in the responder and non-responder groups, $\chi^2(1, 120)=7.41$, $p=.007$. In the responder group, there were 16 males and 20 females; in the non-responder group, there were 17 males and 67 females. There was no significant difference between the responder and non-responder groups on age at randomisation or treatment credibility at posttreatment.

5.4.6. Table 16. Linear regression results, responder vs non-responder analysis

Dependent variable	Predictor variables	B	SE	beta	p	Bootstrapped 95% CI
δ post-traumatic appraisals (CPTCI)	Baseline appraisals	.439	.110	.385	<.001	.221, .657
	Response group	16.9	3.50	.466	.011	9.97, 23.9
δ perceived social support (MSPSS)	Baseline perceived social support	.423	.104	.415	<.001	.216, .630
	Response group	-5.60	3.13	-.183	.077	-11.8, .629
δ safety-seeking behaviours (CSBS)	Baseline safety-seeking behaviours	.302	.105	.308	.005	.093, .511
	Response group	5.27	1.46	.385	<.001	2.35, 8.19
δ memory qual. (TMQQ)	Baseline memory quality	.414	.120	.354	<.001	.175, .653
	Response group	4.46	1.33	.345	.001	1.82, 7.10
δ trauma-related rumination (TMQQ)	Baseline trauma-related rumination	.393	.119	.337	.001	.156, .631
	Response group	1.82	.506	.366	<.001	.807, 2.82
δ self-blame (SB)	Baseline self-blame	.537	.090	.570	<.001	.358, .716
	Response group	1.61	.441	.349	<.001	.737, 2.49

5.5. Discussion

The present study investigated which factors are important in mediating the effect of PTSD treatments in youth on PTSD symptoms, and which factors differentiate responders from non-responders regardless of treatment arm. Post-traumatic cognitions, trauma memory quality, safety-seeking behaviours, trauma-related rumination, and self-blame at post-treatment were shown to have a significant relationship with PTSD symptoms at the 11-month assessment post-treatment in the mediation analysis, highlighting their importance as treatment targets. In addition, participants rated treatment credibility higher for CT-PTSD than TAU. However no indirect effects were found; we did not demonstrate that the superiority of CT-PTSD over TAU at the 11-month assessment was significantly mediated through any of these mechanisms. The process(es) underpinning this difference could not therefore be ascertained in the present study.

When conducting analysis of the change in cognitive-behavioural and psychosocial factors over treatment whilst controlling for baseline score in the responder vs non-responder analysis, change in post-traumatic cognitions, safety-seeking behaviours, trauma memory quality, trauma-related rumination and self-blame from baseline to posttreatment were significantly associated with response (50%+ reduction in PTSD symptoms) at 11-month follow-up. This highlights that change in these variables over the course of treatment, regardless of the treatment provided, is associated with a meaningful reduction in PTSD symptoms, consistent with the cognitive

model of PTSD (Ehlers & Clark, 2000) which proposes that these cognitive-behavioural mechanisms influence the experience of PTSD symptoms.

Understanding how treatments work is important to aid in their evaluation and improvement, and determine whether treatments elicit change through the relevant theorised mechanisms (Kazdin, 2007). A further reason to investigate mechanisms of change is that this can accommodate focus on treatment principles which have been demonstrated as effective (Rosen & Davison, 2003). In addition, said mechanisms may have transdiagnostic relevance for other disorders, contributing to improvements in outcomes beyond the specific disorder being treated (Gallagher, 2017).

The results from the present study broadly align with previous research. Specifically, post-traumatic cognitive appraisals have been measured and identified as an important mechanism of change in a number of previous trials (McLean, Yeh, Rosenfield, & Foa, 2015; Meiser-Stedman et al., 2017; Pfeiffer et al., 2017; Smith et al., 2007). In addition, in a trial comparing online CT-PTSD to waitlist control in a sample aged 12-17 years (P. Smith et al., 2025), elevated scores on measures of cognitive appraisals, rumination, and memory quality at mid-treatment were associated with meeting the criteria for a PTSD diagnosis at posttreatment. Further, safety-seeking behaviours have also previously been demonstrated to mediate reduction in PTSD symptoms in children and adolescents after a single-event trauma (Meiser-Stedman et al., 2017). These trials support the findings of the present research of the significance of these factors in treating PTSD in youth.

However, change in self-blame score was not found to be correlated with change in PTSD symptoms in previous research (Meiser-Stedman et al., 2017) which contrasts with the present study. This may be attributed to the different characteristics of the samples in question, and specifically that the present sample had experienced multiple traumatic events rather than a single-event trauma.

It is important to note that participants in the trial dataset analysed here had experience of multiple traumatic events and complex psychopathology presentations at baseline. Seventy two participants met the criteria for complex PTSD (comprising emotion dysregulation, negative self-perception, and relationship disturbances as well as the core PTSD symptoms of re-experiencing, avoidance, and a sense of current threat, (Lofthouse et al., 2023), 50 participants reported hearing voices in the baseline assessment (Lofthouse et al., 2024), and baseline mean scores on measures of depression, anxiety, and panic symptoms were relatively high and exceeded the clinically significant cut-off points for the respective measures (Lofthouse et al., 2023). This demonstrates the complexity of the psychopathological presentations of the current sample and indicates that the cognitive-behavioural factors identified to be significant in the current analyses are relevant for young people with PTSD who have additional comorbid difficulties.

The clinical implications of this research are that post-traumatic cognitions, trauma memory quality, safety-seeking behaviours, trauma-related rumination, and self-blame are associated with response in youth receiving treatment for PTSD following exposure to multiple traumatic events. However, it should also be noted that these

factors were not found to be significant mediators in the present analysis and that they did not account for all of the variance in PTSD symptoms at 11-month follow-up, leaving room for further factors to be evaluated. In addition, only a relatively small proportion of the sample (30%) demonstrated a 50% reduction in PTSD symptoms at the 11-month follow-up, indicating that there are still further improvements to aim for when it comes to treating PTSD in youth with multiple trauma exposure.

A strength of this study is that analyses were run both to determine the impact of potential mediators on PTSD response with treatment arm as the predictor variable, and when participants were grouped by response and non-response. This means that important factors could be identified across PTSD treatments and the focus was on factors bringing about reduction in PTSD symptoms rather than the effect of a specific arm. In addition, a range of cognitive-behavioural factors were explored beyond the commonly investigated cognitive appraisals, including a number of factors which have been identified as under-researched in PTSD trials, especially for the paediatric population (Kangaslampi & Peltonen, 2019). Finally, it should be considered that the trial was very pragmatic and that the control condition in the trial used for the presented analyses was powerful as therapists delivering treatment for participants allocated to this arm were free to deliver any psychological treatment they felt appropriate. However, limitations are that the analyses were exploratory and not pre-registered with set hypotheses, and that the sample size was relatively small, affording moderate power. In addition, there is debate surrounding the use of change scores when analysing continuous outcomes in randomised controlled trials, but the present research

controlled for baseline scores in order to increase the robustness of the analyses (Clifton & Clifton, 2019).

In conclusion, post-traumatic cognitions, trauma memory quality, safety-seeking behaviours, trauma-related rumination, and self-blame appear to be important targets for PTSD treatment in youth but did not meet criteria to be identified as mediators in a trial of CT-PTSD in youth exposed to multiple traumatic events. Further research should be conducted in the exploration of how CT-PTSD effects reduction in PTSD symptoms, as well as how treatments can be improved to increase both the reduction of PTSD symptoms and the percentage of patients exhibiting response.

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6. Conclusion

In the final chapter, findings from the four chapters are summarised in order to provide a perspective on the phenotype of children and adolescents with a PTSD diagnosis after exposure to multiple traumatic events, an assessment of the effectiveness of gold-standard treatments for youth with PTSD, and a discussion of the apparent mechanisms of improvement present in young people receiving treatment for PTSD. This aims to evaluate the application of theories typically developed to understand adult PTSD in the paediatric population, with implications for the understanding and treatment of PTSD in trauma-exposed youth.

6.1. Overview of Chapters

The four chapters presented in this thesis comprise three secondary data analyses of data from the DECRYPT clinical trial as well as one systematic review and meta-analysis. Two chapters explore the phenotype of participants in the DECRYPT trial (youth aged 8-17 years with a PTSD diagnosis following exposure to multiple traumatic events): one sought to investigate the presence of youth meeting the criteria for CPTSD and factors associated with this diagnosis, while the other assessed the presence of voice hearing and the factors associated with this symptom. The systematic review and meta-analysis provided an overview of the evidence investigating efficacy of psychological PTSD treatments (TF-CBT and EMDR) in paediatric populations. Finally, the fourth chapter used data from the DECRYPT trial in the pursuit to identify cognitive-behavioural and psychosocial factors correlated with response to PTSD treatment (both

CT-PTSD and a range of therapies delivered for participants allocated to treatment as usual) and factors which mediated response to CT-PTSD.

6.2. Cognitive phenotype of PTSD in children and adolescents

6.2.1. Complex PTSD

A number of children and adolescents in the DECRYPT trial met criteria for the still new diagnosis of CPTSD. Comparison within the DECRYPT sample allowed some delineation of trauma characteristics associated with meeting criteria for CPTSD: the CPTSD group had a significantly higher frequency of children and adolescents exposed to sexual trauma than the PTSD-only group, although the groups did not differ significantly on number of trauma types or prevalence of intrafamilial abuse. In addition, when comparing the CPTSD group and the PTSD-only group on comorbid symptoms, the CPTSD group were found to score significantly higher on measures of depression and panic symptoms, and comparison between the groups on cognitive-behavioural and psychosocial factors established that the CPTSD group had significantly higher scores on a measure of negative post-traumatic cognitions. These findings underline that presence of the disturbances of self-organisation (DSO) symptoms (relationship difficulties, emotional dysregulation, and negative self-concept) appear to be associated with additional difficulties amongst multiply trauma-exposed youth. In addition, they provide some perspective on the trauma characteristics which may or may not be associated with the development of DSO symptoms. Primarily, sexual trauma appears to be related, suggesting that children and adolescents who have experienced this type

of trauma are more likely to meet criteria for a CPTSD diagnosis, whereas number of trauma types and intrafamilial abuse were not found to be significantly higher in the group meeting criteria for CPTSD. This demonstrates that sexual abuse specifically appears to be related to the existence of additional difficulties in youths exposed to multiple traumas. Awareness of this may be useful in order to address potential DSO symptoms during treatment, and speaks to the pernicious impact of sexual abuse on mental health difficulties, in particular identity, emotion regulation and interpersonal relationships. The severe impact of sexual abuse is supported by previous research in which an umbrella review found that childhood sexual abuse was associated with 26 of 28 investigated outcomes comprising psychiatric diagnoses, physical health conditions, and psychosocial outcomes (Hailes, Yu, Danese, & Fazel, 2019). Hypotheses regarding the acute impact of childhood sexual abuse suggests that this may be due to elicitation of feelings of shame, erosion of beliefs of trust towards the abuser, and negative influence on body image (Alves, Leitão, Sani, & Moreira, 2024).

Further to investigation of trauma characteristics associated with a CPTSD diagnosis, the research identified demographic factors which differed significantly between the sample meeting the criteria for CPTSD and the sample that did not. The CPTSD sample contained a significantly higher number of female participants than the PTSD-only sample, and the mean age of the CPTSD group was significantly higher (15.5 years, SD 2.2) than the PTSD-only group (14.1 years, SD 2.7). This raises the question as to whether older and female children and adolescents are more susceptible to developing CPTSD DSO symptoms, whether these young people are more likely to be

exposed to the types of traumas (e.g. sexual abuse) than their peers, or whether there are additional risk factors at play which underpin this finding.

However, despite identification of factors associated with a CPTSD diagnosis, the presented data do not provide strong support for the existence or utility of the CPTSD diagnosis that is fundamentally distinct from PTSD in the paediatric population, i.e. there was little evidence to support an entirely separate taxon. One consideration is that negative post-traumatic cognitions, or negative appraisals of the trauma and/or its sequelae, as referred to in the Ehlers and Clark (2000) cognitive model of PTSD, also encompass negative self-concept. This is demonstrated by the Children's Post-Traumatic Cognitions Inventory (Meiser-Stedman, Dalgleish, et al., 2009), used to assess negative post-traumatic cognitions in the DECRYPT trial, which includes items such as 'I am no good' and 'My reactions since the frightening event mean I have changed for the worse'. In the ICD-11 diagnostic criteria for CPTSD, the negative self-concept criterion is defined as 'persistent beliefs about oneself as diminished, defeated, or worthless, accompanied by deep and pervasive feelings of shame, guilt or failure related to the stressor. For example, the individual may feel guilty about not having escaped from or succumbing to the adverse circumstance, or not having been able to prevent the suffering of others.' (World Health Organization, 2019, 6B41). It is difficult to distinguish the 'negative self-concept' DSO symptom from the negative post-traumatic cognitions proposed to underly PTSD symptoms in the cognitive model. Moreover, the DSM-5 PTSD diagnosis has the symptom 'negative alterations in cognitions and mood'. This further highlights the question as to whether CPTSD comprises a separate diagnosis to PTSD or

simply refers to a greater *severity* of PTSD symptoms. A further aspect to consider is that 97.9% of participants in the PTSD-only group endorsed at least one of the DSO symptoms. This suggests that degree of complexity may be a more important clinical consideration rather than a dichotomous classification of CPTSD being present or absent.

In addition, as there is little previous research validating the diagnosis in children and adolescents, conclusions cannot be drawn regarding the prevalence rate of young people meeting criteria for CPTSD diagnosis in this sample relative to youth exposed to single-event traumas. Thus, it is unclear whether multiple or repeated traumas are *specifically* associated with the CPTSD disturbances of self-organisation (DSO) difficulties (emotional dysregulation, negative self-concept, and relationship difficulties). Despite these challenges, it is possible the CPTSD diagnosis may have use as a tool to identify young people who experience disturbances of self-organisation so that these can be addressed in treatment, pending further validation in the paediatric population.

6.2.2. Voice hearing

Amongst participants in the DECRYPT trial, 41.7% of participants reported hearing voices in the two weeks preceding baseline assessment. When comparing participants in the trial who met criteria for voice hearing with those who did not, the voice-hearing group scored significantly higher on measures of negative post-traumatic cognitions, panic symptoms, and trauma memory quality (indicating memories were more sensory-based and fragmented). The findings for post-traumatic cognitions and trauma memory

quality held when conducting a sensitivity analysis when participants whose voices could not be distinguished from PTSD intrusion symptoms (e.g. flashbacks) were removed, increasing the robustness of this finding.

The first finding of note was the prevalence of voice hearing in the sample. Previous research has established a current prevalence for voice hearing of 6.7% in children aged 4-12 years (Fujiki & Thibeault, 2024b) and 7.4% in adolescents aged 13-17 years (Fujiki & Thibeault, 2024a), with lifetime prevalences of 12% and 24.3% respectively. Therefore, the prevalence of 41.7% in the DECRYPT sample is notably higher than children and adolescents in the general population. This is an important finding as voice hearing is not commonly investigated in relation to PTSD symptomatology; the present research highlights the existence of this phenomenon and suggests it may be relatively common amongst young people exposed to multiple traumatic events. Further research in single-trauma samples could increase the generalisability of this finding. One possible limitation of this research is the potential confound between hearing voices and experiences of PTSD flashback symptoms, but qualitative analysis of the content of voices revealed that 29 of 50 participants in the voice hearing group experienced voices which appeared to be distinct from PTSD symptoms.

Between-groups comparisons of the voice hearing and non-voice hearing groups indicated that the voice hearing group scored higher on a measures of negative post-traumatic cognitions, trauma memory quality (where higher scores indicate more fragmented, poorly verbalised memories), and panic symptoms. This suggests that

cognitive processes including negative post-traumatic cognitions and poor trauma memory quality may be related to increased risk of additional difficulties beyond PTSD symptomatology. For example, poor trauma memory quality and negative post-traumatic appraisals could contribute to a sense of current threat, leading to greater awareness of bodily and cognitive phenomena and thus increasing risk of hearing voices. However, it should be noted that comparison between the groups did not identify a significant difference in PTSD symptom score between the groups. A further finding of interest was that the voice hearing and non-voice hearing groups did not differ on the prevalence of sexual trauma, so whilst the finding from the CPTSD chapter suggested that sexual trauma may be related to additional mental health difficulties, it appears that this may be specific to DSO symptoms, or at minimum does not appear to apply to the experience of voice hearing.

6.2.3. Overall phenotype

Taken together, the research presented in these two chapters using baseline data from the DECRYPT trial demonstrates that children and adolescents exposed to multiple traumatic events with PTSD have a complex presentation, with increased risk of a range of comorbid mental health difficulties. This demonstrates that there is a need for transdiagnostic assessment and treatment of young people exposed to traumatic events, especially in the case of young people exposed to multiple or repeated traumas.

Negative post-traumatic cognitions were found to be a key driver of additional complexity in both chapters, and trauma memory quality was found to differ significantly between the voice hearing and non-voice hearing groups. These findings suggest that the

cognitive model may have some applicability beyond the core PTSD symptoms, and that cognitive-behavioural factors may be transdiagnostic and predictive of additional difficulties, such as the demonstrated finding for voice hearing. This has been demonstrated in previous research; one study identified that trauma appraisals were a common risk factor for PTSD, CPTSD, depression, and generalised anxiety disorder (Memarzia et al., 2024), and another identified trauma-related appraisals, cognitive avoidance, and rumination as being associated with symptoms of posttraumatic stress and depression (Claxton, Alberici, Meiser-Stedman, & Chiu, 2025).

This supports broader theories such as the SPAARS model (Schematic, Propositional, Analogical, and Associative Representational Systems) proposed by Dalgleish (2004), a more general theory encompassing emotion and representation which focuses on the underlying relationships between memory and emotion. This proposes that maltreatment results in neurocognitive impacts affecting systems involved in memory and threat processing, which could lead to the findings above related to trauma memory and cognitive appraisals, which then result in exacerbation of interpersonal stressors and thus social thinning, an erosion of an individual's social network. When considering the neurocognitive social transactional model of psychiatric vulnerability proposed by McCrory, Foulkes, and Viding (2022), the findings for negative post-traumatic cognitions support the stress generation phase, in which individuals exposed to maltreatment are more likely to experience interpersonal stressor events due to maladaptive neurocognitive processing. In the DECRYPT sample, negative appraisals may have directly worsened psychopathology, but also increases the risk of further

trauma exposure that in turn further worsens mental health. However, the lack of significant findings on the measure of social support does not support the social thinning mechanism, in which stress generation leads to a gradual erosion in the quantity and quality of social ties, increasing vulnerability to further psychiatric comorbidities. This may be because the present thesis focused specifically on voice hearing and CPTSD symptoms; social thinning may be a mechanism in the development of other comorbidities associated with PTSD.

6.3. Treatment of PTSD in children and adolescents

6.3.1. Efficacy of TF-CBT and EMDR

The systematic review and meta-analysis presented provides a thorough analysis of the effectiveness of gold-standard psychological treatments (TF-CBT and EMDR) for children and adolescents with PTSD. In addition, the use of a novel method to impute response rates and present the results in terms of percentage of participants reaching different thresholds of treatment response provides figures which are easy to interpret relative to effect sizes which are traditionally reported. The primary outcome investigated was a 50% reduction in PTSD symptoms and response rates were also imputed for 20% symptom reduction as well as reliable improvement and deterioration to provide a broader picture of how children and adolescents respond to psychological therapies, alternative therapies used in control arms, and passive control conditions such as a waitlist.

The results support the use of psychological therapies to treat youth with PTSD, as these showed greater response rates (46%, 95% CI 39-52) than active control conditions (28%, 95% CI 22-34) at posttreatment, as well as lower rates of reliable deterioration (psychological therapies: 1%, 95% CI 1-2; active control conditions 7%, CI 95% 2-14). However, this also demonstrates that there is still room for treatments to be improved in order to increase the percentage of young people experiencing a 50% reduction in PTSD symptoms over the course of treatment, as currently this is only the case for less than half of youth included in the analysed trials. When setting the response threshold at 20% symptom reduction, for psychological therapies, the response rate was 75% (95% CI 70-80), whilst for control conditions (all types, including both active and passive), the response rate was 48% (95% CI 42-53). This shows that the difference between psychological therapies and control conditions is present even at lower symptom reductions, but that there are still a minority of young people who do not experience improvement in PTSD symptoms as a result of receiving psychological therapies. Furthermore, at posttreatment, reliable improvement was exhibited by 53% (CI 45-61) of youth receiving psychological therapies for PTSD compared to 25% (CI 20-30) of youth in control conditions. Reliable change indices (calculated as change in symptom score divided by standard error of the difference) are useful for identifying statistically significant change, increasing robustness of the analyses assessing improvement and deterioration.

When considering the comparison between the two types of psychological therapy (TF-CBT and EMDR), the results appear to support TF-CBT as the first-line

recommended treatment for young people with PTSD, as the imputed response rate was 48% of youth displaying a 50% reduction in PTSD for TF-CBT, compared to 30% for EMDR. However, it should be noted that comparison between TF-CBT and EMDR was not significant, so this finding is not conclusive. On a related note, the synthesis of trials assessing psychological therapies for PTSD in youth also demonstrated the comparable lack of research conducted to assess EMDR relative to TF-CBT, thus limiting the power of the calculation; more robust comparisons could be made with further trials investigating EMDR, especially comparing EMDR to active control conditions, and incorporating follow-ups over the longer-term (over six months).

The systematic review also investigated the effect of psychological therapies on symptoms of depression, although these were expectedly only reported in a subset of 40 of the 59 trials included in the meta-analysis. At posttreatment, 33% (CI 26-41) of young people who received psychological therapies exhibited a 50% reduction in depression symptoms, compared to 18% (CI 13-23) of young people allocated to control conditions. This demonstrates the transdiagnostic benefit of psychological therapies for PTSD, an important consideration given the comorbidity of depression with PTSD (Lewis et al., 2019).

6.3.2. Mechanisms of improvement

To extend the findings from the systematic review and meta-analysis, the mechanisms of improvement chapter used data from a pragmatic trial comparing a type of TF-CBT, cognitive therapy for PTSD (CT-PTSD), with treatment as usual to investigate factors which may underlie the symptom improvement experienced by young people

receiving treatment for PTSD. This investigation comprised two parts: one to assess whether scores on measures of psychopathological and cognitive-behavioural factors mediated the relationship between treatment arm and PTSD symptom score at 11-month follow-up and the second to compare responders with non-responders (defined by 50% PTSD symptom improvement) on change scores of the same factors over the course of treatment. An initial finding was that only 30% of participants demonstrated a 50% reduction in PTSD symptoms at 11-month follow-up. When compared to the trials assessing TF-CBT in the systematic review and meta-analysis chapter, these had an average response rate of 62% (CI 44-78) at 12+ month follow-ups, although it should be noted that the DECRYPT sample was comprised of youth with exposure to multiple traumatic events, and potentially more complex psychopathological presentations prior to treatment.

In the mediation analysis, posttreatment scores on measures of post-traumatic cognitions, trauma memory quality, safety-seeking behaviours, trauma-related rumination, and self-blame were found to predict PTSD symptoms at 11 months, but no indirect effects were found. In the comparison of responders and non-responders, change scores from baseline to posttreatment on measures assessing post-traumatic cognitions, safety-seeking behaviours, trauma memory quality, trauma-related rumination, and self-blame were identified as being significantly higher for participants who satisfied the criteria to be in the responder group. There was no significant difference between the responder and non-responder groups on change in social support from baseline to posttreatment, or on age at randomisation, or scores on measures of

therapeutic alliance and treatment credibility at posttreatment. However, there was a significantly higher proportion of males in the responder group (44.4%) than the non-responder group (20.2%).

These results have implications for the treatment of young people with PTSD and broadly support the targeting of post-traumatic cognitions, trauma memory quality, safety-seeking behaviours, trauma-related rumination, and self-blame during therapy. Given the presented analysis of the baseline phenotype of participants in the DECRYPT trial, these implications are applicable for young people who have a complex presentation alongside a PTSD diagnosis. However, given the lack of mediation effects and that the discussed factors did not account for all variance in PTSD symptoms at the 11-month follow-up, it is clear that understanding could still be improved in regard to the exact mechanisms by which children and adolescents experience improvements in their PTSD symptoms over the course of therapy. That said, it should be noted that the total reported effect of CT-PTSD relative to TAU was only modest (Meiser-Stedman et al., 2025), giving little effect to deconstruct, and the sample size reduced the power of the analyses, so the percentage mediated by the factors included in the analysis was reasonable.

6.4. Limitations and further research

The present thesis analysed data from a clinical trial of children and adolescents exposed to multiple traumatic events, therefore further research should seek to ascertain whether CPTSD is associated with multiple traumatic events specifically and

is more likely to be present in these young people, relative to those exposed to single event traumas.

When considering the chapter which investigated voice hearing within the DECRYPT sample, it should be noted that there is a lack of validated measures assessing voice hearing specifically and psychosis symptoms more generally in children and adolescents. However, it should be kept in mind that whilst additional measures would be useful, participant burden should also be considered, especially amongst the paediatric population, as well as comprehensibility of such measures for this age range; therefore, interviews administered by clinicians may be preferable.

In a similar vein, it should be acknowledged that there were a large range of measures and concepts assessed through the battery of semi-structured interviews and questionnaires completed by participants as well as their parents or caregivers throughout the DECRYPT trial. This is useful for assessing the applicability of models such as the cognitive model of PTSD and accommodating analyses of the mechanisms of change involved in PTSD symptom reduction amongst children and adolescents with a PTSD diagnosis. Ideally, all trials would include a similarly large battery of questionnaires and interviews, but this isn't always feasible due to participant burden and available resources impacting funding and clinician availability for diagnostic interviews. However, one takeaway from the present research is that there are a number of factors which may be useful to assess at intake assessment when young people are beginning treatment for PTSD. Understanding of trauma characteristics including number of traumatic events (single vs multiple/repeated) and type of traumatic events

(e.g. sexual abuse vs other types of trauma) could be useful given the potential for greater complexity in presentations of youth exposed to multiple traumas and/or sexual abuse. In addition, awareness of the CPTSD DSO symptoms as a signpost for risk of greater complexity and comorbidity could be useful.

When considering the research investigating mechanisms of improvement within the DECRYPT trial, these were exploratory analyses and the sample size afforded only moderate power, which may go some way to account for the lack of significant mediation effects identified. In addition, the control arm could be considered powerful as participants could receive any psychological treatment chosen by their therapists. This lack of significant effects means that further research should seek to confirm factors which influence improvement of PTSD symptoms in children and adolescents over the course of treatment. Furthermore, the factors investigated in the present research did not account for all of the variance in PTSD symptoms, indicating that further factors could be investigated to improve understanding of the underlying process and thus potentially develop the available treatments for young people with PTSD.

The systematic review and meta-analysis demonstrated the effectiveness of psychological treatments for PTSD and provided useful information for clinicians through the imputation of response rates. However, there were much fewer trials and thus participants involved in trials assessing EMDR in youth with PTSD. As the recommended second-line treatment in the UK by NICE for children and adolescents with a PTSD diagnosis who do not respond to TF-CBT, further research should be conducted to analyse the efficacy of this treatment and investigate potential

mechanisms for change such as cognitive-behavioural and psychosocial factors in order to inform a comparison between EMDR and TF-CBT. EMDR does not appear to explicitly address the factors identified as salient in the present research, and there is a gap in the understanding as to the mechanism by which EMDR operates and delivers results, supporting the hierarchy of TF-CBT being the preferred first-line treatment. In addition, there was a specific lack of trials comparing EMDR with active control arms, so further research should seek to address this. A further area to consider is that there was still a proportion of more than half of young people receiving psychological therapies who did not display 50% symptom reduction by posttreatment, and around a quarter who didn't display a 20% symptom reduction. These findings demonstrate that further development should be pursued in order to increase the proportion of young people benefitting from psychological therapies for PTSD, and further, possibly increase the improvement beyond these thresholds to strive for even greater symptom reduction.

Further research could seek to identify mechanisms shared by the development and maintenance of PTSD and additional psychopathology, such as depression and panic disorder, and mechanisms which are unique to each condition. This could inform the tailoring of treatment for the presentation of each young person receiving PTSD treatment; in the context of TF-CBT, this could mean a treatment plan comprised of core modules aimed to address PTSD mechanisms alongside additional modules to address further psychopathology or comorbidities. The present research highlighted that a large proportion of young people with PTSD after multiple trauma exposure report hearing voices, so strategies to address voice hearing should be considered. Given the

associations identified between voice hearing and cognitive mechanisms (post-traumatic appraisals and trauma memory quality), TF-CBT may be useful to address these symptoms, so this could be a candidate for one of the aforementioned bolt-on treatment modules for relevant young people. When considering the core modules of TF-CBT, negative post-traumatic appraisals were identified to be associated with greater complexity in terms of both meeting criteria for CPTSD and experiencing voice hearing, as well as being significantly worse in non-responders than responders at posttreatment. Over the course of the DECRYPT trial, scores on the CPTCI assessing negative trauma appraisals only reduced from 73.3 (SD 16.6) at baseline to 63.6 (SD 18.3) at posttreatment, indicating that there is further improvement to be sought in addressing these appraisals, which appear to be key in the development and maintenance of PTSD symptoms.

6.5. Conclusion

The present thesis provides insights into the phenotype of children and adolescents with a PTSD diagnosis after exposure to multiple traumatic events who participated in the DECRYPT trial. A large proportion were found to meet criteria for CPTSD, but the utility of this diagnosis in the paediatric population was not confirmed. In addition, a large proportion were found to hear voices, demonstrating the additional complexity and psychopathology beyond PTSD symptoms that young people with experience of trauma may demonstrate. The systematic review and meta-analysis established that nearly 50% of young people receiving psychological therapies for PTSD

exhibit 50% PTSD symptom reduction, supporting the use of TF-CBT as the first line therapy offered to youth presenting with PTSD and highlighting the potential room for improvement when considering paediatric PTSD treatments. Finally, mediation analysis of the DECRYPT trial demonstrated that a range of cognitive-behavioural factors were associated with later PTSD symptoms (although no indirect effects of CT-PTSD were found), and comparison between responders and non-responders (defined by 50% symptom reduction) regardless of treatment arm established that cognitive-behavioural factors significantly differed by response status.

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7. Supplementary Materials

7.1. Appendix S1. Complex PTSD Interview

COMPLEX ITEMS

"Following onset of the stressor event and co-occurring with PTSD symptoms, there is the development of persistent and pervasive impairments in affective, self and relational functioning including problems in affect regulation, persistent beliefs about oneself as diminished, defeated or worthless, persistent difficulties in sustaining relationships" [ICD-11 Working Group, January 31, 2012]

Problems in affect dysregulation are characterized by heightened emotional reactivity to and difficulty recovering from minor stressors, violent outbursts, reckless or self-destructive behaviour and tendency towards dissociative states when under stress. In addition, there may be emotional numbing, particularly a lack of ability to experience pleasure or positive emotions.

The individuals also develops persistent beliefs about himself or herself as diminished, defeated or worthless accompanied by deep and pervasive feelings of shame, guilt or failure related to, for example, not having escaped from or succumbing to the adverse circumstance, or not having been able to prevent the suffering of others.

There are also persistent difficulties in sustaining relationships. This may present in a variety of ways and is characterized primarily by difficulties in feeling close to others. The person may consistently avoid, deride or have little interest in relationships and social engagement more generally. Alternatively there may be occasional intense relationships but the person has difficulty sustaining them.

0	**1**	**2**	**3**	**4**
Not at all	**Once a week or less/a little**	**2 to 3 times a week/somewhat**	**4 to 5 times a week/a lot**	**6 or more times a week/almost always**

1.	*AFFECTIVE DYSREGULATION* Do you get really upset by things that don't upset other people? *Follow-up questions for positive responses*: How often in the past month have you got really upset by small things? When you get upset do you find it hard to control your temper? When you get upset about things, how long does it take you to calm down? Do your feelings tend to be easily hurt? Do you find it hard to enjoy things or feel positive feelings?	0	1	2	3	4

0	1	2	3	4
Not at all	**Once a week or less/a little**	**2 to 3 times a week/somewhat**	**4 to 5 times a week/a lot**	**6 or more times a week/almost always**

2.	*NEGATIVE SELF-CONCEPT* Do you feel like you are no good? *Follow-up questions for positive responses*: How often do you feel like you're no good? Do you feel like you don't matter or that you're worthless? How strong is this feeling? Do you feel guilty or ashamed of yourself?	0	1	2	3	4
3.	*DIFFICULTIES IN SUSTAINING RELATIONSHIPS* Do you find it difficult to have good friends? *Follow-up questions for positive responses*: Do you find it easier not to have friends? Have you given up on having friends? Do you find friendships are always difficult and leave you feeling hurt? How interested are you in getting closer friends?	0	1	2	3	4

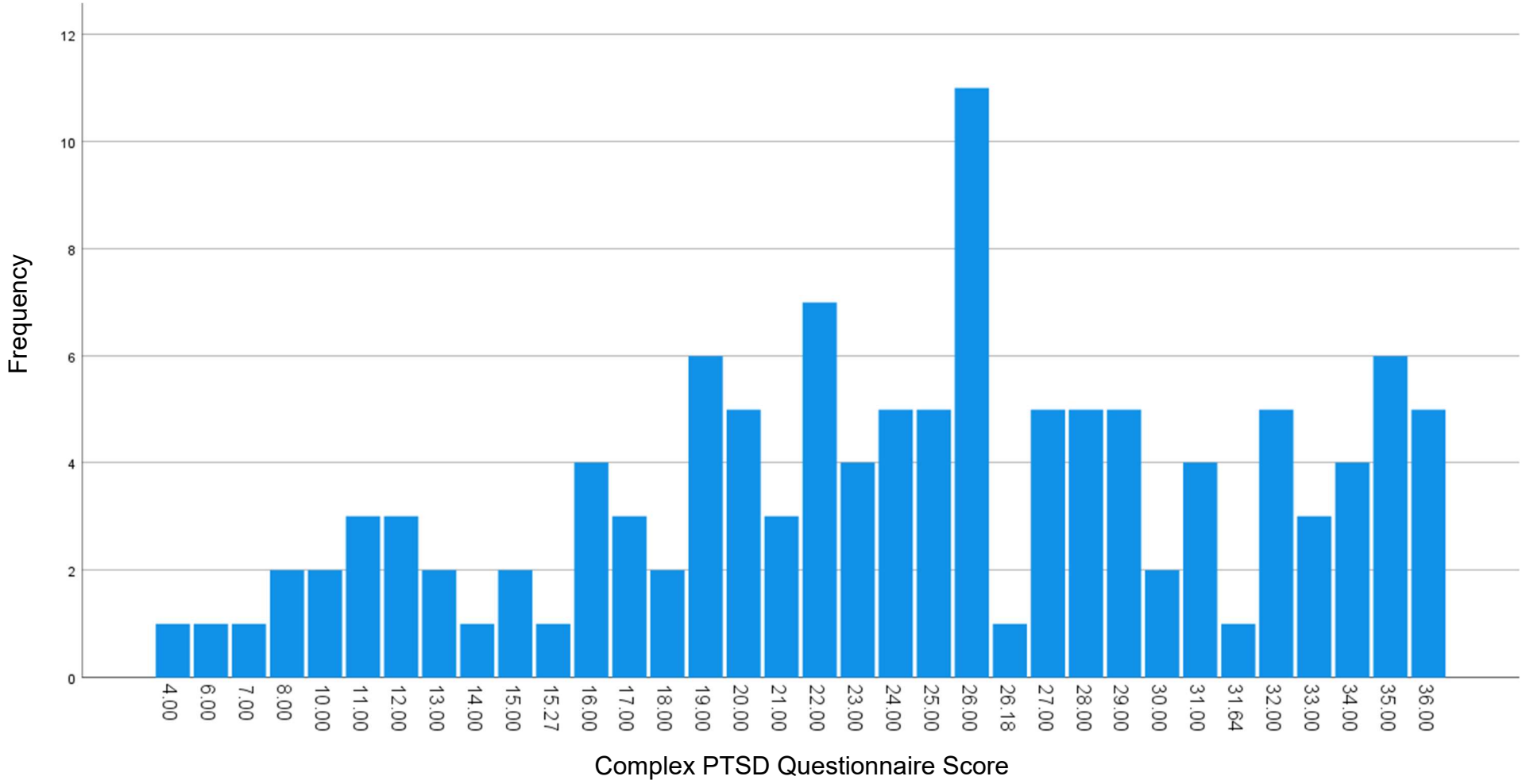
1
2

7.2. Appendix S2. Complex PTSD Checklist

Below are a list of some other problems children and young people sometimes have after very scary or upsetting experiences. Please read each one, and tell me how much each one has been true for you in the **past 2 weeks**?

		Never	Once in a while	Half the time	Almost always
1.	When I am upset, it takes me a long time to calm down.	[ ]	[ ]	[ ]	[ ]
2.	Sometimes I get really angry and cannot control my temper.	[ ]	[ ]	[ ]	[ ]
3.	I get really upset by things that don't bother other people.	[ ]	[ ]	[ ]	[ ]
4.	My feelings get hurt easily.	[ ]	[ ]	[ ]	[ ]
5.	I feel like I am no good.	[ ]	[ ]	[ ]	[ ]
6.	I feel guilty about lots of things.	[ ]	[ ]	[ ]	[ ]
7.	I don't matter.	[ ]	[ ]	[ ]	[ ]
8.	I am worthless.	[ ]	[ ]	[ ]	[ ]
9.	It is easier not to have friends.	[ ]	[ ]	[ ]	[ ]
10.	I don't feel close to anyone.	[ ]	[ ]	[ ]	[ ]
11.	I find it difficult to have good friends.	[ ]	[ ]	[ ]	[ ]
12.	My friendships are always difficult and leave me feeling hurt.	[ ]	[ ]	[ ]	[ ]

7.3. Figure S1. Complex PTSD Questionnaire Score



7.4. Table S1. Partial Correlation Analyses Controlling for PTSD Symptom Severity

Measure	*n*	*r*	*p*
Trauma Characteristics			
Sexual trauma*	120	.252	**.006**
Number of trauma types	120	.243	.008
Intrafamilial abuse*	120	.169	.066
Trauma frequency	120	.146	.113
Psychopathology			
Depression (RCADS)	120	.479	**<.001**
Suicidal ideation (MFQ-SI)	119	.511	**<.001**
Panic (RCADS)	120	.346	**<.001**
Dissociation	120	.356	**<.001**
Generalised Anxiety Disorder (RCADS)	120	.292	**.001**
Impairment (CPSS)	119	.359	**<.001**
Borderline personality disorder traits (MSI)	98	.349	**<.001**
Irritability (ARI-C)	120	.215	.019
Parent-report emotional difficulties (SDQ)	94	.373	**<.001**
Cognitive and Social Factors			
Negative post-traumatic cognitions (CPTCI)	118	.498	**<.001**
Safety behaviours, suppression (CSBS)	115	.314	**<.001**
Trauma memory quality (TMQQ)	120	.206	.024
Social support (MSPSS)	119	-.142	.124
Safety behaviours, hypervigilance (CSBS)	114	.008	.929

Note: Partial correlation conducted with CRIES-8 score as the control variable. Significant results depicted in bold. A Holm-Bonferroni correction was applied.

7.5. Appendix S3. Dissociation Interview

DISSOCIATION (post-event)

Specify whether:
With dissociative symptoms: The individual's symptoms meet the criteria for post-traumatic stress disorder, and in addition, in response to the stressor, the individual experiences persistent or recurrent symptoms of either of the following:

1. **Depersonalization**: Persistent or recurrent experiences of feeling detached and as if one were an outside observer of, one's mental processes or body (e.g. feeling as though one were in a dream; feeling a sense of unreality of self or body or of time moving slowly).

2. **Derealization**: Persistent or recurrent experiences of unreality of surroundings (e.g., the world around the individual is experienced as unreal, dreamlike, distant or distorted).

Note: To use this subtype, the dissociative symptoms must not be attributable to the physiological effects of a substance (e.g., blackouts, behavior during alcohol intoxication) or another medical condition (e.g., complex partial seizures).

	0	**1**	**2**	**3**	**4**
	Not at all	**Once a week or less/a little**	**2 to 3 times a week/somewhat**	**4 to 5 times a week/a lot**	**6 or more times a week/almost always**
1.	**Depersonalization** Have you felt as if you were outside your body? *Follow-up questions for positive responses*: Have you felt as if your body doesn't really belong to you? Has it felt like time is moving very slowly? Have you felt as if you're not really where you actually are? How often has this happened in the past month? How strong is this feeling? *CONFIRM THAT NOT RELATED TO ALCOHOL OR OTHER SUBSTANCES*	0	1	2	3	4
2.	**Derealization** Have you felt as if things around you weren't real? *Follow-up questions for positive responses*: Have you felt as if you were in a dream or a film/movie?	0	1	2	3	4

0	1	2	3	4
Not at all	**Once a week or less/a little**	**2 to 3 times a week/somewhat**	**4 to 5 times a week/a lot**	**6 or more times a week/almost always**

1	Do things around you seem strange or unusual? How often has this happened in the past month? How strong is this feeling? *CONFIRM THAT NOT RELATED TO ALCOHOL OR OTHER SUBSTANCES*					

7.6. Table S2. Normality Test

Measure	Kolmogorov-Smirnov	
	Statistic	*p*
Negative cognitions (CPTCI)	.088	.086
PTSD symptoms (CRIES-8)	**.162**	**<.001**
Memory quality (TMQQ)	.063	.200
Panic disorder (RCADS)	.094	.052
RCADS total score	**.098**	**.033**
Anxiety (RCADS)	.088	.088
Safety behaviours (CSBS)	.089	.076
Dissociation	**.107**	**.014**
Parent-rated emotional difficulties (SDQ)	**.099**	**.030**
Depression (RCADS)	.080	.200
Irritability (ARI-C)	**.120**	**.003**
Social support (MSPSS)	.069	.200
Transformed Variables		
PTSD symptoms (CRIES-8) square root	**.175**	**<.001**
RCADS total score square root	.078	.200
Dissociation square root	**.129**	**<.001**
Parent-rated emotional difficulties (SDQ) square root	.071	.200
Irritability (ARI-C) square root	**.121**	**.003**

Note: Significant results depicted in bold; a significant result indicates that the distribution of that variable is significantly different from a normal distribution. CPTCI – Post-Traumatic Cognitions Inventory, Child version; CRIES-8 = Child Revised Impact of Events Scale; TMQQ = Trauma Memory Quality Questionnaire; RCADS = Revised Child Anxiety and Depression Scale; CSBS = Child Safety Behaviour Scale; SDQ

= Strengths and Difficulties Questionnaire; ARI-C = Affective Reactivity Index – Child version; MSPSS = Multidimensional Scale of Perceived Social Support.

7.7. Table S3. Sensitivity Analysis (Participants with voices indistinguishable from flashbacks/intrusions removed)

Measure	Voices group *(n=29), m (SD)*	No voices group *(n=70), m (SD)*	Test Statistic	*p*	Effect Size (*Cohen's d*)
Primary Analysis					
Negative cognitions (CPTCI)	**80.3 (13.2)**	**70.7 (17.2)**	***t* = 1.80**	**.01**	**.588**
PTSD symptoms (CRIES-8)	33.7 (4.83)	30.6 (6.42)	*U* = 723.5	.024	.466
Sexual trauma*	14 (48.3%)	25 (35.7%)	χ^2 = 1.36	.244	.324
Secondary Analysis					
Memory quality (TMQQ)	**34.3 (5.00)**	**30.0 (5.25)**	***t* = 3.73**	**<.001**	**.823**
Panic disorder (RCADS)	16.4 (6.59)	12.9 (7.36)	*t* = 2.28	.025	.503
RCADS total score	88.4 (24.1)	77.4 (25.2)	*t* = 1.97	.052	.435
Anxiety (RCADS)	12.8 (3.89)	11.3 (4.05)	*t* = 1.60	.112	.354
Safety behaviours (CSBS)	38.1 (6.96)	34.4 (7.60)	*t* = 2.23	.028	.498
Dissociation	7.69 (2.59)	6.51 (2.53)	*U* = 746.5	.038	.427
Parent-rated emotional difficulties (SDQ)	23.3 (7.26)	20.6 (6.04)	*t* = 1.58	.120	.392
Depression (RCADS)	20.8 (6.70)	18.9 (6.21)	*t* = 1.38	.170	.306
Irritability (ARI-C)	9.64 (4.27)	7.36 (3.98)	*U* = 684.5	.011	.531
Complex PTSD diagnosis*	15 (51.7%)	41 (58.6%)	χ^2 = 0.391	.532	.117
Social support (MSPSS)	57.4 (12.9)	57.9 (13.0)	*t* = 0.185	.854	.041

Note: Significant results depicted in bold. A Bonferroni correction was applied for the three primary analyses and a Holm-Bonferroni correction was applied for the secondary analysis.

CPTCI – Post-Traumatic Cognitions Inventory, Child version; CRIES-8 = Child Revised Impact of Events Scale; TMQQ = Trauma Memory Quality Questionnaire; RCADS = Revised Child Anxiety and Depression Scale; CSBS = Child Safety Behaviour Scale; SDQ

= Strengths and Difficulties Questionnaire; ARI-C = Affective Reactivity Index – Child version; MSPSS = Multidimensional Scale of Perceived Social Support.
*Categorical variables so frequencies rather than means are reported.

7.8. Table S4. Logistic regression modelling of voice hearing, controlling for dissociation

Model number	Predictor variable	Model Nagelkerke R^2	Model χ^2 (df = 2)	Predictor variable Wald statistic	Predictor variable Odds ratio
1	Negative cognitions (CPTCI)	.066	5.92 (*p* = .052)	2.66 (*p* = .103)	1.02
	Dissociation			.182 (*p* = .670)	1.04
2	Memory quality (TMQQ)	.188	18.1 (*p* < .001)	**12.25 (*p* < .001)**	1.18
	Dissociation			.003 (*p* = .960)	1.00
3	Panic disorder (RCADS)	.091	8.43 (*p* = .015)	**4.82 (*p* = .028)**	1.07
	Dissociation			.248 (*p* = .618)	1.05

7.9. Table S5. Logistic regression modelling of voice hearing, controlling for dissociation (using sensitivity analysis groups with participants with voices indistinguishable from intrusions/flashbacks removed)

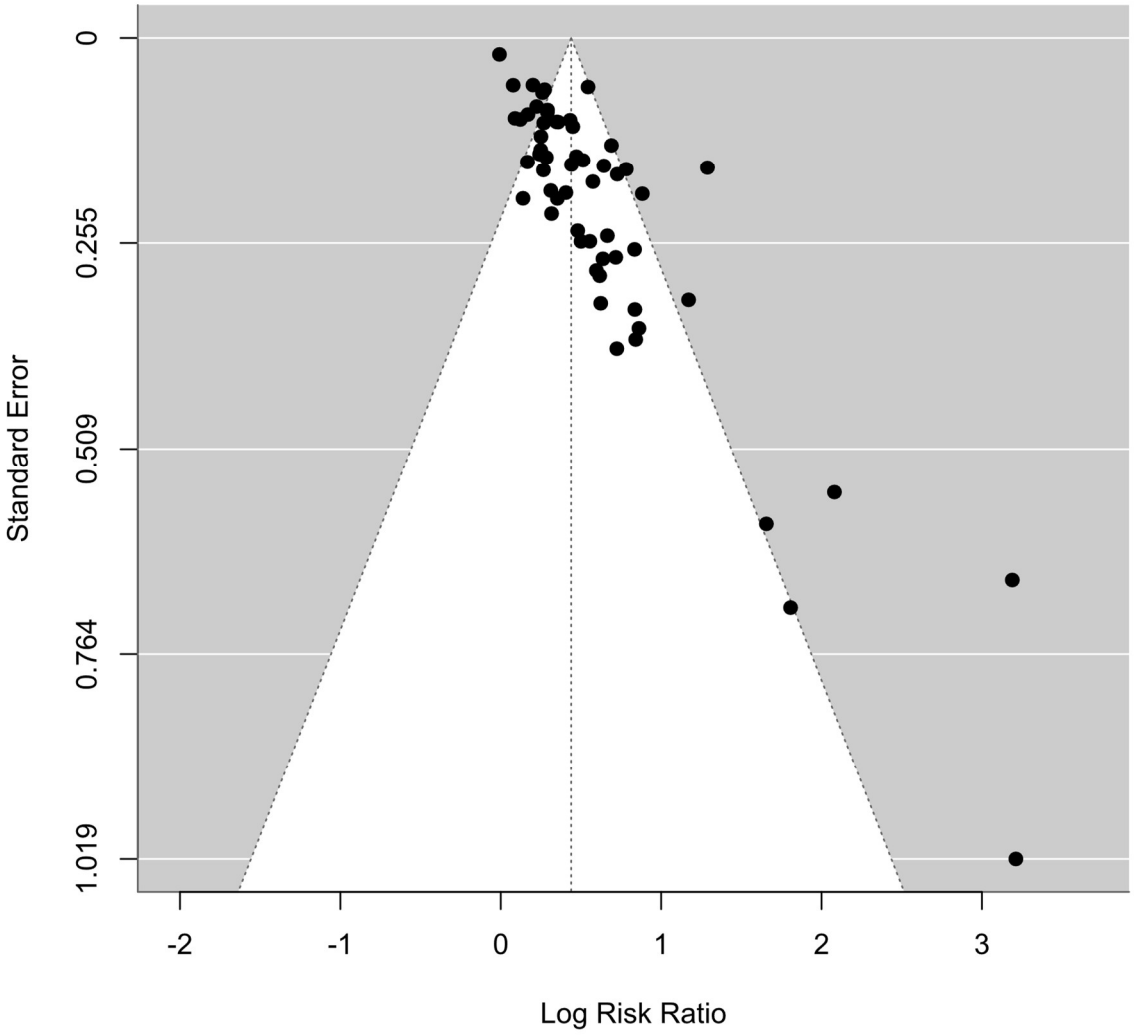
Model number	Predictor variable	Model Nagelkerke R^2	Model χ^2 (df = 2)	Predictor variable Wald statistic	Predictor variable Odds ratio
1	Negative cognitions (CPTCI)	.047	4.01 (p = .134)	.938 (p = .333)	1.02
	Dissociation			.664 (p = .415)	1.09
2	Memory quality (TMQQ)	.122	11.0 (p < .004)	**6.94 (p = .008)**	1.13
	Dissociation			.269 (p = .604)	1.05
3	Panic disorder (RCADS)	.070	6.21 (p = .045)	2.82 (p = .093)	1.06
	Dissociation			.564 (p = .453)	1.07

7.10. Appendix S4. Search Strategy

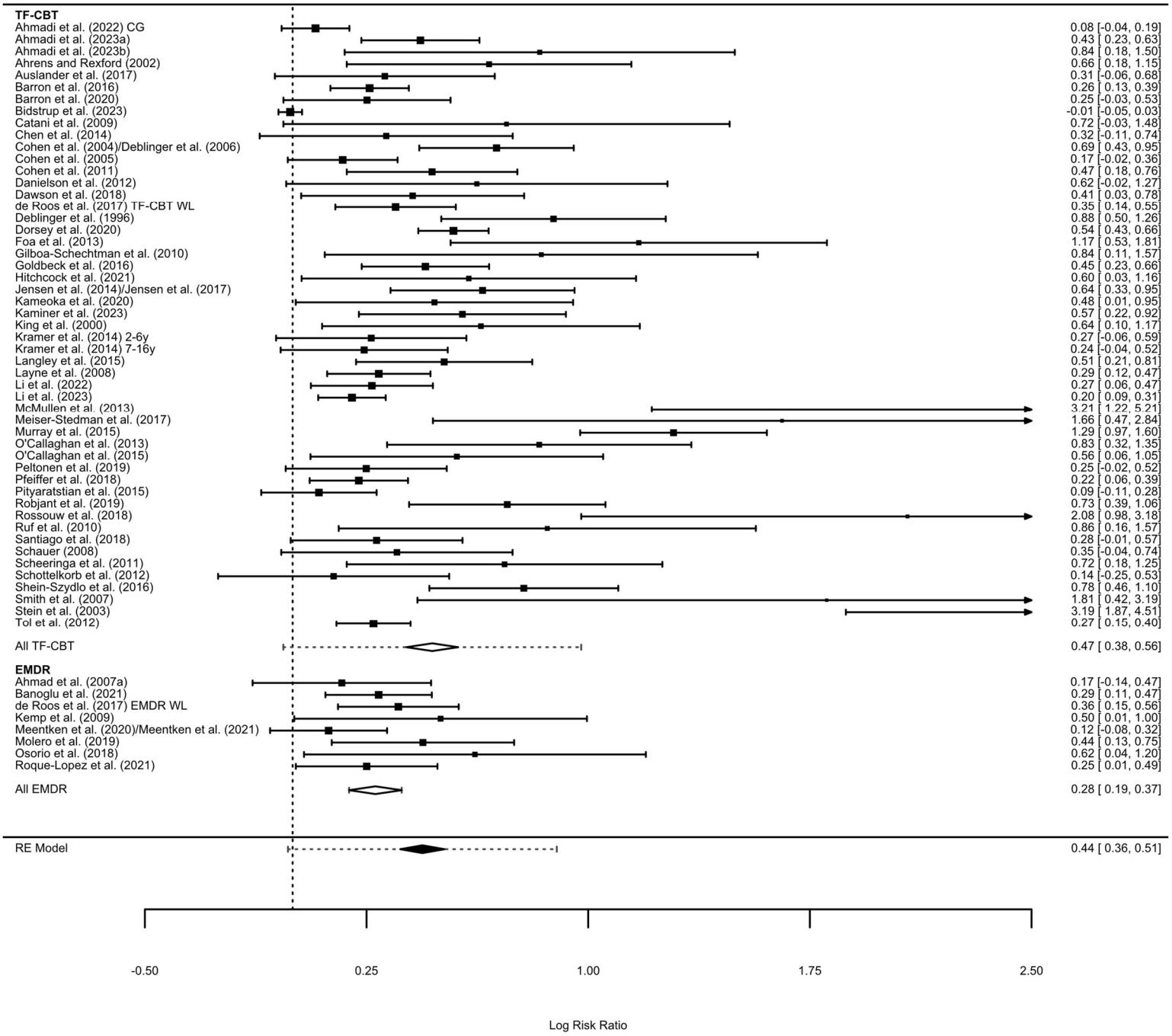
Databases: MEDLINE, PsycINFO, PubMed, PTSDPubs

Terms: Posttraumatic Stress Disorder (Posttraumatic stress OR post-traumatic stress OR Posttraumatic syndrome* OR post traumatic syndrome* OR PTSD OR P.T.S.D OR PTSS OR psychotraumatology OR traumatic stress) and Children (child* OR adolescen* OR teen* OR student* OR pupil* OR minor* OR youth* OR pediat* OR boy* OR girl*) and Treatment (EMDR OR eye movement desensitisation and reprocessing OR cognitive behaviour* therapy OR CBT OR C.B.T. OR trauma-focused cognitive behavioural therapy) and Randomized Controlled Trial (randomized control* OR randomised control* OR RCT OR controlled clinical trial OR controlled trial OR random allocation*).

7.11. Figure S2. Funnel Plot for 50% Improvement Risk Ratio, PTSD Symptoms



7.12. Figure S3. Forest Plot for 50% Improvement Risk Ratio, PTSD Symptoms



7.13. Table S6. Absolute proportion of participants showing improvement and reliable change in PTSD symptoms at follow-up, TF-CBT and EMDR

Analysis	k	N	Proportion	95% CI	95% PI	Cochran's Q	I^2
Follow-up (1-5 months)							
50% improvement							
All	19	555	0.44	0.34, 0.55	0.09, 0.84	105.5***	83.1%
All, assume dropout are non-responders	19	666	0.38	0.27, 0.50	0.03, 0.83	141.5***	88.5%
EMDR vs TF-CBT							
EMDR	3	60	.47	.24, .72	.09, .87	7.2*	72.3%
TF-CBT	16	495	.44	.32, .56	.08, .85	97.6***	85.0%
20% improvement							
All	19	555	.74	.63, .84	.26, 1.00	139.3***	87.2%
All, assume dropouts are non-responders	19	666	.64	.50, .77	.11, 1.00	187.1***	92.0%
Reliable change							
All studies							
Improvement	19	555	.52	.37, .67	.03, .99	230.1***	91.9%
Deterioration	19	555	.02	.01, .04	.00, .13	39.6*	56.2%
TF-CBT only							
Improvement	16	495	.51	.34, .68	.01, .99	217.8***	93.2%
Deterioration	16	495	.02	.01, .05	.00, .15	36.9*	61.4%
Follow-up (6+ months)							
50% improvement							
All	13	712	.59	.41, .76	.05, 1.00	161.7***	94.7%
All, assume dropout are non-responders	13	781	.53	.35, .71	.02, .99	217.5***	95.7%
EMDR vs TF-CBT							
EMDR	1	30	.25	.11, .41	.11, .41	0.0	0.00%
TF-CBT	12	682	.62	.44, .78	.07, 1.00	140.5	94.7%
20% improvement							
All	13	712	.88	.76, .96	.40, 1.00	124.7***	92.4%
All, assume dropouts are non-responders	13	781	.80	.64, .92	.21, 1.00	240.6***	95.2%
Reliable change							
All studies							
Improvement	13	712	.72	.53, .88	.09, 1.00	214.3***	95.7%
Deterioration	13	712	.0004	.0000, .0033	.0000, .0033	2.4	0.00%
TF-CBT only							
Improvement	12	682	.73	.53, .89	.08, 1.00	208.4***	96.1%
Deterioration	12	682	.0003	.0000, .0031	.0000, .0031	2.0	0.00%

Note. [1] Only using the TF-CBT studies.

***p<.0001 **p<.001 *p<.05

7.14. Table S7. Absolute proportion of participants showing improvement and reliable change in PTSD symptoms at follow-up, control conditions

Analysis	k	N	Proportion	95% CI	95% PI	Cochran's Q	I^2	Moderator p
Follow-up (1-5 months)								
50% improvement								
All	20	541	.22	.15, .31	.01, .60	87.2***	80.2%	
All, dropouts as non-responders	20	634	.20	.12, .29	.00, .61	123.6***	85.1%	
Active vs passive								<.01
Active	14	431	.29	.19, .39	.03, .66	58.8***	80.6%	
Passive	6	110	.10	.04, .17	.02, .24	6.1	29.6%	
20% improvement								
All	20	541	.51	.42, .60	.17, .84	75.5***	76.8%	
All, dropouts as non-responders	20	634	.44	.34, .55	.08, .85	129.3***	85.7%	
Reliable change								
All studies								
Improvement	20	541	.27	.18, .37	.01, .70	111.6***	83.7%	
Deterioration	20	541	.13	.05, .24	.00, .70	174.7***	90.8%	
Active conditions								
Improvement	14	431	.32	.20, .44	.02, .76	85.6***	85.4%	
Deterioration	14	431	.08	.01, .19	.00, .63	107.0***	91.8%	
Passive conditions								
Improvement	6	110	.16	.06, .29	.00, .49	16.9*	66.7%	
Deterioration	6	110	.30	.16, .45	.05, .65	13.4*	65.1%	
Follow-up (6+ months)								
50% improvement								
All	13	708	.43	.29, .57	.04, .88	84.0***	91.6%	
All, dropouts as non-responders	13	778	.38	.25, .51	.03, .83	94.0***	92.0%	
Active vs passive								
Active	11	657	.49	.37, .61	.15, .84	49.7***	86.7%	
Passive	2	51	.10	.00, .36	.00, .56	5.2*	80.7%	
20% improvement								
All	13	708	.73	.58, .85	.22, 1.00	93.2***	92.3%	
All, dropouts as non-responders	13	778	.63	.50, .76	.18, .97	104.5***	91.8%	
Reliable change								
All studies								
Improvement	13	708	.52	.35, .69	.03, .98	137.1***	94.7%	
Deterioration	13	708	.02	.00, .06	.00, .21	51.0***	82.2%	
Active conditions								
Improvement	11	657	.56	.37, .74	.05, .99	116.0***	94.7%	
Deterioration	11	657	.00	.00, .02	.00, .04	18.3	41.7%	

Passive conditions							
Improvement	2	51	.31	.00, .82	.00, 1.00	15.1**	93.4%
Deterioration	2	51	.18	.00, .59	.00, .85	9.4*	89.4%

***p<.0001, **p<.001, *p<.05

7.15. Table S8. Absolute proportion of participants showing improvement and reliable change in depression symptoms at post-treatment, TF-CBT and EMDR

Analysis	k	N	Proportion	95% CI	95% PI	Cochran's Q	I^2	Moderator p
50% improvement								
All	40	1584	.33	.26, .41	.02, .79	369.4***	90.3%	
All, assume dropout are non-responders	40	1704	.30	.23, .38	.01, .76	359.4***	90.4%	
EMDR vs TF-CBT								.94
EMDR	5	132	.33	.09, .63	.00, .95	39.1***	91.8%	
TF-CBT	35	1452	.33	.25, .41	.02, .78	324.5***	90.2%	
Trauma type[1]								.45
Single	9	255	.28	.10, .51	.00, .91	114.2***	92.4%	
Multiple	26	1197	.35	.27, .43	.05, .73	194.2***	87.7%	
Treatment format[1]								.86
Group	17	831	.33	.24, .43	.06, .70	116.6***	86.2%	
Individual	18	621	.32	.20, .46	.00, .86	206.9***	92.0%	
Country type[1]								.79
HIC	19	644	.34	.23, .46	.01, .83	180.5***	89.8%	
LMIC	16	808	.32	.21, .43	.02, .75	143.0***	90.5%	
Trauma type[1]								.84
Sexual trauma exclusive	4	160	.35	.14, .60	.01, .84	23.4***	87.0%	
Other	31	1292	.33	.24, .42	.01, .79	298.9***	90.6%	
RoB[1]								.41
Low	12	503	.38	.23, .54	.02, .87	124.2***	91.6%	
High	23	949	.30	.21, .40	.02, .75	197.6***	89.2%	
20% improvement								
All	40	1584	.60	.52, .68	.15, .96	343.2***	90.0%	
All, assume dropouts are non-responders	40	1704	.55	.47, .63	.13, .93	337.2***	90.4%	
Reliable change								
All studies								
Improvement	39	1541	.25	.19, .31	.02, .61	238.8***	84.7%	
Deterioration	39	1541	.02	.01, .03	.00, .07	56.0*	37.7%	
TF-CBT only								
Improvement	34	1409	.25	.19, .31	.03, .58	193.8***	83.3%	
Deterioration	34	1409	.02	.01, .03	.00, .07	51.2*	40.8%	

Note. [1] Only using the TF-CBT studies.
***p<.0001 **p<.001 *p<.05

7.16. Table S9. Absolute proportion of participants showing improvement and reliable change in depression symptoms at post-treatment, control conditions

Analysis	k	N	Proportion	95% CI	95% PI	Cochran's Q	I^2	Moderator p
50% improvement								
All	40	1528	.18	.13, .23	.00, .51	242.2***	83.5%	
All, dropouts as non-responders	40	1614	.16	.12, .21	.00, .49	246.0***	83.8%	
Active vs passive								.66
Active	21	839	.19	.12, .27	.00, .57	160.5***	86.8%	
Passive	19	689	.16	.10, .23	.01, .46	81.3***	77.6%	
20% improvement								
All	40	1528	.37	.31, .43	.09, .71	211.1***	81.9%	
All, assume dropouts are non-responders	40	1614	.35	.29, .41	.08, .69	223.9***	82.8%	
Reliable change								
All studies								
Improvement	39	1496	.13	.10, .17	.01, .34	119.8***	70.1%	
Deterioration	39	1496	.10	.02, .21	.00, .94	2131.1***	97.4%	
Active conditions								
Improvement	20	807	.15	.09, .21	.00, .44	93.7***	80.3%	
Deterioration	20	807	.06	.00, .19	.00, .84	319.5***	97.0%	
Passive conditions								
Improvement	19	689	.12	.09, .15	.05, .21	25.5	31.9%	
Deterioration	19	689	.15	.02, .37	.00, .99	1432.2***	97.6%	

Note. [1] Only using the TF-CBT studies.
***p<.0001 **p<.001 *p<.05

7.17. Table S10. Absolute proportion of participants showing improvement and reliable change in depression symptoms at follow-up, TF-CBT and EMDR

Analysis	k	N	Proportion	95% CI	95% PI	Cochran's Q	I^2
Follow-up (1-5 months)							
50% improvement							
All	15	466	.31	.14, .51	.00, .97	223.3***	94.8%
All, assume dropout are non-responders	15	558	.28	.11, .48	.00, .96	268.9***	95.9%
EMDR vs TF-CBT							
EMDR	2	61	.64	.12, 1.00	.00, 1.00	21.0***	95.2%
TF-CBT	13	405	.26	.10, .46	.00, .93	156.0***	94.3%
20% improvement							
All	15	466	.64	.45, .81	.03, 1.00	202.9***	94.1%
All, assume dropouts are non-responders	15	558	.55	.35, .74	.00, 1.00	213.2***	95.5%
Reliable change							
All studies							
Improvement	15	466	.31	.21, .43	.04, .71	83.9***	82.4%
Deterioration	15	466	.03	.01, .06	.00, .19	54.6***	69.6%
TF-CBT only							
Improvement	13	405	.26	.19, .33	.09, .48	29.2*	58.6%
Deterioration	13	405	.03	.00, .07	.00, .21	48.1*	70.9%
Follow-up (6+ months)							
50% improvement							
All	8	245	.53	.35, .70	.09, .94	43.6***	87.5%
All, assume dropout are non-responders	8	299	.45	.27, .64	.04, .92	61.3***	90.7%
EMDR vs TF-CBT							
EMDR	2	61	.68	.25, .97	.05, 1.00	12.1**	91.8%
TF-CBT	6	184	.48	.29, .68	.07, .90	26.2***	86.1%
20% improvement							
All	8	245	.81	.68, .91	.42, 1.00	41.4***	82.2%
All, assume dropouts are non-responders	8	299	.69	.52, .84	.21, .99	70.7***	89.4%
Reliable change							
All studies							
Improvement	8	245	.47	.29, .64	.06, .90	58.8***	87.0%
Deterioration	8	245	.00	.00, .02	.00, .02	3.4	0.00%
TF-CBT only							
Improvement	6	184	.43	.27, .61	.08, .83	33.4***	82.4%
Deterioration	6	184	.01	.00, .02	.00, .02	2.7	0.00%

Note. [1] Only using the TF-CBT studies.

***p<.0001 **p<.001 *p<.05

7.18. Table S11. Absolute proportion of participants showing improvement and reliable change in depression symptoms at follow-up, control conditions

Analysis	k	N	Proportion	95% CI	95% PI	Cochran's Q	I^2
Follow-up (1-5 months)							
50% improvement							
All	15	446	.19	.10, .29	.00, .60	84.7***	84.0%
All, dropouts as non-responders	15	513	.16	.08, .26	.00, .57	94.1***	86.1%
Active vs passive							
Active	12	371	.21	.12, .32	.01, .59	51.7***	81.0%
Passive	3	75	.11	.00, .43	.00, .76	18.1**	89.7%
20% improvement							
All	15	446	.40	.28, .52	.05, .83	96.6***	85.1%
All, dropouts as non-responders	15	513	.34	.23, .47	.02, .79	109.0***	87.5%
Reliable change							
All studies							
Improvement	15	446	.16	.09, .23	.01, .43	46.3***	71.8%
Deterioration	15	446	.17	.01, .45	.00, 1.00	489.7***	97.6%
Active conditions							
Improvement	12	371	.18	.11, .27	.01, .47	37.6***	73.1%
Deterioration	12	371	.15	.01, .43	.00, 1.00	253.7***	97.2%
Passive conditions							
Improvement	3	75	.07	.02, .14	.02, .14	0.5	0.00%
Deterioration	3	75	.28	.00, 1.00	.00, 1.00	176.9***	98.6%
Follow-up (6+ months)							
50% improvement							
All	8	260	.36	.26, .46	.13, .62	19.4*	66.9%
All, dropouts as non-responders	8	297	.32	.24, .41	.14, .53	16.4*	59.0%
Active vs passive							
Active	6	184	.31	.19, .45	.07, .63	16.4*	74.8%
Passive	2	76	.33	.23, .43	.23, .43	0.0	0.0%
20% improvement							
All	8	260	.60	.50, .71	.34, .84	20.4*	66.1%
All, dropouts as non-responders	8	297	.54	.44, .63	.30, .76	18.4*	63.8%
Reliable change							
All studies							
Improvement	8	260	.29	.18, .40	.06, .60	28.0**	74.1%
Deterioration	8	260	.03	.00, .21	.00, .75	89.4***	95.7%
Active conditions							
Improvement	6	184	.32	.18, .47	.05, .67	22.9**	76.6%
Deterioration	6	184	.06	.00, .35	.00, .91	85.7***	96.5%
Passive conditions							
Improvement	2	76	.21	.11, .34	.08, .39	1.6	38.8%
Deterioration	2	76	.00	.00, .01	.00, .01	0.0	0.00%

***p<.0001, **p<.001, *p<.05

7.19. Table S12. Risk ratio for improvement and reliable change in PTSD symptoms at follow-up, psychological therapy (TF-CBT or EMDR) vs control

Analysis	k	N	Risk ratio	95% CI	95% PI	Risk ratio p	Cochran's Q	I^2	Moderator p
Follow-up 1 (1-5 months)									
50% improvement									
All	19	1084	1.25	1.12, 1.39	0.94, 1.66	<.0001	31.8*	38.9%	
All, dropouts as non-responders	19	1288	1.14	1.08, 1.21	1.05, 1.25	<.0001	27.9	7.6%	
EMDR vs TF-CBT									
EMDR	3	122	1.62	1.12, 2.36	0.90, 2.93	.01	4.02	50.7%	
TF-CBT	16	962	1.20	1.08, 1.33	0.94, 1.53	<.01	23.7	31.2%	
Active vs Passive									.93
Active control	14	886	1.25	1.10, 1.41	0.96, 1.62	<.001	20.4	28.2%	
Passive control	5	198	1.35	1.02, 1.80	0.76, 2.41	.04	11.0*	72.6%	
20% improvement									
All, post treatment	19	1084	1.48	1.17, 1.87	0.76, 2.86	<.01	31.6*	48.4%	
All, dropouts as non-responders	19	1288	1.63	1.37, 1.94	0.93, 2.85	<.0001	48.4**	65.4%	
EMDR vs TF-CBT									
EMDR	3	122	2.90	1.39, 6.07	0.99, 8.52	<.01	3.0	35.9%	
TF-CBT	16	962	1.30	1.06, 1.60	0.82, 2.08	.01	21.3	31.9%	
Active vs Passive									.50
Active control	14	886	1.41	1.06, 1.87	0.71, 2.82	.02	21.5	46.1%	
Passive control	5	198	1.86	1.06, 3.27	0.62, 5.57	.03	9.69*	65.8%	
Reliable change									
Improvement									
All	19	1084	1.37	1.16, 1.61	0.81, 2.32	<.01	43.7**	69.4%	
EMDR vs TF-CBT									
EMDR	3	122	1.88	1.37, 2.60	1.37, 2.60	<.01	1.3	0.0%	
TF-CBT	16	962	1.25	1.08, 1.46	0.82, 1.91	<.01	32.1*	61.3%	
Active vs Passive									.90
Active control	14	886	1.35	1.14, 1.62	0.85, 2.16	<.001	27.3*	56.7%	
Passive control	5	198	1.48	0.96, 2.28	0.59, 3.68	.08	14.3*	85.5%	
Deterioration									
All	19	1084	0.97	0.92, 1.01	0.83, 1.12	.16	60.5***	74.2%	
EMDR vs TF-CBT									
EMDR	3	122	0.54	0.33, .91	.22, 1.35	.02	7.8*	71.0%	
TF-CBT	16	962	1.00	0.97, 1.03	.93, 1.06	.83	37.9**	38.1%	
Active vs Passive									<.01
Active control	14	886	1.00	0.97, 1.03	0.94, 1.07	.93	37.8**	37.2%	
Passive control	5	198	0.77	0.63, 0.95	0.52, 1.15	.01	10.5*	65.3%	
Follow-up 2 (6+ months)									
50% improvement									

All	13	1420	1.38	1.10, 1.73	0.73, 2.62	<.01	62.8***	78.7%
All, dropouts as non-responders	13	1559	1.32	1.07, 1.62	0.71, 2.43	<.01	68.5***	83.7%
EMDR vs TF-CBT								
EMDR	1	62	1.05	0.80, 1.37	0.80, 1.37	.74	0.0	0.00%
TF-CBT	12	1358	1.44	1.12, 1.84	0.73, 2.81	<.01	62.6***	78.7%
Active vs Passive								
Active control	11	1313	1.53	1.19, 1.98	0.82, 2.87	<.01	29.1*	60.8%
Passive control	2	107	0.99	0.92, 1.07	0.92, 1.07	.83	0.2	0.00%
20% improvement								
All, post treatment	13	1420	2.13	1.32, 3.44	0.59, 7.69	<.01	36.2**	68.0%
All, dropouts as non-responders	13	1559	1.73	1.13, 2.64	0.49, 6.05	.01	49.0***	81.2%
EMDR vs TF-CBT								
EMDR	1	62	1.14	0.54, 2.39	0.54, 2.39	.74	0.0	0.00%
TF-CBT	12	1358	2.32	1.38, 3.90	0.61, 8.81	<.01	35.0**	68.5%
Active vs Passive								
Active control	11	1313	2.67	1.54, 4.63	0.73, 9.72	<.001	24.2*	56.0%
Passive control	2	107	1.14	0.84, 1.54	0.84, 1.54	.40	0.0	0.00%
Reliable change								
Improvement								
All	13	1420	1.63	1.15, 2.30	0.59, 4.50	<.01	69.0***	83.2%
EMDR vs TF-CBT								
EMDR	1	62	1.02	0.57, 1.83	0.57, 1.83	.95	0.0	0.00%
TF-CBT	12	1358	1.72	1.18, 2.50	0.60, 4.96	<.01	68.4***	84.7%
Active vs Passive								
Active control	11	1313	1.87	1.25, 2.79	0.64, 5.45	<.01	60.8***	78.4%
Passive control	1	45	1.03	0.85, 1.26	0.85, 1.26	.75	0.0	0.00%
Deterioration								
All	13	1420	1.00	0.99, 1.01	0.99, 1.01	.66	12.5	1.55%
EMDR vs TF-CBT								
EMDR	1	62	0.96	0.88, 1.04	0.88, 1.04	.29	0.0	0.00%
TF-CBT	12	1358	1.00	0.99, 1.01	0.99, 1.01	.73	11.4	1.23%
TF-CBT only								
Active control	11	1313	1.00	0.99, 1.00	0.99, 1.00	.79	4.5	0.00%
Passive control	1	45	0.62	0.43, 0.89	0.43, 0.89	<.01	0.0	0.00%

Note. [1] Only using the TF-CBT studies.

***p<.0001 **p<.001 *p<.05

7.20. Table S13. Risk ratios for improvement and reliable change in depression symptoms at post-treatment, psychological therapy (TF-CBT or EMDR) vs control

Analysis	k	N	Risk ratio	95% CI	95% PI	Risk ratio p	Cochran's Q	I^2	Moderator p
50% improvement									
All	40	3112	1.18	1.10, 1.25	0.89, 1.55	<.0001	90.5***	78.2%	
All, dropouts as non-responders	40	3318	1.13	1.08, 1.19	0.92, 1.40	<.0001	81.7***	69.1%	
EMDR vs TF-CBT									.91
EMDR	5	232	1.18	0.96, 1.45	0.81, 1.72	.11	10.2*	55.8%	
TF-CBT	35	2880	1.18	1.10, 1.26	0.89, 1.56	<.0001	80.1***	78.4%	
Active vs Passive									.43
Active control	21	1705	1.13	1.05, 1.21	0.92, 1.39	<.001	38.4*	66.6%	
Passive control	19	1407	1.25	1.11, 1.40	0.84, 1.85	<.001	52.1***	82.6%	
20% improvement									
All	40	3112	1.39	1.25, 1.55	0.90, 2.15	<.0001	107.3***	64.6%	
All, dropouts as non-responders	40	3318	1.27	1.17, 1.37	0.97, 1.66	<.0001	89.5***	46.0%	
EMDR vs TF-CBT									.73
EMDR	5	232	1.33	0.94, 1.87	0.74, 2.40	.10	6.7	41.3%	
TF-CBT	35	2880	1.40	1.25, 1.57	0.90, 2.20	<.0001	99.3***	67.5%	
Active vs Passive									.97
Active control	21	1705	1.35	1.21, 1.50	1.04, 1.74	<.0001	25.7	27.2%	
Passive control	19	1407	1.52	1.22, 1.90	0.72, 3.21	<.001	60.0***	82.6%	
Reliable change									
Improvement									
All	39	3037	1.11	1.06, 1.16	0.94, 1.30	<.0001	74.9**	47.0%	
EMDR vs TF-CBT									.71
EMDR	5	232	1.09	1.00, 1.19	1.00, 1.19	.06	4.5	0.0%	
TF-CBT	34	2805	1.12	1.06, 1.18	0.92, 1.36	<.0001	70.0**	56.5%	
Active vs Passive									.96
Active control	20	1630	1.11	1.04, 1.18	0.92, 1.34	<.01	37.4*	53.2%	
Passive control	19	1407	1.11	1.04, 1.18	0.93, 1.32	<.01	36.7*	40.5%	
Deterioration									
All	39	3037	1.01	1.00, 1.02	1.00, 1.02	.15	85.4***	0.4%	
EMDR vs TF-CBT									.33
EMDR	5	232	0.99	.97, 1.02	0.97, 1.02	.69	2.6	0.0%	
TF-CBT	34	2805	1.01	1.00, 1.02	1.00, 1.02	.09	81.8***	0.5%	
Active vs Passive									.86
Active control	20	1630	1.01	1.00, 1.02	1.00, 1.02	.18	39.1*	0.8%	
Passive control	19	1407	1.01	0.99, 1.02	0.99, 1.02	.59	46.3**	0.1%	

Note. [1] Only using the TF-CBT studies.

***p<.0001 **p<.001 *p<.05

7.21. Table S14. Risk ratio for improvement and reliable change in depression symptoms at follow-up, psychological therapy (TF-CBT or EMDR) vs control

Analysis	k	N	Risk ratio	95% CI	95% PI	Risk ratio p	Cochran's Q	I^2
Follow-up 1 (1-5 months)								
50% improvement								
All, post treatment	15	912	1.01	0.97, 1.04	0.97, 1.04	.79	23.9*	0.0%
All, dropouts as non-responders	15	1071	1.00	0.97, 1.03	0.97, 1.03	1.00	24.3*	0.0%
EMDR vs TF-CBT								
EMDR	2	126	1.89	0.72, 4.95	0.41, 8.63	.19	3.3	69.7%
TF-CBT	13	786	1.00	0.96, 1.04	0.96, 1.04	.98	15.5	0.0%
Active vs Passive								
Active control	12	765	1.00	0.95, 1.05	0.95, 1.05	.98	17.8	0.1%
Passive control	3	147	1.15	0.86, 1.53	0.72, 1.82	.34	6.0*	58.5%
20% improvement								
All, post treatment	15	912	1.25	1.04, 1.52	0.77, 2.05	.02	30.2*	61.7%
All, dropouts as non-responders	15	1071	1.00	0.97, 1.03	0.97, 1.03	1.00	24.3*	0.0%
EMDR vs TF-CBT								
EMDR	2	126	2.91	0.36, 23.61	0.13, 65.84	.32	1.7	41.7%
TF-CBT	13	786	1.21	0.99, 1.46	0.76, 1.92	.06	23.9*	60.6%
Active vs Passive								
Active control	12	765	1.29	1.02, 1.63	0.76, 2.20	.03	22.2*	46.5%
Passive control	3	147	1.23	0.76, 2.01	0.56, 2.71	.40	5.1	60.1%
Reliable change								
Improvement								
All	15	912	1.16	1.05, 1.29	0.90, 1.50	<.01	25.5*	46.8%
EMDR vs TF-CBT								
EMDR	2	126	1.76	0.99, 3.12	0.77, 4.01	.05	1.7	41.0%
TF-CBT	13	786	1.12	1.02, 1.22	0.92, 1.36	.02	17.4	34.8%
Active vs Passive								
Active control	12	765	1.15	1.03, 1.28	0.91, 1.46	.01	18.5	36.2%
Passive control	3	147	1.24	0.92, 1.68	0.75, 2.08	.15	7.0*	68.4%
Deterioration								
All	15	912	1.02	0.97, 1.08	0.89, 1.18	.39	60.3***	68.0%
EMDR vs TF-CBT								
EMDR	2	126	1.01	0.96, 1.07	0.96, 1.07	.71	0.9	0.0%
TF-CBT	13	786	1.01	0.93, 1.10	0.81, 1.26	.80	59.4***	83.4%
Active vs Passive								
Active control	12	765	1.02	0.95, 1.09	0.84, 1.23	.62	51.0***	82.2%
Passive control	3	147	1.03	0.95, 1.13	0.95, 1.13	.46	9.2*	0.0%

Follow-up 2 (6+ months)								
50% improvement								
All, post treatment	8	505	1.29	1.06, 1.58	0.86, 1.95	.01	13.3	45.5%
All, dropouts as non-responders	8	596	1.19	1.00, 1.42	0.82, 1.74	.05	15.1*	53.5%
EMDR vs TF-CBT								
EMDR	2	125	1.76	0.66, 4.73	0.37, 8.41	.26	3.7	72.9%
TF-CBT	6	380	1.26	1.01, 1.56	0.83, 1.89	.04	8.9	47.6%
Active vs Passive								
Active control	6	356	1.20	0.99, 1.47	0.86, 1.68	.07	8.6	32.1%
Passive control	2	149	1.48	0.90, 2.45	0.70, 3.13	.12	2.5	60.3%
20% improvement								
All, post treatment	8	505	1.58	1.21, 2.06	1.21, 2.06	<.001	8.3	0.0%
All, dropouts as non-responders	8	596	1.33	1.01, 1.74	0.78, 2.26	.04	13.2	40.0%
EMDR vs TF-CBT								
EMDR	2	125	2.91	0.41, 20.64	0.15, 56.00	.29	2.1	51.7%
TF-CBT	6	380	1.58	1.15, 2.17	1.08, 2.31	<.01	6.2	6.9%
Active vs Passive								
Active control	6	356	1.47	1.09, 1.99	1.09, 1.99	.01	3.8	0.0%
Passive control	2	149	2.80	0.71, 11.0	0.32, 24.19	.14	3.5	71.5%
Reliable change								
Improvement								
All	8	505	1.29	1.07, 1.54	0.89, 1.85	.01	12.8	44.5%
EMDR vs TF-CBT								
EMDR	2	125	1.57	0.71, 3.50	0.45, 5.55	.27	3.3	69.6%
TF-CBT	6	380	1.28	1.04, 1.58	0.86, 1.91	.02	9.3	46.0%
Active vs Passive								
Active control	6	356	1.24	1.01, 1.54	0.86, 1.81	.04	8.1	36.2%
Passive control	2	149	1.40	0.90, 2.16	0.71, 2.75	.13	3.3	70.0%
Deterioration								
All	8	505	1.00	0.99, 1.02	0.99, 1.02	.75	9.5	0.4%
EMDR vs TF-CBT								
EMDR	2	125	1.00	0.95, 1.05	0.95, 1.05	.96	0.1	0.0%
TF-CBT	6	380	1.00	0.99, 1.02	0.99, 1.02	.72	9.3	1.4%
Active vs Passive								
Active control	6	356	1.00	0.99, 1.02	0.99, 1.02	.77	9.4	0.1%
Passive control	2	149	1.00	0.97, 1.04	0.97, 1.04	.92	0.0	0.0%

Note. [1] Only using the TF-CBT studies.
***p<.0001 **p<.001 *p<.05

7.22. Journal article: Characteristics of complex posttraumatic stress disorder (PTSD) in young people with PTSD following multiple trauma exposure

7.23. Journal article: Voice hearing in young people with posttraumatic stress disorder (PTSD) following multiple trauma exposure

7.24. Journal article: Systematic review and meta-analysis: Imputing response rates for first-line psychological treatments for posttraumatic stress disorder in youth

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Characteristics of complex posttraumatic stress disorder (PTSD) in young people with PTSD following multiple trauma exposure

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Background: Complex PTSD (CPTSD) is a relatively new diagnosis. The objective of the present study was to investigate how trauma characteristics, comorbid psychopathology and cognitive and social factors experienced by children and adolescents with a posttraumatic stress disorder (PTSD) diagnosis following exposure to multiple traumatic events differs between those who meet the criteria for CPTSD and those who do not. **Method:** The present research used baseline data from the DECRYPT trial (BMJ Open, 2021, 11, e047600). Participants (n = 120) were aged 8–17 years and had exposure to multiple traumas and a PTSD diagnosis. The data collected comprised self-report and parent/caregiver-report questionnaires and interviews. Three primary analyses were conducted, comparing number of trauma types, prevalence of sexual trauma and prevalence of intrafamilial abuse between the CPTSD and PTSD-only groups. A range of comorbid psychopathology and cognitive and social factors were compared between the groups in an exploratory secondary analysis. All analyses were preregistered. **Results:** The CPTSD group (n = 72, 60%) had a significantly higher frequency of sexual trauma than the PTSD-only group (n = 48, 40%). The groups did not significantly differ on number of trauma types or prevalence of intrafamilial abuse. From the secondary analysis, the CPTSD group were found to have significantly higher scores on measures of negative post-traumatic cognitions, depression and panic. These results were replicated in correlation analyses using a continuous measure of CPTSD symptoms. **Conclusions:** A large proportion of youth exposed to multiple traumatic events met criteria for CPTSD. Sexual trauma appears to be related to CPTSD symptoms. Youth with CPTSD appear to have greater severity of comorbid depression and panic symptoms, as well as more negative post-traumatic cognitions. Further investigation could focus on the directionality and mechanisms for these associations.
Keywords: Post-traumatic stress disorder; trauma; depression; cognition; panic.

Background

Post-traumatic stress disorder (PTSD) is a reaction to trauma which has comorbidity with other mental health difficulties (Lewis et al., 2019) and is associated with a range of outcomes related to overall functioning. The new diagnosis of complex post-traumatic stress disorder (CPTSD), introduced in the ICD-11 (World Health Organization, 2019), requires disturbances of self-organisation (DSO) comprising emotion dysregulation, negative self-perception and relationship disturbances) as well as the core PTSD symptoms of re-experiencing, avoidance and a sense of heightened current threat. This diagnosis is related to wider complexity comprising symptoms outside the remit of current PTSD diagnosis or potentially specific trauma characteristics. Research into CPTSD is important for improving the understanding and effective treatment of people who have been exposed to trauma.

Previous research validating the CPTSD diagnosis using latent class analysis found a 40.6% prevalence rate of CPTSD in children and adolescents exhibiting post-traumatic stress symptoms after exposure to one or more traumatic events (Sachser, Keller, & Goldbeck, 2017). Research into treatment of youth with CPTSD has demonstrated that trauma-focused CBT, the treatment recommended by National Institute for Health and Care Excellence (NICE) guidelines (NICE, 2018), is effective in reducing PTSD symptoms in young people with CPTSD, but that these individuals end treatment with significantly greater PTSD symptoms than PTSD-only individuals (Sachser, Keller, & Goldbeck, 2017).

As a relatively new diagnosis, research into CPTSD could be useful to better understand the phenotype and experience of trauma-exposed youth. The ICD-11 states that CPTSD typically occurs 'after exposure

Conflict of interest statement: No conflicts declared.

to chronic, repeated traumatic events', and that 'exposure to repeated traumas, especially in early development, is associated with a greater risk of developing CPTSD'. However, Elliott et al. (2021) found that in a sample of young people exposed to a *single* incident trauma, of those who met the criteria for ICD-11 PTSD, one third met the full CPTSD criteria, demonstrating a reasonably high prevalence. Therefore, investigation of how the frequency of traumatic events influences CPTSD onset in youth is necessary.

A further area which may be relevant to consider is how specific trauma types may be related to CPTSD symptoms. Villalta et al. (2020) demonstrated that disturbances in self-organisation are frequent in adolescents exposed to sexual trauma, suggesting that sexual trauma may be associated with a greater risk of developing CPTSD symptoms. In addition, Daniunaite et al. (2021) found that CPTSD in adolescence is associated with family problems (financial difficulties and conflict in the home, school problems, and a lack of social support) and a systematic review by Karatzias et al. (2019) demonstrated that CPTSD is associated with younger age, interpersonal trauma in childhood, and interpersonal trauma in adulthood. These findings imply that interpersonal trauma may be more associated with CPTSD than other trauma types. Specifically, intrafamilial abuse (witnessing or experiencing abuse within the family environment) could be linked to CPTSD as it can be a marker of *repeated* traumatic events, although little research has thus far been conducted in young people to explore the effects of interpersonal trauma within the family.

In addition to trauma characteristics, a CPTSD diagnosis could be associated with comorbid psychopathology and a number of cognitive and social factors. Karatzias et al. (2019) found in their systematic review that those with CPTSD are more likely to endorse symptoms of major depressive disorder and generalised anxiety disorder and that both PTSD and CPTSD increased likelihood of suicidality. Furthermore, Karatzias et al. (2018) used logistic regression analysis to demonstrate that negative trauma-related cognitions about the self was the most important factor in CPTSD diagnosis. This aligns with the cognitive model of PTSD (Ehlers & Clark, 2000), whereby negative appraisals are central in maintaining a sense of current threat, contributing to PTSD symptoms. Other aspects of the cognitive model, such as safety-seeking behaviours ('strategies intended to control threat/symptoms', Ehlers and Clark (2000)) may also be related to CPTSD diagnosis.

The present study aimed to investigate how trauma characteristics in young people exposed to multiple traumatic events are related to CPTSD diagnosis, in order to better understand potential risk factors for this increased complexity. We identified three possible characteristics of trauma exposure to consider on the basis of ICD-11 criteria for CPTSD and previous research, comprising number of trauma types, exposure to sexual trauma and exposure to intrafamilial abuse. Number of trauma types was selected as a primary outcome due to reduced variability compared to total trauma frequency, which was included as a secondary outcome variable. Furthermore, the present research also explored how a range of comorbid psychopathology and cognitive and social factors, selected based on the cognitive model of PTSD (Ehlers & Clark, 2000) and the ICD-11 criteria for CPTSD, might differ between the CPTSD and PTSD-only groups. Elucidating the comorbidities and phenotype of young people who meet the criteria for CPTSD could inform better treatment for these individuals through addressing specific comorbid symptoms or underlying mechanisms found to be associated with CPTSD.

Our primary hypotheses were that the CPTSD group would have a significantly higher number of trauma types and significantly higher prevalence of sexual trauma and intrafamilial abuse. Our secondary hypothesis was that the CPTSD group would have significantly higher scores than the PTSD-only group on measures of comorbid psychopathology and cognitive and social factors.

Method

Design

The present study was a cross-sectional design comprising of analysis of the baseline data from the Delivery of Cognitive Therapy for Young People after Trauma (DECRYPT) trial (Allen et al., 2021), a randomised controlled trial of cognitive therapy for PTSD in youth exposed to multiple traumatic stressors. Measures were selected from the battery of self-report and parent/caregiver-report interviews and questionnaires to assess number of trauma types, prevalence of sexual trauma and prevalence of intrafamilial abuse for the primary analysis. For the secondary analysis, measures assessing dissociation, depression, anxiety, irritability, trauma memory quality, safety behaviours and social support were identified. Hypotheses were preregistered on the Open Science Framework (https://osf.io/chx7s/).

Ethical considerations

Ethical approval for the DECRYPT trial was provided by UK Health Research Authority Research Ethics Committee (East of England–Cambridge South, 16/EE/0233). For participants aged under 16 years, informed consent was provided by parents and caregivers, and the child or young person was also asked to give their assent. Participants aged 16 years or older could provide informed consent without their parent or caregiver.

Participants

One hundred twenty participants were included in this analysis; this sample size was determined by a power calculation for the primary outcome of the DECRYPT trial. Participants were drawn from Child and Adolescent Mental Health Services and Youth Services in Cambridgeshire Cardiff,

Essex, Hertfordshire, Kent, Norfolk, South London and Suffolk. Inclusion criteria required participants to be aged 8–17 years with a diagnosis of PTSD (as defined by DSM-5 and diagnosed using the CPSS-I-5, Child PTSD Symptom Scale – Interview version, Foa et al. (2018)) following multiple trauma exposure, and to have a score equal to or greater than 17 on the Child Revised Impact of Events Scale, 8-item version (CRIES-8, Perrin et al. (2005)). Six potential participants were excluded due to having a score below 17 on the CRIES-8, prior to administering the CPSS-I-5. Exclusion criteria were a change of prescribed psychiatric medication within the past 2 months, PTSD symptoms relating exclusively to one trauma, pervasive developmental or neurodevelopmental disorder, intellectual disability, another primary psychiatric diagnosis or clinical need warranting treatment ahead of PTSD (e.g. psychosis), inability to speak English, ongoing exposure to threat, strong likelihood of being unable to complete treatment (e.g. imminent house move), or history of organic brain damage. Table 1 contains the demographic and trauma history data for the sample.

At baseline, participants completed a battery of interviews and questionnaires in an appointment lasting 60–90 min, with further appointments made available if required. See Allen et al. (2021) for full procedure information. Interviews and questionnaires relevant for the present study are described below.

Measures

Complex PTSD screen. In order to establish whether participants met the criteria for CPTSD, as defined by ICD-11 (World Health Organization, 2019), a 3-item self-report structured interview was conducted. When the DECRYPT trial was designed, the ICD-11 was not yet published so the interview was devised by the DECRYPT trial team (see Supporting Information) based on draft criteria for CPTSD. The three interview items correspond to the three DSO symptoms defined in ICD-11: affective dysregulation, negative self-concept, and difficulties in sustaining relationships. Each item had one introductory question assessing the overall symptom, with optional follow-up questions for positive responses. Each of the three DSO symptoms was assessed on a 5-point Likert-type scale from zero ('Not at all') to four ('Six or more times a week/almost always'), consistent with the CPSS-I-5, with scores above zero sufficient for endorsement of a symptom. Participants met criteria for CPTSD if they endorsed all three DSO symptoms.

Child Complex PTSD Checklist. The Child Complex PTSD Checklist is a 12-item self-report measure which assesses the three DSO symptoms of CPTSD, comprising negative self-concept, interpersonal difficulties and affect dysregulation. Each item is rated on a 4-point Likert-type scale from zero ('Never') to three (almost always). The measure was developed based on preliminary drafts of ICD-11 in 2016 and has been demonstrated to have good internal consistency (Hiller et al., 2021).

Child and Adolescent Trauma Screen (CATS). The CATS (Sachser, Berliner, et al., 2017) has self-report and caregiver-report versions, both of which were employed in the present study as a structured interview. For the present research, the first 15 items pertaining to trauma history were analysed; these list 14 different trauma types and an open answer question to accommodate any nonlisted trauma types, with the participant asked to indicate if they have experienced each event as a yes or no question; caregivers were asked the same with regards to the young person in their care. These data, alongside qualitative description of traumatic events, was used to establish the prevalence of sexual trauma (items 8 and 9) and intrafamilial abuse (items 4 and 6).

Children's Revised Impact of Event Scale, 8-item version (CRIES-8). The CRIES-8 (Perrin et al., 2005) is a self-report questionnaire measure assessing frequency of post-traumatic stress symptoms over the preceding 7 days. It has good face, construct, predictive and criterion validity (Perrin et al., 2005; Stallard et al., 1999).

Post-Traumatic Cognitions Inventory – Child version (CPTCI). The Post-Traumatic Cognitions Inventory – Child version (Meiser-Stedman et al., 2009) is a 25-item self-

Table 1 Sample demographic characteristics

	Whole sample (n = 120)	CPTSD sample (n = 72)	PTSD-only sample (n = 48)
Age in years, mean (*SD*)	14.9 (2.5)	15.5 (2.2)	14.1 (2.7)
Sex, n (%)			
Male	33 (27.5)	14 (19.4)	19 (39.6)
Female	87 (72.5)	58 (80.6)	29 (60.4)
Ethnicity, n (%)			
White (any background)	97 (80.8)	59 (81.9)	38 (79.2)
Black (any background)	9 (7.5)	4 (5.6)	5 (10.4)
Asian (any background)	2 (1.7)	2 (2.8)	0 (0.0)
Mixed (any background)	11 (9.2)	7 (9.7)	4 (8.3)
Any other ethnic group	1 (0.8)	0 (0.0)	1 (2.1)
Traumatic experiences, n (%)			
Natural disaster	3 (2.5)	2 (2.8)	1 (2.1)
Accident	34 (28.3)	21 (29.2)	13 (27.1)
Robbed	10 (8.3)	5 (6.9)	5 (10.4)
Physical abuse inside family	57 (47.5)	32 (44.4)	25 (52.1)
Physical abuse outside family	57 (47.5)	36 (50.0)	21 (43.8)
Witnessed physical abuse inside family	66 (55)	37 (51.4)	29 (60.4)
Witnessed physical abuse outside family	53 (44.2)	34 (47.2)	19 (39.6)
Inappropriate sexual contact	36 (30)	30 (41.7)	6 (12.5)
Someone forcing/pressuring sex	30 (25)	25 (34.7)	5 (10.4)
Sudden death/injury of a close person	55 (45.8)	35 (48.6)	20 (41.7)
Attacked, stabbed, shot at or hurt badly	13 (10.8)	10 (13.9)	3 (6.3)
Witnessed someone attacked, stabbed, shot at or hurt badly	35 (29.2)	22 (30.6)	13 (27.1)
Medical procedure	29 (24.2)	19 (26.4)	10 (20.8)
Exposure to war	0 (0.0)	0 (0.0)	0 (0.0)
Other	83 (69.2)	49 (68.1)	34 (70.8)
Number of trauma types, mean (*SD*)	4.7 (2.2)	5.0 (2.3)	4.3 (1.9)

report questionnaire which assesses appraisals of traumatic experiences in the preceding 2 weeks. The measure has good internal consistency, test–retest reliability, convergent validity and discriminative validity (Meiser-Stedman et al., 2009).

Revised Child Anxiety and Depression Scale. The Revised Child Anxiety and Depression Scale (RCADS) (Chorpita et al., 2000) is a 47-item self-report questionnaire assessing symptoms in the preceding 2 weeks corresponding to anxiety disorders and depression in young people. The measure has good internal consistency (Kösters et al., 2015), test–retest reliability and convergent validity (Chorpita et al., 2000).

Child PTSD symptom scale – Interview version (CPSS-I-5). The Child PTSD Symptom Scale – Interview Version (Foa et al., 2018) is a 27-item semistructured self-report interview assessing DSM-5 PTSD symptoms. Foa et al. (2018) demonstrated that the interview has excellent internal consistency, reliability and validity. The present study used the final seven items which assess impairment of experienced symptoms on daily functioning.

Dissociation screen. The dissociation screen used in the present study is a 2-item self-report interview assessing the presence of depersonalisation ('Have you felt as if you were outside your body?') and derealisation ('Have you felt as if things around you weren't real?') measured on a 5-point Likert-type scale from 'Not at all' to 'Six or more times a week/almost always'.

Strengths and Difficulties Questionnaire. The Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) is a 25-item caregiver-report measure assessing emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems and prosocial behaviour, with each of these scales comprised of five items. The first four scales (comprised of 20 items), excluding prosocial behaviour, are used to calculate a total difficulties score, which was employed in the present study. The total difficulties score has acceptable test–retest reliability (Bergström & Baviskar, 2021), and sufficient convergent, discriminant and criterion validity (Vugteveen et al., 2021).

Affective Reactivity Index – Child version. The Affective Reactivity Index – Child version (ARI-C; Stringaris et al., 2012) is a 7-item self-report measure of irritability, which asks participants to rate irritability symptoms compared to others of the same age (e.g. 'I am easily annoyed by others').

Trauma Memory Quality Questionnaire (TMQQ). The TMQQ (Meiser-Stedman et al., 2007) is an 11-item self-report questionnaire which assesses the current characteristics of trauma memories; particularly the extent to which they are composed of sensory elements. The measure has good internal consistency, criterion validity and convergent validity (Meiser-Stedman et al., 2007). Higher scores indicate more sensory-based and fragmented memories.

Child Safety Behaviour Scale (CSBS). The Child Safety Behaviour Scale (Alberici et al., 2018) is a 13-item self-report questionnaire designed to assess safety behaviours conducted over the past 2 weeks. The items can be divided into two subscales comprising hypervigilance and suppression. The measure has excellent internal consistency and good discriminant validity and specificity (Alberici et al., 2018).

Multidimensional Scale of Perceived Social Support (MSPSS). The Multidimensional Scale of Perceived Social Support (Zimet et al., 1988) is a 12-item self-report questionnaire measuring a participant's perceptions of support from family, friends and a significant other. The measure has good internal reliability (Zimet et al., 1988) and good convergent and discriminative validity (De Maria et al., 2018).

McLean Screening Instrument for Borderline Personality Disorder (MSI). The McLean Screening Instrument (Zanarini et al., 2003) is a 10-item parent/guardian-report interview assessing symptoms of DSM-4 borderline personality disorder (BPD), in which items are rated on a dichotomous scale of present or absent. The measure has good sensitivity, specificity, reliability and validity (Zanarini et al., 2003). A cut-off of seven is commonly used in screening for BPD.

Mood and Feelings Questionnaire – Suicidal Ideation (MFQ-SI). The Mood and Feelings Questionnaire – Suicidal Ideation subset is a self-report four-item questionnaire developed by Hammerton et al. (2014), as a composite of relevant items from the full Mood and Feelings Questionnaire (Angold & Costello, 1987). Hammerton et al. (2014) demonstrated that this composite has reasonable validity.

Data analysis

The sample size was predetermined by the DECRYPT trial. For the current study, a post hoc power analysis conducted using G*Power version 3.1.9.7 (Faul et al., 2007) indicated that two groups ($n = 48$ and $n = 72$) with a significance criterion of $\alpha = .05$ for a test of means comparisons would have 80% power to detect an effect size (standardised mean difference) of .47. Statistical analysis was conducted using IBM SPSS Statistics Version 28 (IBM Corp., 2021). Data were assessed for assumptions of normality, skewness and kurtosis. The normality of the score distribution on each measure was assessed using the Kolmogorov–Smirnov Test.

Demographic data were compared between the CPTSD and PTSD-only groups. For the categorical variables (ethnicity and sex), chi-square tests were conducted. A Mann–Whitney test was conducted to compare the ages of the groups.

The scores for number of trauma types, total trauma frequency, CRIES-8, SDQ, ARI-C, total RCADS, Dissociation, MSI (BPD), CSBS suppression subscale, CPSS impairment and Suicidal Ideation did not meet the normality assumption. For the number of trauma types, CRIES-8, ARI-C, Dissociation, MSI (BPD), CPSS Impairment and Suicidal Ideation scores, no adequate transformations could be found; therefore, nonparametric Mann–Whitney tests were conducted for these variables. The scores for the SDQ, total RCADS and CSBS suppression subscale met the normality assumption after a square root transformation, and the total trauma frequency met the normality assumption after a log transformation, allowing parametric tests to be conducted as planned. Independent samples *t*-tests were conducted to compare the voice hearing and nonvoice hearing groups on scores for the following variables: total trauma frequency, CPTCI, RCADS total and subscales (depression, panic, generalised anxiety disorder), SDQ, TMQQ, CSBS subscales (hypervigilance and suppression) and MSPSS. Prevalence of sexual trauma and intrafamilial abuse was compared between the CPTSD and PTSD-only groups using chi-square tests due to the categorical nature of these variables.

Corrections were applied to adjust for multiple comparisons. For the primary analysis (number of trauma types, sexual trauma prevalence, intrafamilial abuse prevalence), a Bonferroni correction was applied. For the exploratory secondary analysis comprising all other variables, a Holm-Bonferroni correction was applied.

Levene's test for equal variances was conducted for all *t*-tests; this was not significant and equal variances were assumed unless otherwise specified. Cohen's *d* effect sizes were calculated for all between-groups analyses, with effects sizes for dichotomous factors (e.g. sex, trauma type) converted from odds ratios to Cohen's *d* to allow easy comparison between variables.

In order to confirm that the CPTSD self-report questionnaire assessed the intended CPTSD symptoms, a *t*-test was conducted to compare the CPTSD and PTSD-only groups (as defined using the CPTSD diagnostic interview) on the CPTSD questionnaire scores. As expected, the CPTSD group had a significantly higher score on the CPTSD questionnaire ($M = 26.2$, $SD = 7.02$) than the PTSD only group ($M = 20.2$, $SD = 7.58$), $p < .001$, Cohen's $d = .825$.

Correlation analyses were then conducted using the Complex PTSD checklist and all of the trauma characteristics, psychopathological, cognitive and social variables. A Holm-Bonferroni correction was applied.

Results

Descriptive statistics

Table 2 contains descriptive statistics of all measures included in the present study. 72 of 120 participants (60%) met the criteria for CPTSD with the remaining 48 meeting criteria for PTSD. In the PTSD-only group, one participant (2.1%) had 0 DSO symptoms, six participants (12.5%) had one DSO symptom, and 41 participants (85.4%) had two DSO symptoms. The distribution of scores for the CPTSD questionnaire measure are reported in the Supporting Information, Figure S1.

Demographic analyses

There was no significant difference between the CPTSD and PTSD-only groups on ethnicity ($p = .542$). There was a significant difference between the groups on age ($p = .008$), with a higher mean age for the CPTSD group ($M = 15.5$, $SD = 2.20$) than for the PTSD-only group ($M = 14.1$, $SD = 2.72$). There was also a significant difference in the sex distribution of the groups ($p = .016$), with a greater proportion of females in the CPTSD group (80.6%) than in the PTSD-only group (60.4%).

Primary analyses

Table 3 contains mean scores differentiated by group. With respect to number of trauma types, a Mann–Whitney test indicated that despite the CPTSD group having a higher mean score, there was no significant difference between the CPTSD group and the PTSD-only group ($p = .344$; Cohen's $d = .37$). A chi-square test indicated a significant difference between prevalence of sexual trauma in the CPTSD and PTSD-only groups, ($p < .001$, Bonferroni correction required $p = .0167$; Cohen's $d = .83$). 54.2% of the CPTSD group had experienced sexual trauma, compared to 20.8% of the PTSD-only group. There was no significant relationship between CPTSD and intrafamilial abuse ($p = .28$; Cohen's $d = .32$).

A logistic regression was performed to assess the effect of sexual trauma on CPTSD diagnosis while controlling for PTSD symptom severity (CRIES-8 score). Sexual trauma remained a significant predictor of CPTSD diagnosis ($p < .001$) after controlling for PTSD symptom severity; the model found that participants exposed to sexual trauma were 4.5 times more likely to have a CPTSD diagnosis than those not exposed to sexual trauma.

Secondary analyses

For mean scores on secondary measures, see Table 3. The CPTSD group endorsed our measure of negative trauma-related cognitions (the CPTCI) more strongly than the PTSD-only group ($p < .001$; Cohen's $d = .69$). The CPTSD group also had a significantly higher score on the RCADS depression subscale ($p < .001$; Cohen's $d = .73$) and the RCADS panic disorder subscale ($p = .002$; Cohen's $d = .54$) than the PTSD-only group. There were no significant differences between the CPTSD and PTSD-only groups on the other secondary measures.

A one-way analysis of covariance was conducted to assess whether the significant results from the secondary analysis remained after controlling for PTSD symptom severity (CRIES-8 scores). There was still a significant difference between the groups on negative trauma-related cognitions ($F(1, 115) = 10.1$, $p = .002$), RCADS depression ($F(1, 117) = 12.5$, $p < .001$) and RCADS panic disorder ($F(1, 117) = 7.1$, $p = .009$) when controlling for PTSD symptom severity.

Correlation analysis

See Table 4 for the full correlation analysis. CPTSD symptoms as assessed by the self-report questionnaire measure were found to have large correlations ($r > .5$) with negative trauma-related cognitions (CPTCI), depression (RCADS), panic (RCADS), suicidal ideation (MFQ-SI), dissociation and PTSD symptoms (CRIES-8); medium correlations ($r > .3$) with generalised anxiety (RCADS), suppression (CSBS), trauma memory quality (TMQQ) and borderline personality disorder traits (MSI); small correlations ($r > .1$) with irritability, parent-reported emotional difficulties and sexual trauma.

The pattern of correlation analyses remained broadly the same when controlling for PTSD symptom severity (CRIES-8 score), see Table S1.

Discussion

The present study is a novel investigation of the presentation of CPTSD in children and adolescents with a PTSD diagnosis following multiple trauma exposure. The CPTSD and PTSD-only groups were

Table 2 Descriptive statistics for all measures

Measure	*n*	*M*	*SD*	Range	Cronbach's α
Trauma characteristics					
Sexual trauma	120	*N* = 50[a]	41.7%[a]		
Number of trauma types	120	4.7	2.2	1–11	.47
Intrafamilial abuse	120	*N* = 90[a]	75.0%[a]		
Negative post-traumatic cognitions (CPTCI)	118	73.6	15.9	26–100	.94
Depression (RCADS)	120	19.5	6.2	2–30	.83
Panic (RCADS)	120	14.4	7.1	0–27	.91
Dissociation	120	6.87	2.5	3–12	.73
Generalised Anxiety Disorder (RCADS)	120	12.0	3.93	2–18	.78
Safety behaviours – Suppression subscale (CSBS)	115	17.8	3.6	7–24	.69
Strengths and Difficulties Questionnaire (SDQ)	94	21.5	6.1	9–35	.66
Impairment (CPSS)	119	4.6	1.3	1–7	.48
PTSD symptoms (CRIES-8)	120	31.6	6.0	17–40	.66
Trauma memory quality (TMQQ)	120	31.8	5.5	17–44	.73
Safety behaviours – hypervigilance subscale (CSBS)	114	17.8	5.2	7–28	.83
Suicidal ideation (MFQ-SI)	119	4.8	2.7	0–8	.86
Social support (MSPSS)	119	57.8	13.4	17–84	.82
Trauma frequency	120	152.3	653.2	0–6,110	.46
Borderline personality disorder traits (MSI)	98	6.3	2.4	0–10	.71
Irritability (ARI-C)	120	7.9	4.2	0–14	.94

ARI-C, Affective Reactivity Index – Child version; CRIES-8, Child Revised Impact of Events Scale; CPTCI – Post-Traumatic Cognitions Inventory, Child version; CSBS, Child Safety Behaviour Scale; MSPSS, Multidimensional Scale of Perceived Social Support; RCADS, Revised Child Anxiety and Depression Scale; SDQ, Strengths and Difficulties Questionnaire; TMQQ, Trauma Memory Quality Questionnaire.
[a]Sexual trauma and CPTSD diagnosis are categorical variables, so the frequencies and percentages for these variables are reported here.

compared on trauma characteristics, comorbid psychopathology, and cognitive and social factors. The CPTSD group had a significantly higher prevalence of sexual trauma and significantly higher scores on measures of negative trauma-related cognitions, depression and panic.

First, the prevalence of CPTSD within this sample is higher than rates reported by other studies; 72 of 120 participants (60%) met the criteria for CPTSD compared to 40.6% found by Sachser, Keller, and Goldbeck (2017) in latent class analysis of a sample of youth exposed to at least one traumatic event with at least medium severity of post-traumatic stress symptoms. This difference may be due to the requirement for multiple traumas as well as high PTSD symptom severity scores in the present sample, potentially contributing to greater complexity and higher rates of CPTSD. Furthermore, the high rates of subthreshold DSO symptoms (97.9% of PTSD-only group endorsing at least one symptom) show that these are experienced by a majority of young people with a PTSD diagnosis, consistent with Elliott et al. (2021), who found that 90% of participants meeting PTSD criteria also endorsed at least one DSO symptom.

Primary analyses comprising between-groups comparisons showed that the CPTSD group had a significantly higher prevalence of sexual trauma than the PTSD-only group. This is consistent with Cloitre et al. (2019), where childhood sexual abuse by caregivers was associated with risk for CPTSD in adults. However, the other two primary hypotheses were not confirmed. There was no significant difference between the CPTSD and PTSD-only groups on number of trauma types or prevalence of intrafamilial abuse. The lack of significant difference for number of trauma types echoes the finding of Daniunaite et al. (2021), although the lack of difference in intrafamilial abuse prevalent does not replicate their finding that CPTSD was associated with family problems such as financial difficulties and conflicts in the home. However, it should be noted that the number of trauma types was high for both groups (M = 5.0 for CPTSD group; M = 4.3 for PTSD-only group) relative to similar samples such as Jensen et al. (2014).

The secondary analyses showed that the CPTSD group scored significantly higher on measures of negative post-traumatic cognitions, symptoms of depression and symptoms of panic. The finding for negative post-traumatic cognitions is consistent with Karatzias et al. (2018), who used logistic regression analysis to establish negative trauma-related cognitions about the self were the most important factor in predicting CPTSD diagnosis in adults. However, given that negative self-concept is a symptom of CPTSD, it is possible that this is related to, or overlaps with, negative post-traumatic cognitions, causing the significant difference between the groups. Furthermore, the findings for depression and panic are supported by Karatzias et al. (2019), in which adults with CPTSD were more likely to endorse symptoms for major depressive disorder and generalised anxiety disorder. It is feasible that

Table 3 Between-groups analysis for primary and secondary outcomes

Measure	CPTSD group (n = 72), m (SD)	PTSD-only group (n = 48), m (SD)	Test statistic	p	Effect size (Cohen's d unless specified)
Primary analysis					
Sexual trauma[a]	39 (54.2%)	10 (20.8%)	χ^2 = 13.2	**<.001**	.828
Number of trauma types	5.0 (2.3)	4.3 (1.9)	U = 1553.5	.344	.173
Intrafamilial abuse[a]	51 (70.8%)	39 (81.3%)	χ^2 = 1.7	.197	.319
Secondary analysis					
Trauma frequency	209.2 (827.8)	66.9 (180.7)	t = 0.27	.788	.051
Psychopathology					
Depression (RCADS)	21.2 (5.6)	16.9 (6.3)	t = 3.9	**<.001**	.731
Panic (RCADS)	16.0 (6.5)	12.0 (7.4)	t = 3.2	**.002**	.587
Dissociation	7.3 (2.5)	6.1 (2.4)	U = 1246.0	.009	.489
Generalised Anxiety Disorder (RCADS)	12.6 (4.0)	11.1 (3.7)	t = 2.1	.037	.393
Parent-reported emotional difficulties (SDQ)	22.5 (5.7)	20.3 (6.5)	t = 1.8	.072	.379
Impairment (CPSS)	4.9 (1.1)	4.2 (1.5)	U = 1376.5	.076	.330
PTSD symptoms (CRIES-8)	32.3 (5.9)	30.5 (6.0)	U = 1401.0	.078	.326
Suicidal ideation (MFQ-SI)	5.2 (2.6)	4.3 (2.7)	U = 1480.5	.22	.226
Borderline personality disorder traits (MSI)	6.5 (2.0)	5.9 (2.9)	U = 1159.0	.902	.025
Irritability (ARI-C)	7.9 (4.2)	7.9 (4.2)	U = 1722.5	.976	.005
Cognitive and social factors					
Negative post-traumatic cognitions (CPTCI)	77.8 (14.6)	67.4 (16.0)	t = 3.7	**<.001**	.686
Safety behaviours – Suppression subscale (CSBS)	12.6 (3.6)	10.8 (3.4)	t = 2.1	.04	.393
Trauma memory quality (TMQQ)	32.5 (5.1)	30.7 (6.0)	t = 1.7	.095	.313
Safety behaviours – hypervigilance subscale (CSBS)	11.3 (5.3)	10.3 (5.0)	t = 1.3	.208	.240
Social support (MSPSS)	56.8 (13.8)	59.4 (12.7)	t = 1.1	.285	.201

Significant results depicted in bold. A Bonferroni correction was applied for the three primary analyses and a Holm-Bonferroni correction was applied for the secondary analysis. ARI-C, Affective Reactivity Index – Child version; CPTCI – Post-Traumatic Cognitions Inventory, Child version; CRIES-8, Child Revised Impact of Events Scale; CSBS, Child Safety Behaviour Scale; MSPSS, Multidimensional Scale of Perceived Social Support; RCADS, Revised Child Anxiety and Depression Scale; SDQ, Strengths and Difficulties Questionnaire; TMQQ, Trauma Memory Quality Questionnaire.

[a] Categorical variables so frequencies rather than means are reported.

these features are transdiagnostic, whereby negative self-concept seen in CPTSD could feed into symptoms of depression, while emotional dysregulation, also a feature of CPTSD, could contribute to symptoms of panic.

Correlational analyses using the continuous questionnaire self-report measure of CPTSD symptoms replicated the results from the primary and secondary analyses with all of the factors identified in the between-groups analyses producing significant correlations, as well as some factors which were nonsignificant in the between-groups analyses producing significant correlations.

A further finding of note was the difference in age and sex distribution of the CPTSD and PTSD-only groups. The CPTSD group was found to be significantly older and contain a significantly higher proportion of females than the noncomplex group. The finding for age is not consistent with Karatzias et al. (2019), who found that younger age was associated with CPTSD in an adult sample. One explanation for the difference in sex distribution may be that females are more likely to experience or report sexual trauma (Finkelhor et al., 2014), which significantly differed between the groups in the primary analysis. This may also relate to the difference in mean ages, as sexual trauma may be more likely to be disclosed as young people enter puberty and gain more independence.

An additional consideration is the range of comorbid psychopathology and cognitive and social factors which were *not* found to significantly differ between the CPTSD and PTSD-only groups. The lack of significant difference for social support is surprising given the relationship difficulties symptom of CPTSD. Similarly, irritability produced a small, significant correlation with CPTSD symptoms but was not found to significantly differ in the between-groups analysis, despite its apparent relation to the DSO symptom of affect regulation. PTSD symptom severity had a large correlation with the CPTSD questionnaire measure but was not significant in the between-groups analyses, although this may be attributed to the high scores for the entire sample and thus a potential ceiling effect.

Table 4 Correlation analysis for primary and secondary outcomes

Measure	*n*	*r*	95% Confidence interval	*p*
Trauma characteristics				
Sexual trauma*	120	.241	.064 to .403	**.008**
Number of trauma types	120	.159	.023 to .368	.083
Intrafamilial abuse*	120	.073	−.107 to .249	.426
Trauma frequency	120	.111	−.070 to 2.84	.229
Psychopathology				
Depression (RCADS)	120	.621	.497 to .720	**<.001**
Suicidal ideation (MFQ-SI)	119	.551	.412 to .665	**<.001**
PTSD symptoms (CRIES-8)	120	.517	.373 to .638	**<.001**
Panic (RCADS)	120	.509	.363 to .531	**<.001**
Dissociation	120	.516	.372 to .637	**<.001**
Generalised Anxiety Disorder (RCADS)	120	.443	.287 to .577	**<.001**
Impairment (CPSS)	119	.374	.208 to .519	**<.001**
Borderline personality disorder traits (MSI)	98	.347	.159 to .510	**<.001**
Irritability (ARI-C)	120	.286	.112 to .442	**.002**
Parent-report emotional difficulties (SDQ)	94	.279	.081 to .456	**.006**
Cognitive and social factors				
Negative post-traumatic cognitions (CPTCI)	118	.637	.516 to .734	**<.001**
Safety behaviours, suppression (CSBS)	115	.486	.333 to .615	**<.001**
Trauma memory quality (TMQQ)	120	.395	.232 to .536	**<.001**
Social support (MSPSS)	119	−.191	−.358 to −.011	.038
Safety behaviours, hypervigilance (CSBS)	114	.151	−.034 to .326	.108

Significant results depicted in bold. A Holm-Bonferroni correction was applied.
* Categorical variables.

This research could have clinical implications. It has shown that sexual trauma specifically may be associated with greater complexity in children and adolescents. In addition, the CPTSD group having higher scores on post-traumatic negative cognitions suggests that this may be an important treatment target for multiple trauma-exposed young people, consistent with a recent systematic review which demonstrated that negative post-traumatic cognitions was the most consistent mediator or mechanism of change in PTSD treatments (Alpert et al., 2023).

The present research had various strengths and limitations. The study design and hypotheses were preregistered and a correction for multiple comparisons was used to ensure methodological rigour. Both the CPTSD and PTSD-only groups being comprised of youth with a PTSD diagnosis following exposure to multiple traumatic events allowed for a robust comparison, although there was the possibility for ceiling effects given the large proportion of the PTSD-only group endorsing two DSO symptoms and the elevated scores on psychopathology measures. The sample size was determined by the DECRYPT trial, meaning that while adequately powered, only medium-sized effects could be detected. In addition, most of the sample was female, which is comparable to other examples of PTSD research (Meiser-Stedman et al., 2017; Sachser & Goldbeck, 2016). A further consideration is the lack of validated diagnostic interviews available to assess CPTSD in youth. The additional interview items used in the present research were designed to be consistent with the CPSS-I-5 (an interview designed for DSM-5 PTSD, not ICD-11 PTSD or CPTSD); further research should aim to validate these supplementary interview items or other CPTSD diagnostic measures, in order to expand on the CPTSD self-report questionnaires now available (Haselgruber et al., 2020; Sachser et al., 2022).

Further research could be useful to better understand risk factors for CPTSD and the relationships linking CPTSD with psychopathological symptoms and cognitive and social factors. The cross-sectional design of the present research means that a longitudinal design affording exploration of causal relationships could develop these findings further. In addition, repeating similar analyses in an adult sample may be useful to know whether developmental stages influence these relationships. Given the higher mean age of the CPTSD group, examining psychometrics of CPTSD and PTSD measures across age groups in youth could elucidate this finding. Furthermore, investigating how CPTSD symptoms influence treatment course of PTSD could have important clinical implications.

In conclusion, this research has demonstrated that in youth with exposure to multiple traumatic events, CPTSD diagnosis is associated with only selected aspects of trauma history, namely sexual trauma. Youth with CPTSD were also shown to have more negative post-traumatic cognitions and more severe symptoms of depression and panic.

Supporting information

Additional supporting information may be found online in the Supporting Information section at the end of the article:

Appendix S1. Complex PTSD Interview.
Appendix S2. Complex PTSD Checklist.
Figure S1. Complex PTSD Questionnaire Score.
Table S1. Partial Correlation Analyses Controlling for PTSD Symptom Severity.

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Data availability statement

Research data are not shared.

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Key points

- Complex PTSD (CPTSD) is a relatively new diagnosis in the ICD-11. Research investigating factors related to CPTSD in young people could have clinical utility.
- The present study explored CPTSD in youth aged 8–17 years who had a diagnosis of PTSD and exposure to multiple traumatic stressors.
- Those who met criteria for CPTSD diagnosis had higher frequency of sexual trauma and higher scores on measures of negative post-traumatic cognitions, depression and panic than those who did not.
- The CPTSD group also had a higher mean age and larger proportion of females than the PTSD-only group.
- Future research should seek to clarify the directionality and mechanisms of these relationships and compare them to an adult sample.

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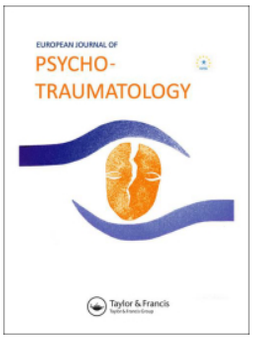

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CLINICAL RESEARCH ARTICLE

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Voice hearing in young people with posttraumatic stress disorder (PTSD) following multiple trauma exposure

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ABSTRACT

Background: PTSD is comorbid with a number of other mental health difficulties and the link between voice hearing and PTSD has been explored in adult samples.

Objective: To compare the trauma history, symptomatology, and cognitive phenotypes of children and adolescents with a PTSD diagnosis following exposure to multiple traumatic events presenting with voice hearing with those who do not report hearing voices.

Methods: Participants ($n = 120$) were aged 8–17 years and had PTSD following exposure to multiple traumas. Three primary analyses were conducted, comparing PTSD symptom severity, prevalence of sexual trauma, and level of negative post-traumatic cognitions between the voice hearing and non-voice hearing groups. Participants were allocated to the voice hearing group if they reported hearing voices in the past two weeks. A range of mental health and cognitive–behavioural factors were considered in exploratory secondary analyses. All analyses were pre-registered.

Results: The voice hearing group ($n = 50$, 41.7%) scored higher than the non-voice hearing group ($n = 70$, 58.3%) for negative post-traumatic cognitions, but not PTSD symptom severity or prevalence of sexual trauma. In secondary analyses, the voice hearing group had more sensory-based and fragmented memories and higher scores for panic symptoms than the non-voice hearing group. When participants whose voices were not distinguishable from intrusions or flashbacks were removed from the voice hearing group in a sensitivity analysis, the voice hearing group ($n = 29$, 24.2%) scored higher on negative post-traumatic cognitions and trauma memory quality, with similar effect sizes to the original analysis.

Conclusions: Voice hearing is common among youth exposed to multiple traumas with PTSD and is related to cognitive mechanisms proposed to underpin PTSD (appraisals, memory quality) and more panic symptoms. Further research should seek to investigate the underlying mechanisms and directionality for these relationships.

Jóvenes que escuchan voces con trastorno de estrés postraumático (TEPT) tras exposición a múltiples traumas

Antecedentes: El TEPT es comórbido con una serie de otras dificultades de salud mental, y el vínculo entre la experiencia de escuchar voces y el TEPT ha sido explorado en muestras de adultos.

Objetivo: Comparar la historia de trauma, la sintomatología y los fenotipos cognitivos de niños y adolescentes con diagnóstico de TEPT tras la exposición a múltiples eventos traumáticos que presentan la experiencia de escuchar voces, con aquellos que no reportan escuchar voces.

Método: Los participantes ($n = 120$) tenían entre 8 y 17 años, los cuales habían desarrollado TEPT tras la exposición a múltiples traumas. Se realizaron tres análisis principales para comparar la gravedad de los síntomas de TEPT, la prevalencia de trauma sexual y el nivel de cogniciones negativas postraumáticas entre los grupos con y sin experiencia de escuchar voces. Se asignó a los participantes al grupo que escucha voces si declaran haber oído voces al menos en las últimas dos semanas. En los análisis secundarios exploratorios se tuvieron en cuenta diversos factores de salud mental y cognitivo-conductuales. Todos los análisis se registraron previamente.

Resultados: El grupo que escucha voces ($n = 50$, 41.7%) obtuvo puntuaciones más altas que el grupo que no escucha voces ($n = 70$, 58.3%) en cogniciones negativas postraumáticas, pero no

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PTSD; youth; voice hearing; trauma; cognition; panic

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TEPT; juventud; escuchar voces; trauma; cognición; pánico; memoria; apreciaciones

HIGHLIGHTS

- 41.7% of a sample of young people with PTSD following exposure to multiple traumatic events reported hearing voices.
- The voice hearing group scored higher than the non-voice hearing group on measures of negative post-traumatic cognitions and panic symptoms and had poorer trauma memory quality.
- A sensitivity analysis which excluded participants whose voices were not distinguishable from intrusions or flashbacks replicated the findings for negative post-traumatic cognitions and trauma memory quality.

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en la gravedad de los síntomas de TEPT ni en la prevalencia de trauma sexual. En los análisis secundarios, el grupo que escucha voces mostró más recuerdos sensoriales y fragmentados, así como puntuaciones más altas en síntomas de pánico en comparación con el grupo que no escucha voces. Al excluir, en un análisis de sensibilidad, a los participantes cuyas voces no se distinguían de intrusiones o recuerdos retrospectivos (flashbacks), el grupo que escucha voces ($n = 29$, 24.2%) mantuvo puntuaciones más altas en cogniciones negativas postraumáticas y calidad de la memoria del trauma, con tamaño del efecto similar al análisis original.
Conclusión: La experiencia de escuchar voces es común entre jóvenes expuestos a múltiples traumas con TEPT y está relacionada con mecanismos cognitivos propuestos como base del TEPT (apreciaciones, calidad de la memoria) y con un mayor número de síntomas de pánico. Se necesitan más investigaciones para examinar los mecanismos subyacentes y la direccionalidad de estas relaciones.

1. Background

Post-traumatic stress disorder (PTSD) is a possible reaction to trauma which is associated with a range of poor outcomes related to quality of life and overall functioning, as well as comorbidity with other mental health difficulties in children and adolescents (Lewis et al., 2019). Research into symptoms which are comorbid to PTSD is key for the understanding and effective treatment of young people who have been exposed to trauma. PTSD is frequently comorbid with depression (Angelakis & Nixon, 2015; O'Donnell et al., 2004) and anxiety disorders (Hubbard et al., 1995) but research into comorbid voice hearing is limited. Hearing voices is common in the general population (Watkins, 2008) and can cause significant distress.

Voice hearing is defined by Longden et al. (2012) as 'a percept-like experience in the absence of appropriate stimulus, which manifests as a human vocalisation, which is experienced in a conscious state and is not induced by organic or state-dependent circumstances'. There are multiple perspectives on how voice hearing is understood in the context of trauma. One is that voice hearing may be considered as a 'psychotic-like experience' as it could be an auditory hallucination, classified as a feature of psychotic disorders (DSM-5; American Psychiatric Association, 2013). Psychotic-like experiences are a broad category encompassing 'subtle, subclinical hallucinations and delusions which are quite common in general population' (Remberk, 2017).

Psychotic-like experiences are common, reported by approximately 60% of young people (Laurens et al., 2007; Laurens et al., 2012) . Armando et al. (2010) found that psychotic-like experiences in adolescents and young adults (aged 15–26 years) were associated with distress, depression, and poor functioning. When considering research into trauma and psychosis in children, Arseneault et al. (2011) found that children who experienced maltreatment were more likely to report psychotic symptoms at age 12 than children who did not experience maltreatment and Kelleher et al. (2013) observed a bidirectional relationship between childhood trauma and psychosis in a prospective cohort study. Furthermore, Bloomfield et al. (2020) found a relationship between developmental trauma (defined as experiences including emotional, sexual, or physical abuse in childhood or adolescence) and psychosis symptoms during adulthood, which was mediated by dissociation, emotional dysregulation, and PTSD symptoms. However, research investigating the specific link between voice hearing and PTSD has thus far been limited to adult samples; Anketell et al. (2010) found that voice hearing in an adult sample with PTSD diagnosis had a prevalence of 50%.

Alternatively, as voices are experienced as originating outside of oneself, voice hearing can be understood as a dissociative phenomenon. Dissociation is conceptualised as 'a disruption, interruption, and/or discontinuity of the normal, subjective integration of behaviour, memory, identity, consciousness, emotion, perception, body representation, and motor control' by the DSM-5 (American Psychiatric Association, 2013), and hearing voices can be understood as one such disruption. Dissociative experiences and psychotic voices may overlap, but they may also be distinguished by features of the voices and comorbid symptoms (e.g. delusions and negative symptoms such as blunted affect are more associated with psychotic voices) (Ross, 2020).

It is important to consider the potential confound between voice hearing and re-experiencing symptoms of PTSD, as intrusions and flashbacks may include experiencing voices related to traumatic events, therefore warranting identification of voice hearing occurring in the absence of re-experiencing symptoms. There could be some overlap between the experiences of intrusions and voice hearing, and there is potential for shared mechanisms such as dissociation and emotional dysregulation (Bloomfield et al., 2020). Hardy et al. (2005) found that in a trauma-exposed adult sample with a diagnosis of nonaffective psychosis, 57.5% of participants had identifiable associations between hallucinations and traumatic experiences, established by assessing the themes and content of the hallucinations in relation to reported traumas. This suggests that there is an overlap between

hallucinations and PTSD symptoms, but that it may be possible to distinguish between trauma-related and non-trauma related hallucinations. The present research focused on the experience of voice hearing specifically (rather than the broader category of auditory hallucinations or psychotic-like experiences), because it is a clearly defined and easily measurable construct which may be distressing and clinically meaningful, even in the absence of a psychotic episode or dissociation.

Fundamental questions around the nature of voice hearing in youth with PTSD – including not only its prevalence but also its correlates and potential underlying mechanisms – need to be addressed. Andrew et al. (2008) compared psychiatric and non-psychiatric voice hearers (distinguished by negative and positive appraisals of voice hearing, respectively) and found that current trauma symptoms were a significant predictor of beliefs about voices, suggesting a link between these experiences. In addition, the psychiatric voice hearing group reported a significantly higher level of childhood sexual abuse, with no significant difference between the groups in number of trauma types experienced, which suggests that sexual trauma specifically may be related to the symptom of hearing voices. Furthermore, Anilmis et al. (2015) extended on the importance of appraisals and demonstrated that negative self-beliefs mediate the relationship between the psychological impact of victimisation and psychotic-like experiences in children aged 8–14 years.

Therefore, in light of previous findings, we identified three areas of primary importance to consider. First, given the association between PTSD and a broader range of mental health outcomes (Lewis et al., 2019), the relationship between PTSD severity and voice hearing warrants exploration. Second, trauma *type* (sexual vs non-sexual trauma) may be a key factor in the development of voice hearing. Third, cognitive appraisals warrant consideration, due to the previously identified link between victimisation and psychotic-like experiences in children.

Further to PTSD symptom severity, trauma type, and negative cognitions, there are a range of other psychopathological and cognitive-behavioural factors which could be related to the experience of hearing voices. Psychopathological factors may include complex PTSD (World Health Organization, 2019), dissociation (Longden et al., 2012), depression, anxiety (Lewis et al., 2019), and irritability (Zhang et al., 2022). Cognitive-behavioural factors of interest include trauma memory quality (Meiser-Stedman et al., 2012), safety-seeking behaviours (Alberici et al., 2018), and perceived social support (Daniunaite et al., 2021).

The present study investigated how hearing voices is related to trauma experiences, psychopathological symptom severity, and cognitive-behavioural factors in young people (aged 8–17 years) diagnosed with PTSD following multiple trauma exposure. For the primary analysis, voice hearing and non-voice hearing groups were compared on PTSD symptom severity, sexual trauma prevalence, and negative trauma-related cognitions. Exploratory secondary analyses were conducted comparing these groups on a range of variables covering other psychopathological (i.e. complex PTSD, dissociation, depression, anxiety, and irritability) and cognitive-behavioural (i.e. trauma memory quality, safety-seeking behaviours, and perceived social support) factors. Sensitivity analyses were conducted in which participants whose voices were distinguishable from intrusions were identified and the analyses rerun. In addition, given the importance some commentators have placed on dissociation, we also sought to evaluate this factor as a confounding variable.

Our primary hypotheses were that the voice hearing group would have significantly higher scores than the non-voice hearing group on PTSD symptom severity and negative cognitions and a significantly higher rate of sexual trauma. These aimed to replicate associations established by previous research: that voice hearing is associated with greater PTSD symptom severity, heightened negative cognitions, and experience of sexual trauma. Our secondary exploratory hypothesis was that the voice hearing group would have significantly higher scores than the non-voice hearing groups on other measures of psychopathological and cognitive-behavioural factors.

2. Methods

2.1. Design

The present study was a cross-sectional design comprising of analysis of the baseline data from the Delivery of Cognitive Therapy for Young People after Trauma (DECRYPT) trial (Allen et al., 2021), a randomised controlled trial of cognitive therapy for PTSD in youth exposed to multiple traumatic stressors. Measures were selected from the battery of self-report and parent/caregiver-report interviews and questionnaires to assess PTSD symptom severity, prevalence of sexual trauma, and negative post-traumatic cognitions for the primary analysis. For the secondary analysis, measures assessing dissociation, depression, anxiety, irritability, trauma memory quality, safety behaviours, and social support were identified. These analyses were pre-registered on the Open Science Framework (https://osf.io/q85rz/).

2.2. Ethical considerations

Ethical approval for the DECRYPT trial was provided by UK Health Research Authority Research Ethics Committee (East of England – Cambridge South, 16/EE/0233). For participants aged under 16 years,

informed consent was provided by parents and caregivers, and the child or young person was also asked to give their assent. Participants aged 16 years or older could provide informed consent without their parent or caregiver.

2.3. Participants

The sample size of 120 participants was determined by the primary outcome of the DECRYPT trial (Allen et al., 2021). Participants were drawn from Child and Adolescent Mental Health Services (CAMHS) and Youth Services in Cambridgeshire, Cardiff, Essex, Hertfordshire, Kent, Norfolk, South London, and Suffolk. Inclusion criteria required participants to be aged 8–17 years with a diagnosis of PTSD (as defined by DSM-5 and diagnosed using the CPSS-I-5, Child PTSD Symptom Scale – Interview version, Foa et al. [2018]) following multiple trauma exposure, and to have a score equal to or greater than 17 on the Child Revised Impact of Events Scale, 8-item version (Perrin et al., 2005). All participants also met ICD-11 criteria for PTSD. Exclusion criteria were a change of prescribed psychiatric medication within the past two months, PTSD symptoms relating exclusively to one trauma, pervasive developmental or neurodevelopmental disorder, intellectual disability, another primary psychiatric diagnosis or clinical need warranting treatment ahead of PTSD (e.g. psychosis), inability to speak English, ongoing exposure to threat, strong likelihood of being unable to complete treatment (e.g. imminent house move), or history of organic brain damage. Table 1 contains the demographic and trauma history data for the sample.

Table 1. Sample demographic characteristics.

	Whole sample $n = 120$	Voice hearing sample ($n = 50$)	Non-voice hearing sample ($n = 70$)
Age in years, mean (*SD*)	14.9 (2.5)	15.1 (2.3)	14.8 (2.7)
Gender, *n* (%)			
Male	33 (27.5)	12 (24.0)	21 (30.0)
Female	87 (72.5)	38 (76.0)	49 (70.0)
Ethnicity, *n* (%)			
White (any background)	96 (80.0)	42 (84.0)	55 (78.5)
Black (any background)	9 (7.5)	1 (2.0)	8 (11.4)
Asian (any background)	2 (1.7)	1 (2.0)	1 (1.4)
Mixed (any background)	11 (9.2)	5 (10.0)	6 (8.6)
Any other ethnic group	1 (0.8)	1 (2.0)	0 (0.0)
Ethnicity not stated	1 (0.8)	0 (0.0)	0 (0.0)
Traumatic Experiences, *n* (%)			
Natural disaster	3 (2.5)	2 (4.0)	1 (1.4)
Accident	34 (28.3)	17 (34.0)	17 (24.3)
Robbed	10 (8.3)	5 (10.0)	5 (7.1)
Physical abuse inside family	57 (47.5)	25 (50.0)	32 (45.7)
Physical abuse outside family	57 (47.5)	24 (48.0)	33 (47.1)
Witnessed physical abuse inside family	66 (55)	32 (64.0)	34 (48.6)
Witnessed physical abuse outside family	53 (44.2)	24 (48.0)	29 (41.4)
Inappropriate sexual contact	36 (30)	19 (38.0)	17 (24.3)
Someone forcing/ pressuring sex	30 (25)	15 (30.0)	15 (21.4)
Sudden death/injury of a close person	55 (45.8)	23 (46.0)	32 (45.7)
Attacked, stabbed, shot at, or hurt badly	13 (10.8)	7 (14.0)	6 (8.6)
Witnessed someone attacked, stabbed, shot at, or hurt badly	35 (29.2)	15 (30.0)	20 (28.6)
Medical procedure	29 (24.2)	17 (34.0)	12 (17.1)
Exposure to war	0 (0.0)	0 (0.0)	1 (1.4)
Other	83 (69.2)	32 (64.0)	51 (72.9)
Number of Trauma Types, mean (SD)	4.7 (2.2)	5.1 (2.2)	4.3 (2.11)

2.4. Measures

2.4.1. Voice hearing interview

The voice hearing interview is a child-report structured interview comprised of six items, four of which were taken from the Unusual Experiences Questionnaire (UEQ) (Anilmis et al., 2015; Laurens et al., 2012). The UEQ has good internal consistency (Laurens et al., 2012). The question establishing the presence of voices ('Have you ever heard voices that other people could not hear?') was measured on a three-point Likert-type scale from 'Not true' to 'Certainly true'. The other three items concerning the frequency, distress, and impairment related to hearing voices were assessed on a four-point Likert-type scale from 'Not at all' to 'A great deal'. Two additional items were included to explore how the voices relate to trauma and PTSD symptoms ('Were these voices of the people that attacked you?' and 'Were these voices part of your intrusive thoughts or flashbacks?'). These were measured on a three-point Likert-type scale from 'Not true' to 'Certainly true'. In addition, interviewers completed an open response item clarifying the nature and content of voices.

Participants were included in the voice hearing group if they endorsed hearing at least one voice in the preceding two weeks. A sensitivity analysis was conducted whereby information from the two items linking voices to PTSD symptoms and the open response item regarding the content of voices was analysed to exclude participants from the voice hearing group whose voices appeared to be exclusively flashback or intrusion related, or any participants with insufficient information to establish this. Two authors (KL and RMS) independently reviewed the voice content open response item and disagreements were discussed at a consensus meeting to reach full agreement.

2.4.2. Children's revised impact of event scale, 8-item version (CRIES-8)

The CRIES-8 (Perrin et al., 2005) is a self-report questionnaire measure assessing frequency of post-traumatic stress symptoms over the preceding seven days. It has good face, construct, predictive, and

criterion validity (Perrin et al., 2005; Stallard et al., 1999), $\alpha = .66$ in this sample.

2.4.3. Child and adolescent trauma screen (CATS)

The CATS (Sachser et al., 2017) has self-report and caregiver-report versions, both of which were employed in the present study as a structured interview. For the present research, the first 15 items pertaining to trauma history were analysed; these list 14 different trauma types and an open answer question to accommodate any non-listed trauma types, with the participant asked to indicate if they have experienced each event as a yes or no question; caregivers were asked the same with regards to the young person in their care. One of the participant or their parent/caregiver needed to endorse a sexual trauma for the participant to meet the sexual trauma criterion.

2.4.4. Post-Traumatic cognitions inventory – child version (CPTCI)

The CPTCI (Meiser-Stedman et al., 2009) is a 25-item self-report questionnaire assessing negative appraisals over the preceding two weeks of one or more of a participant's traumatic experiences. The scale comprises two subscales, a sense of 'permanent and disturbing change' and a sense of being a 'fragile person in a scary world'. The measure has good internal consistency, test-retest reliability, convergent validity, and discriminative validity (Meiser-Stedman et al., 2009), $\alpha = .94$ in this sample.

2.4.5. Complex PTSD interview

To establish whether participants met the criteria for complex PTSD, as defined by ICD-11 (World Health Organization, 2019), a three-item self-report structured diagnostic interview was conducted. The interview was devised by the DECRYPT trial team (see supplementary material) based on ICD-11 draft criteria (World Health Organization, 2019). The three interview items correspond to the three disturbances in self-organisation (DSO) symptoms defined in ICD-11: affective dysregulation, negative self-concept, and difficulties in sustaining relationships. Each item had one introductory question assessing the overall symptom, with optional follow-up questions for positive responses. Each of the three DSO symptoms was assessed on a five-point Likert-type scale from zero ('Not at all') to four ('Six or more times a week/almost always'), consistent with the CPSS-I-5.

2.4.6. Revised child anxiety and depression scale (RCADS)

The RCADS (Chorpita et al., 2000) is a 47-item self-report questionnaire assessing symptoms in the preceding two weeks corresponding to anxiety disorders and depression in young people. The measure has good internal consistency (Kösters et al., 2015), test-retest reliability, and convergent validity (Chorpita et al., 2000), $\alpha = .94$ in this sample.

2.4.7. Dissociation

Dissociation was measured using a three-item questionnaire assessing symptoms experienced during the preceding two weeks. Items were scored on a four-point Likert-type scale from 'Not at all or only one time' to 'Five or more times a week/almost always', $\alpha = .73$ in this sample.

2.4.8. Strengths and difficulties questionnaire (SDQ)

The SDQ (Goodman, 1997) is a 25-item caregiver-report measure assessing emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behaviour, with each scale comprised of five items. The first four scales (20 items), excluding prosocial behaviour, are used to calculate a total difficulties score, used in the present research. The total difficulties score has acceptable test-retest reliability (Bergström & Baviskar, 2021), and sufficient convergent, discriminant, and criterion validity (Vugteveen et al., 2021), $\alpha = .66$ in this sample.

2.4.9. Affective reactivity index – child version (ARI-C)

The ARI-C (Stringaris et al., 2012) is a seven-item self-report measure of irritability which asks participants to rate irritability symptoms compared to others of the same age (e.g. 'I am easily annoyed by others'), $\alpha = .94$ in the sample.

2.4.10. Trauma memory quality questionnaire (TMQQ)

The TMQQ (Meiser-Stedman et al., 2007) is an 11-item self-report questionnaire which assesses the current characteristics of trauma memories; particularly the extent to which they are composed of sensory elements. The measure has good internal consistency, criterion validity, and convergent validity (Meiser-Stedman et al., 2007). Higher scores indicate more sensory-based and fragmented memories, $\alpha = .73$ in this sample.

2.4.11. Child safety behaviour scale (CSBS)

The CSBS (Alberici et al., 2018) is a 13-item self-report questionnaire assessing safety behaviours (strategies employed to prevent a dreaded outcome, Salkovskis et al., 1999) over the past two weeks. The measure has excellent internal consistency and good discriminant validity and specificity (Alberici et al., 2018), $\alpha = .81$ in this sample.

2.4.12. Multidimensional scale of perceived social support (MSPSS)

The MSPSS (Zimet et al., 1988) is a 12-item self-report questionnaire measuring a participant's perceptions of

support from family, friends, and a significant other. The measure has good internal reliability (Zimet et al., 1988) and good convergent and discriminative validity (De Maria et al., 2018), $\alpha = .82$ in this sample.

2.5. Data analysis

The sample size was predetermined by the DECRYPT trial. A power analysis conducted using G*Power version 3.1.9.7 (Faul et al., 2007) indicated that two groups ($n = 50$ and $n = 70$) with a significance criterion of $\alpha = .05$ for a test of means comparisons would have 80% power to detect an effect size (standardised mean difference) of .52. Statistical analysis was conducted using IBM SPSS Statistics Version 28 (IBM Corp. 2021). Data were assessed for assumptions of normality, skewness, and kurtosis (see Supplementary Material). The scores for the CRIES-8, SDQ, ARI-C, total RCADS, and Dissociation did not meet the normality assumption. For the CRIES-8, ARI-C, and Dissociation scores, no adequate transformations could be found; therefore, non-parametric Mann-Whitney tests were conducted for these variables. The scores for the SDQ and total RCADS met the normality assumption after a square root transformation, allowing parametric tests to be conducted as planned. Independent samples t-tests were conducted to compare the voice hearing and non-voice hearing groups on scores for the following variables: CRIES-8, CPTCI, RCADS total and subscales (depression, panic, generalised anxiety disorder), SDQ, TMQQ, CSBS-13, and MSPSS. Prevalence of sexual trauma and complex PTSD diagnosis were compared between the voice hearing and non-voice hearing groups using chi-square tests due to the categorical nature of these variables. Corrections were applied to adjust for multiple comparisons. For the primary analysis (CRIES-8 score, sexual trauma prevalence, and CPTCI score), a Bonferroni correction was applied. For the exploratory secondary analysis comprising all other variables, a Holm-Bonferroni correction was applied.

Levene's test for equal variances was conducted for all t-tests; this was not significant and equal variances were assumed unless otherwise specified. Cohen's d effect sizes were calculated.

Table 2. Descriptive statistics for all measures.

Measure	*n*	*M*	*SD*	Range	Cronbach's *α*
PTSD symptoms (CRIES-8)	120	31.6	6.00	17–40	.66
Negative cognitions (CPTCI)	118	73.6	15.9	26–100	.94
RCADS total score	120	82.1	24.8	20–133	.94
Anxiety (RCADS)	120	12.0	3.93	2–18	.78
Depression (RCADS)	120	19.5	6.24	2–30	.83
Panic disorder (RCADS)	120	14.4	7.12	0–27	.91
Parent-rated emotional difficulties (SDQ)	94	21.5	6.13	9–35	.66
Irritability (ARI-C)	120	7.93	4.21	0–14	.94
Memory quality (TMQQ)	120	31.8	5.50	17–44	.73
Safety behaviours (CSBS)	114	35.7	7.30	15–51	.81
Social support (MSPSS)	119	57.8	13.4	17–84	.82
Dissociation	120	6.87	2.50	3–12	.73
Sexual Trauma*	50				
Complex PTSD Diagnosis*	72				

Note: CRIES-8 = Child Revised Impact of Events Scale; CPTCI – Post-Traumatic Cognitions Inventory, Child version; RCADS = Revised Child Anxiety and Depression Scale; SDQ = Strengths and Difficulties Questionnaire; ARI-C = Affective Reactivity Index – Child version; TMQQ = Trauma Memory Quality Questionnaire; CSBS = Child Safety Behaviour Scale; MSPSS = Multidimensional Scale of Perceived Social Support.
* Sexual trauma and Complex PTSD diagnosis are categorical variables, so the frequency of each of these within the sample is reported here.

3. Results

3.1. Descriptive statistics

The sample comprised 120 participants, mean age 14.9 years (*SD* 2.5 years), 72.5% female, 96% white. Table 2 contains descriptive statistics of all measures. Fifty of 120 participants (41.6%) reported hearing voices in the preceding two weeks. Table 3 contains statistics regarding the characteristics of voices.

3.2. Demographic analyses

There was no difference between the voice hearing and the non-voice hearing groups on mean age, mean number of trauma types, proportion of female participants, or proportion of non-white participants.

3.3. Primary analyses

Table 4 contains mean scores differentiated by group. With respect to PTSD symptom severity, a Mann-Whitney test indicated that despite the voice hearing group having a higher mean score, there was no significant difference between the voice hearing group and the non-voice hearing group ($p = .046$; Bonferroni correction required $p = .0167$; Cohen's $d = .37$). There

Table 3. Frequencies for characteristics of voices.

	***n* (%)**			
Question	*Not at all*	*Only a little*	*Quite a lot*	A great deal
How much has it upset you?	4 (8%)	11 (22%)	22 (44%)	13 (26%)
How hard has it made things at home or school?	7 (14%)	9 (18%)	20 (40%)	14 (28%)
	***n* (%)**			
Question	*Not true*	*Somewhat true*	*Certainly true*	
Were these the voices of the people that attacked you?	24 (48%)	9 (18%)	17 (34%)	
Were these voices part of your intrusive thoughts or flashbacks?	14 (28%)	20 (40%)	15 (30%)	

Table 4. Between groups analysis for primary and secondary outcomes.

Measure	Voices group *(n = 50), m (SD)*	No voices group *(n = 70), m (SD)*	Test statistic	*p*	Effect size *(Cohen's d)*
Primary analysis					
Negative cognitions (CPTCI)	**77.7 (13.1)**	**70.7 (17.2)**	***t* = 2.49**	**.014**	**.445**
PTSD symptoms (CRIES-8)	32.9 (5.07)	30.6 (6.42)	$U = 1377.0$	.046	.366
Sexual trauma*	24 (48%)	25 (35.7%)	$\chi^2 = 1.82$	.177	.280
Secondary Analysis					
Memory quality (TMQQ)	**34.2 (4.94)**	**30.0 (5.25)**	***t* = 4.36**	**<.001**	**.807**
Panic disorder (RCADS)	**16.6 (6.20)**	**12.9 (7.36)**	***t* = 2.90**	**.004**	**.537**
RCADS total score	88.7 (22.9)	77.4 (25.2)	$t = 2.54$	.012	.470
Anxiety (RCADS)	12.9 (3.61)	11.3 (4.05)	$t = 2.12$	.036	.392
Safety behaviours (CSBS)	24.3 (6.60)	21.4 (7.60)	$t = 2.10$	.038	.397
Dissociation	7.36 (2.39)	6.51 (2.53)	$U = 1391.5$	.055	.355
Parent-rated emotional difficulties (SDQ)	22.8 (6.08)	20.6 (6.04)	$t = 1.77$	.080	.369
Depression (RCADS)	20.4 (6.23)	18.9 (6.21)	$t = 1.35$	.181	.249
Irritability (ARI-C)	8.73 (4.43)	7.36 (3.98)	$U = 1389.5$	.054	.357
Complex PTSD diagnosis*	31 (62%)	41 (58.6%)	$\chi^2 = 0.143$	.705	.013*
Social support (MSPSS)	57.7 (14.0)	57.9 (13.0)	$t = 0.068$	.946	.013

Note: Significant results depicted in bold. A Bonferroni correction was applied for the three primary analyses and a Holm-Bonferroni correction was applied for the secondary analysis.

CPTCI – Post-Traumatic Cognitions Inventory, Child version; CRIES-8 = Child Revised Impact of Events Scale; TMQQ = Trauma Memory Quality Questionnaire; RCADS = Revised Child Anxiety and Depression Scale; CSBS = Child Safety Behaviour Scale; SDQ = Strengths and Difficulties Questionnaire; ARI-C = Affective Reactivity Index – Child version; MSPSS = Multidimensional Scale of Perceived Social Support.

*Categorical variables so frequencies rather than means are reported.

was no relationship between hearing voices and sexual trauma ($p = .18$, Cohen's $d = .28$). With respect to negative trauma-related cognitions, an independent samples t-test was conducted. The voice hearing group scored higher than the non-voice hearing group ($p = .014$; Cohen's $d = .45$).

3.4. Secondary analyses

Differences were found between voice hearing and non-voice hearing on measures of trauma memory quality and panic disorder. The voice hearing group had a higher TMQQ score than the non-voice hearing group, indicating more sensory-based and poorly verbalised memories, with a large effect size, Cohen's $d = .81$. The voice hearing group had a higher score on the RCADS panic disorder subscale than the non-voice hearing group (Cohen's $d = .54$). There were no differences between the voice hearing and non-voice hearing groups on the other secondary measures.

3.5. Sensitivity analyses

A sensitivity analysis was conducted in which participants whose voices did not appear to be distinguishable from intrusions or flashbacks, or with insufficient information to conclude this, were excluded from the analysis, resulting in a group of 29 participants in the voice hearing group and 70 in the non-voice hearing group (see Supplementary Material).

The full sensitivity analysis is reported in the Supplementary Material. Negative trauma-related cognitions remained higher for the voice hearing group ($p = .01$, Cohen's $d = .59$). Trauma memory quality remained ($p < .001$, Cohen's $d = .82$), but there was no longer a difference between the groups on panic disorder symptoms ($p = .025$, Cohen's $d = .50$). There was no difference between the sensitivity analysis groups on demographic factors.

Further analyses were conducted to consider the potential confounding effect of dissociation. Logistic regression models were determined where voice hearing status was the dependent variable and the variables identified as significant (negative post-traumatic cognitions, trauma memory quality, and panic disorder) were entered as independent variables alongside dissociation score (see Supplementary Materials Tables S3 and S4). The results for trauma memory quality and panic disorder remained, but negative trauma-related cognitions were not a predictor of voice hearing after controlling for dissociation.

4. Discussion

The present study is a novel investigation of the experience of voice hearing in children and adolescents with a PTSD diagnosis following multiple trauma exposure, with comparisons made between the voice hearing and non-voice hearing groups on trauma type and psychopathological and cognitive–behavioural factors. As hypothesised, the voice hearing group scored higher on a measure of negative cognitions than the non-voice hearing group. There was no evidence for a difference in PTSD symptom severity or incidence of sexual trauma between the groups, contrary to our other primary hypotheses. From the secondary analyses, the voice hearing group had worse trauma memory quality (more fragmented, sensory based, poorly verbalised memories) and more severe panic symptoms than the non-voice hearing group, partially endorsing the secondary hypothesis that the voice hearing group would score higher on

measures of psychopathology and cognitive–behavioural factors. However, no differences were found between the groups on incidence of complex PTSD diagnosis or on measures of dissociation, depression, generalised anxiety disorder, irritability, safety behaviours, or perceived social support.

The first finding of note was the prevalence of voice hearing. Fifty of 120 participants (41.7%) endorsed at least one incidence of voice hearing in the preceding two weeks. Furthermore, most voice hearers were at least 'quite a lot' upset by their experience of voice hearing. Disentangling the experience of voice hearing from trauma-related themes or PTSD symptoms was difficult, with just over half of the voice hearing group reporting that the voices they heard were those of their attackers. However, a significant proportion of voice hearers (34%) confirmed that the voices they heard did *not* form part of their re-living symptoms. This is comparable to previous research in which 27% of young people aged 15–25 years presenting with post-traumatic intrusions and hallucinations following a first episode of psychosis experienced hallucinations which were not related to their post-traumatic intrusions (Peach et al., 2021).

There are a range of models relevant to understanding the link between PTSD and voice hearing. Hardy (2017) proposed a trauma-informed model of voices suggesting that trauma increases the risk of unhelpful emotion regulation, distorted trauma memories, and alterations to appraisals. These three vulnerability factors can lead to trauma memory intrusions (re-experiencing symptoms of PTSD) and anomalous experiences such as voice hearing. This model proposes that PTSD intrusions and hallucinations lie on a continuum of memory fragmentation following trauma. The present findings support this given the results for poorer trauma memory quality and negative post-traumatic appraisals.

Between-groups comparisons found that the voice hearing group scored higher on a measure of negative cognitions than the non-voice hearing group. The importance of negative schematic beliefs in adolescents was demonstrated by Anilmis et al. (2015), who found that negative beliefs about the self and others mediated the relationship between bullying and distressing unusual experiences in a sample aged 8–14 years. The importance of negative cognitions aligns with the cognitive model of PTSD (Ehlers & Clark, 2000), in which negative appraisals can contribute to a sense of current threat, and also with the cognitive model of psychosis (Garety et al., 2001), in which negative cognitions mediate the relationship between negative experiences and positive symptoms of psychosis. The relationship between voice hearing and negative cognitions held in the sensitivity analysis when focusing only on non-flashback voices, supporting the cognitive model of psychosis as a potential mechanism for voice hearing experiences. However, this relationship was no longer significant when controlling for symptoms of dissociation, suggesting the experience of voice hearing may be generated through dissociative mechanisms. A further possibility is that experiences of voice hearing could result in more negative appraisals regarding a sense of being damaged or vulnerable, as the present research does not provide information regarding the directionality of effects. From the secondary analyses, the voice hearing group had more sensory-based, poorly verbalised trauma memories. The effect for trauma memory was noteworthy in its size ($d > .8$), and its persistence in sensitivity analyses. These findings support that more fragmented memories may play a role in voice hearing for trauma-exposed youth. In the Ehlers and Clark (2000) cognitive model of PTSD, poor memory quality contributes to a sense of current threat, which may then increase the risk of voice hearing. Similarly, in the Hardy (2017) model, distorted trauma memories are linked to greater vulnerability to anomalous experiences such as voice hearing.

A further finding was that the voice hearing group experienced more severe panic symptoms than the non-voice hearing group. The negative appraisals underpinning PTSD may overlap with the catastrophic misinterpretations involved in the development of panic (Clark, 1986), which could worsen a sense of threat and thus lead to heightened panic symptoms in those hearing voices. A further common mechanism in the cognitive model may be greater attention towards bodily and cognitive phenomena. The Hardy (2017) model also suggests that exposure to trauma increases the risk of emotion dysregulation, which panic symptoms may be indicative of. Alternatively, voice hearing could pre-date trauma and may increase the frequency of panic episodes and the likelihood of negative appraisals. The lack of evidence exhibiting a difference between the voice hearing and non-voice hearing groups on the other psychopathological and cognitive factors included in the secondary analyses is also noteworthy, but this may be attributed to lack of power to detect small effects.

The present research demonstrates that voice hearing within youth with PTSD following multiple trauma exposure is a common and distressing experience, so could have clinical implications as a treatment target. Screening for voice hearing, associated distress, and characteristics of voices may inform treatment for PTSD. Maddox et al. (2013) demonstrated that CBT for unusual (psychotic-like) experiences in children is effective, so incorporating these techniques into cognitive therapy for PTSD to address voice hearing may enhance treatment efficacy for young people presenting with voice hearing. Nevertheless, the present study suggests that targeting the cognitive pathways proposed in the Ehlers and Clark (2000) model of

PTSD (in particular appraisals and trauma memory quality) may help to reduce voice hearing symptoms through mechanisms common to both PTSD and voice hearing. Longitudinal analysis of participants in the DECRYPT trial could compare the response of voice hearing and non-voice hearing participants to trauma-focused CBT.

The strengths and limitations of the present study should be noted. The study design was robust, with a sample comprised of young people with a PTSD diagnosis after exposure to multiple traumatic events, resulting in a powerful control group to compare with but also reducing generalisability to non-PTSD or non-trauma samples. To ensure methodological rigour, the study design and hypotheses were pre-registered and a correction for multiple comparisons was used. The robustness of the results was also confirmed using sensitivity analyses. The gender distribution was skewed towards females, but this is reflective of wider PTSD research (Meiser-Stedman et al., 2017; Sachser & Goldbeck, 2016). As the sample size was predetermined by the DECRYPT trial, the power afforded, whilst adequate, was only able to detect medium-sized effects. The dissociation questionnaire and complex PTSD interview have not previously been validated and some questionnaires (in particular the CRIES-8 and the SDQ) produced low scores for reliability. In addition, the dissociation questionnaire used was brief, with items selected to reflect DSM-5 depersonalisation and derealisation, and therefore covered a narrower range of dissociative symptoms relative to other measures of dissociation such as the Dissociative Experiences Scale (Bernstein et al., 1986), which also contains items related to dissociative identity. Similarly, a measure of psychosis would have strengthened the research by confirming whether participants experienced other symptoms consistent with psychosis beyond just voice hearing.

Several areas could be researched further to better understand the relationship between voice hearing and the identified psychopathological (panic symptoms) and cognitive (negative cognitions and trauma memory quality) factors. As the current findings involved a cross-sectional design, investigation of the underlying mechanisms relating negative cognitions, trauma memory quality, and panic symptoms to voice hearing may be clarified through a longitudinal design to determine the direction of these relationships and whether they are interconnected. Similar research with a single-trauma PTSD group or a non-trauma group could be useful to investigate how experience or frequency of trauma may relate to voice hearing. In addition, the relationship between, and overlap of, voice hearing and flashback symptoms warrants investigation, given that these were distinct experiences for some participants but not for others. Furthermore, research distinguishing between psychotic and dissociative experiences of voice hearing may be useful for elucidating the underlying mechanisms.

In conclusion, this study has demonstrated that voice hearing occurs in a significant proportion of young people with a PTSD diagnosis following exposure to multiple traumatic events, and that voice hearing and non-voice hearing groups differ with regards to negative cognitions, trauma memory quality, and panic symptoms. Future research should explore how these factors are related and investigate management of voice hearing in treatment of trauma-exposed youth.

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Data availability statement

As this research used data from a randomised controlled trial, data will be made available after publication of the main trial paper for participants who consented to sharing their data.

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META-ANALYSIS

Systematic Review and Meta-Analysis: Imputing Response Rates for First-Line Psychological Treatments for Posttraumatic Stress Disorder in Youth

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Objective: Meta-analyses assessing psychological therapies for posttraumatic stress disorder (PTSD) in youth have demonstrated their effectiveness using standardized mean differences. Imputation of response rates (ie, 50% or greater reduction in symptoms) may facilitate easier interpretation for clinicians.

Method: We searched 4 databases (MEDLINE, PsycINFO, PTSDPubs, and Web of Science) and screened 1,654 records to include 60 randomized controlled trials (52 trauma-focused cognitive–behavioral therapy [TF-CBT], 8 eye movement desensitization [EMDR]) with a total of 5,113 participants, comparing psychological therapies for PTSD against control conditions in youth. Data from randomized controlled trials of EMDR and TF-CBT for PTSD were used to impute response rates, establishing how many patients display 50% reduction, 20% reduction, and reliable improvement and deterioration (using reliable change indices) in PTSD and depression.

Results: The proportion of youth exhibiting a 50% reduction in PTSD symptoms was 0.48 (95% CI = 0.41-0.55) for TF-CBT, 0.30 (0.24-0.37) for EMDR, and 0.46 (0.39-0.52) for all psychological therapies, compared to 0.20 (0.16-0.24) for youth in control conditions. Reliable improvement was displayed by 0.53 (0.45-0.61; TF-CBT 0.55 [0.46-0.64], EMDR 0.42[0.30-0.55]) of youth receiving psychological therapies, compared to 0.25 (0.20-0.30) of youth in control conditions. Reliable deterioration was seen in 0.01 (0.01-0.02) of youth receiving psychological therapies, compared to 0.13 (0.08-0.20) of youth in control conditions. There was a high degree of heterogeneity in the included studies.

Conclusion: Psychological therapies, in particular TF-CBT, for young people with PTSD are effective and unlikely to cause deterioration, with around half of youth receiving TF-CBT exhibiting 50% symptom reduction.

Key words: PTSD; youth; meta-analysis; review; therapy

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Trauma exposure is common in childhood, with previous research estimating that 61% of youth 13 to 17 years of age in the United States are exposed to trauma,[1] and that 31.1% of youth in England and Wales experience a traumatic event before the age of 18 years.[2] Exposure to traumatic events is associated with negative outcomes, including posttraumatic stress disorder (PTSD)[2] and comorbid difficulties such as mood and anxiety disorders[3] and substance abuse.[4] PTSD symptoms include re-experiencing (trauma-related intrusions), avoidance of trauma-related memories, and hyperarousal (a sense of heightened current threat).[5,6] Effective treatment of PTSD is important to reduce the burden of these symptoms, as well as associated negative outcomes such as comorbid mental health difficulties.[2]

Psychological interventions are recommended by multiple treatment guidelines, including the International Society for Traumatic Stress Studies,[7] the American Academy for Child and Adolescent Psychiatry,[8] the Australian National Health and Research Guidelines,[9] and the UK National Institute for Health and Care Excellence guidelines[10] as the first-line treatment for children and adolescents presenting with PTSD. Trauma-focused cognitive–behavioral therapy (TF-CBT) in particular has been assessed by previous meta-analyses that have demonstrated its effectiveness in treating children and adolescents with PTSD compared to active and passive control conditions.[11,12] Eye movement desensitization and reprocessing (EMDR) has also been endorsed by these guidelines, albeit less strongly; there are fewer trials concerning this treatment, particularly trials that have used an active control condition and medium- or long-term follow up.[11]

Meta-analyses typically report results in terms of standardized mean differences, such as the Hedges *g* statistic,[13]

which denotes the effect size for the standardized mean difference between 2 groups, with adjustment for sample size. These statistics can be difficult to interpret; therefore, Furukawa *et al.*[14] developed a method to impute response rates, namely, dichotomous outcomes defined as the absolute number of participants meeting a specified criteria, such as a 50% reduction in symptoms, from continuous outcomes (reported as means and standard deviations). This dichotomization reduces statistical power but produces results that are more easily interpreted by clinicians and service users in the form of absolute response rates and risk ratios, providing clear data regarding the proportions of people who experience symptom reduction in response to a specific intervention. A further benefit is that calculating absolute response rates reduces inflation of effect sizes when psychological interventions are compared with a waitlist rather than an active control condition, as response rates are calculated separately for the participants allocated to the experimental and control conditions. Beyond symptom reduction thresholds, reliable change can also be calculated. This is a psychometric measure assessing whether change in symptoms (improvement or deterioration) from one timepoint to another can be considered statistically significantly different from normal deviation on that measure.

The imputation method has been used by researchers investigating the effectiveness of treatments for mental health disorders such as depression and schizophrenia.[15,16] In addition, Cuijpers *et al.*[17] conducted a systematic review and meta-analysis examining absolute response rate for psychotherapies across 8 mental disorders in adults and found a response rate of 38% for PTSD. This demonstrated the feasibility and utility of this analysis technique. However, similar analyses have not yet been conducted for the treatment of PTSD in young people.

To address this, we conducted a systematic review and meta-analysis to impute response rates for children and adolescents receiving TF-CBT or EMDR in a randomized controlled trial (RCT). We calculated response rates for 50% improvement, 20% improvement, and reliable improvement and deterioration in PTSD symptoms for experimental and control groups at posttreatment and follow-up, as well as calculating risk ratios. These cut-off rates were selected to be consistent with those in previous meta-analyses,[17,18] with the addition of 20% improvement to add sensitivity and to capture mild/moderate symptom improvement. Reliable deterioration was included as well as the metrics for symptom improvement to address concerns regarding retraumatization during psychological therapy for PTSD.[19]

A range of moderators were investigated to determine whether response rate was influenced by study characteristics. This included treatment type (TF-CBT vs EMDR) and format (group vs individual), control condition (passive vs active), trauma characteristics (single vs multiple incidence; exclusively sexual trauma vs other type of trauma), symptom measure (questionnaire vs interview), country (high-income country vs low-to-middle–income country), and risk of bias (low vs high). We also repeated analyses with depression symptom data where these were reported, consistent with previous meta-analyses,[20] to assess the transdiagnostic effects of treatment.

METHOD

This meta-analysis was preregistered on PROSPERO (CRD42022304592) and follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) reporting guidelines.

Search Strategy

Relevant studies were identified through systematic searches of MEDLINE, PubMed, PsycINFO, and PTSDPubs. The final search was carried out on May 17, 2024. The search strategy contained terms relating to PTSD, children and adolescents, treatment, and randomized controlled trials (Supplement 1, available online). We also checked reference lists of recent reviews. Figure 1 provides the PRISMA diagram.

Selection Criteria

To be included in the analysis, studies were required to meet the following inclusion criteria: mean age of participants 18 years or less; at least 60% of participants had a PTSD diagnosis or scored above cutoff on a measure of PTSD symptoms (or the sample mean exceeded the cutoff for a measure of PTSD symptoms where individual participant data was not reported); randomized controlled trial comparing a psychological therapy (TF-CBT or EMDR) to a control condition; at least 10 participants in each arm of the trial; and a PTSD symptom measure reported at pre- and posttreatment.

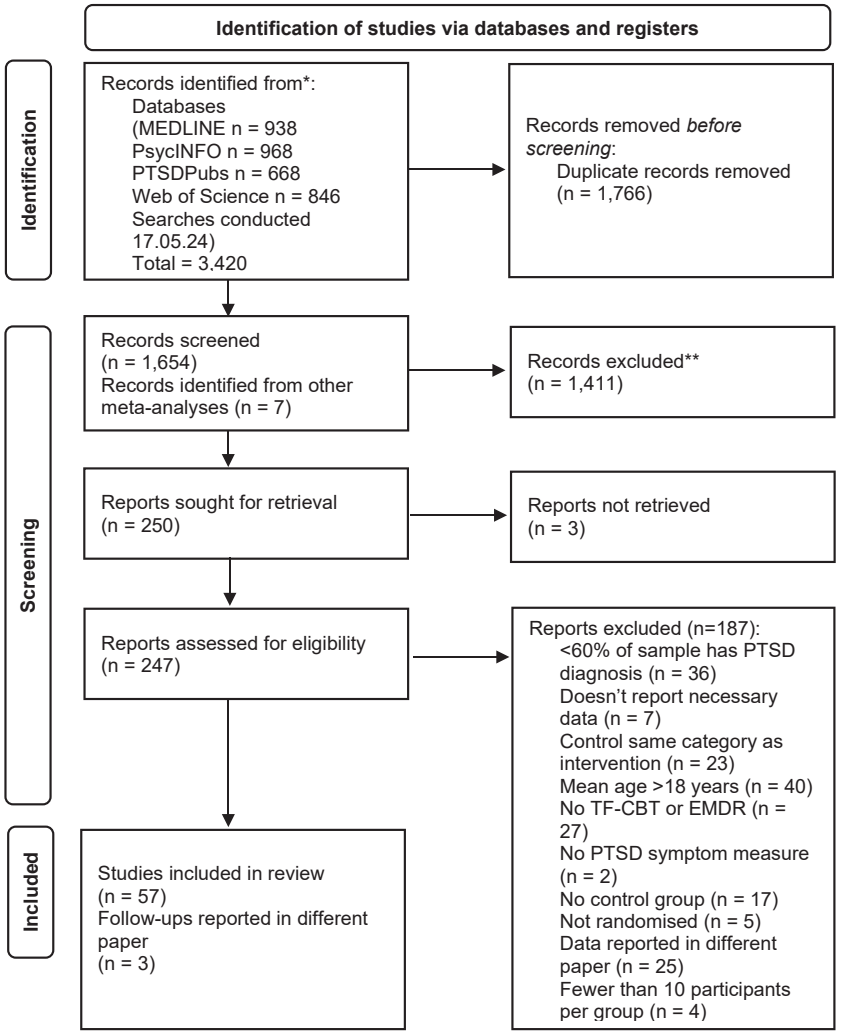
Screening Process

The first author (KL) screened all titles and abstracts, and a second reviewer (AD) independently screened a random 10%, with 95.5% agreement. Full texts were imported and all were reviewed by KL, with a random 20% independently reviewed by AD, with 94.1% agreement. Disagreements were resolved by a third reviewer (RMS).

Data Extraction

All descriptive and quantitative data were extracted into a spreadsheet by KL and checked by AD.

FIGURE 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Flow Diagram



Descriptive data extracted comprised the following: type of psychological therapy; type of control condition (categorized as active or passive); format of psychological therapy; single or multiple trauma sample; sexual trauma sample; country in which the study was conducted (categorized as high income or low- to-middle income); mean age; percentage of female participants; and PTSD outcome measure (categorized as interview or questionnaire).

Quantitative data extracted comprised the following: means and SDs from PTSD symptom measure at pretreatment, posttreatment, and follow-up timepoints if applicable; number of participants in each arm at each timepoint; and means and SDs from depression symptom measure where this was reported. Follow-ups were categorized as short term (follow-up 1) when they took place from 1 to 5 months after posttreatment assessment or as long term (follow-up 2) when they took place 6 months or more after posttreatment assessment. If there were multiple follow-ups, the first timepoint in each follow-up window was extracted.

Risk of Bias Assessment

Risk of bias was assessed to classify the quality of studies included in the meta-analysis and to conduct a moderator analysis assessing whether this moderated results. Assessment was conducted by the first author (KL) using items recommended by Cuijpers *et al.*[21] (Supplement 2, available online). A second reviewer (AD) conducted independent assessment of 25% of studies, with an agreement of 100%. Studies were classified as low risk of bias if they met at least 7 of the 8 risk of bias criteria and as high risk of bias if they did not.

Statistical Analysis

Statistical analyses were conducted using the metafor package[22] in R 4.3.2.[23] The method validated by

Furukawa *et al.*[14] was used to calculate response rates. This method uses pre- and posttreatment means and SDs and the number of participants at posttreatment in the following formula: "Number of participants at endpoint × normal standard distribution corresponding with (50% of the baseline score – endpoint score)/SD."[14] Response rates were reported as the proportion of participants exhibiting 50% reduction, 20% reduction, reliable improvement, and reliable deterioration[15] in symptoms. Reliable change indices are calculated as the change in symptom score divided by the standard error of the difference, using a conservative assumption for Cronbach alpha of 0.75.[18,24] If this value is greater than 1.96, the criterion for reliable change has been met. Both 95% confidence intervals and 95% prediction intervals[25] were calculated for each response rate; 95% CIs are presented in parentheses for all pooled statistics. Risk ratios were also calculated to compare participants receiving psychological therapies with those in control conditions. For completeness, numbers needed to treat were calculated using pooled risk ratio and response rate in the control arm.[15] Because the large majority of included studies addressed TF-CBT, we report in the main body of the text outcomes for this treatment modality, and all psychological treatments (ie, TF-CBT and EMDR) and EMDR alone when there are sufficient studies (ie, $\geq$4) that consider EMDR; full results are reported in supplementary tables. Complete intent-to-treat data were reported by most trials (n = 42), resulting in posttreatment data for 4,862 participants. Sensitivity analyses were conducted whereby participants who were randomized but not included in the reported posttreatment statistics in the original article were assumed to be nonresponders, consistent with previous meta-analyses,[17,18] resulting in a sample size of 5,113 participants, with missing data comprising 4.91% of the sample. The sensitivity analyses were also conducted for follow-up data. Heterogeneity was assessed using the Cochran Q and the I^2 statistic.

A number of moderator analyses were undertaken to see if different factors (type of trauma or therapy, measure used, setting, trial methodology) had an influence on the pooled effect size estimates. These comprised the following: type of psychological therapy (EMDR vs TF-CBT); trauma frequency (single vs multiple); measure type (questionnaire vs interview); psychological therapy format (group vs individual); country type (high-income country vs low-to-medium–income country); trauma type (exclusively sexual trauma vs other/mixed traumatic experiences); risk of bias (low vs high); and control condition type (active vs passive).

Publication Bias

To evaluate publication bias, funnel plots and results of funnel plot asymmetry tests were inspected alongside the Egger test of intercept[26] and the trim-and-fill procedure[27] were used.

RESULTS

Selection and Characteristics of Included Studies

After deletion of duplicate records, a total of 1,654 records were identified. A further 7 records were identified from reference lists of relevant meta-analyses.[11] In all, 60 articles met inclusion criteria, 3 of which provided follow-up data to other included studies, resulting in a total of 57 included studies yielding 60 comparisons (as 3 studies had multiple comparison arms or split data into age groups). Figure 1 provides the PRISMA flowchart detailing study selection.

The total sample size was 5,113 participants, with sample sizes for each study ranging from 20 to 640 participants. Table 1[28-87] lists characteristics of the included studies. The mean age of participants (where reported) was 12.3 years (range, 2-18 years), and 55% of studies (k = 33) were conducted in high-income countries.

The majority of studies (k = 52; 86.7%) assessed TF-CBT, with the remaining 13.3% (k = 8) assessing EMDR. Treatment was on an individual basis in 56.7% of cases (k = 34), and self-report questionnaires were used to assess PTSD symptoms in 66.7% of studies (k = 40), as opposed to interviews in the remaining studies. Active control conditions were used as the comparator in 51.7% of studies (k = 31). Participants had exposure to multiple traumatic events in 73.3% of studies (k = 44), whereas participants in the remaining studies were recruited after exposure to a single traumatic event. In 11.7% of studies (k = 7), participants had exposure to sexual trauma exclusively. A total of 40 studies reported data on depression symptoms, with a sample size of 1,704 participants.

Risk of Bias

The majority of studies (66.7%; k = 40) were classified as having high risk of bias, with scores ranging from 1 to 8 on the scale used. Risk of bias was included as a potential moderator, and no significant difference was found between studies classified as low vs high risk of bias (p = .61).

Absolute Response Rates

PTSD Symptoms, Posttreatment. Table 2 lists absolute response rates for TF-CBT and EMDR, and Table 3 provides absolute response rates for control conditions. The CIs for all assessed levels of response did not overlap when comparing TF-CBT and EMDR with control conditions. At posttreatment, pooled 50% improvement response rates for TF-CBT alone (k = 51) were 0.48 (95% CI = 0.41-0.55), EMDR alone (k = 8) 0.30 (0.24-0.37), and for all

TABLE 1 Study Characteristics

Study	Country	Sample size	Age, y, range (mean)	Ethnicity (%)	Psychological therapy	Therapy format	Control condition	Trauma frequency	Exclusively sexual trauma	Follow-up timepoints	PTSD measure	Depression measure
Ahmad *et al.* (2007a)[28]	Sweden	33	6-16 (9.94)	Other (42.4), Swedish (57.6)	EMDR	Individual	WL	Multiple	No	—	PTSS-C	—
Ahmadi *et al.* (2022)[29] CG	Afghanistan	78	12-18 (16)	Afghan (Hazara) (100)	TF-CBT	Group	CG	Single	No	3 mo	CRIES-13	—
Ahmadi *et al.* (2023a)[30]	Afghanistan	96	11-19 (15.96)	Afghan (100)	TF-CBT	Group	TAU	Multiple	No	3 mo	CRIES-13	MFQ-SF
Ahmadi *et al.* (2023b)[31]	Afghanistan	26	14-19 (16.7)	Afghan (100)	TF-CBT	Group	CG	Single	No	3 mo	CRIES-13	MFQ-SF
Ahrens and Rexford (2002)[32]	US	38	15-18 (16.4)	African American (26.3), Caucasian (60.5), Hispanic (5.3), Native American (5.3), Other (2.6)	TF-CBT	Group	WL	Multiple	No	—	PSS-SR	BDI
Auslander *et al.* (2017)[33]	US	25	12-18 (14.64)	Black (44.4), Other/Mixed (33.3), White (22.2)	TF-CBT	Group	TAU	Multiple	No	3 mo	CPSS	CDI
Banoglu *et al.* (2021)[34]	Turkey	61	6-15 (NR)	Syrian (100)	EMDR	Group	WL	Multiple	No	—	CPTS-RI	MDI
Barron *et al.* (2016)[35]	Palestine	154	11-15 (13.5)	NR	TF-CBT	Group	WL	Multiple	No	—	CRIES-13	DSRS
Barron *et al.* (2020)[36]	Brazil	30	8-13 (10.1)	Brazilian (100)	TF-CBT	Group	TAU	Multiple	No	—	CRIES-13	—
Bidstrup *et al.* (2023)[37]	Denmark	54	2-5 (3.46)	NR	TF-CBT	Individual	TAU	Multiple	No	12 mo	PEDS	—
Catani *et al.* (2009)[38]	Sri Lanka	31	8-14 (11.94)	NR	TF-CBT	Individual	MED-RELAX	Multiple	No	6 mo	UPID	—
Chen *et al.* (2014)[39]	China	20	NR (14.5)	Chinese (100)	TF-CBT	Group	General support	Single	No	3 mo	CRIES-13	CES-D
Chen *et al.* (2014)[39] CG	China	22	NR (14.5)	Chinese (100)	TF-CBT	Group	CG	Single	No	3 mo	CRIES-13	CES-D
Cohen *et al.* (2004)[40]/ Deblinger *et al.* (2006)[41]	US	180	8-14 (10.76)	African American (28), Biracial (7), Hispanic American (4), Other (1), White (60)	TF-CBT	Individual	CCT	Multiple	Yes	6 mo	K-SADS-PL	CDI
Cohen *et al.* (2005)[42]	US	82	8-15 (11.1)	African American (37), Biracial (2), Caucasian (60), Hispanic (1)	TF-CBT	Individual	NST	Multiple	Yes	6 mo	TSC-C	CDI
Cohen *et al.* (2011)[43]	US	75	7-14 (9.64)	Black (33.1), Biracial (11.3), White (55.6)	TF-CBT	Individual	CCT	Multiple	No	—	K-SADS-PL	CDI

(*continued*)

TABLE 1 Continued

Study	Country	Sample size	Age, y, range (mean)	Ethnicity (%)	Psychological therapy	Therapy format	Control condition	Trauma frequency	Exclusively sexual trauma	Follow-up timepoints	PTSD measure	Depression measure
Danielson *et al.* (2012)[44]	US	28	13-17 (14.8)	African American (46), Biracial (8.3), Hispanic (4), Native American (4.2), White (37.5)	TF-CBT	Individual	TAU	Multiple	Yes	3 mo and 6 mo	UPID	CDI
Dawson *et al.* (2018)[45]	Indonesia	64	7-14 (10.7)	NR	TF-CBT	Individual	PS	Multiple	No	3 mo	UCLA PTSD-RI	CDI
de Roos *et al.* (2017)[46] TF-CBT WL	Netherlands	60	8-18 (13.06)	NR	TF-CBT	Individual	WL	Single	No	—	CRTI	—
de Roos *et al.* (2017)[46] EMDR WL	Netherlands	61	8-18 (13.06)	NR	EMDR	Individual	WL	Single	No	—	CRTI	—
Deblinger *et al.* (1996)[47]	US	68	7-13 (9.84)	African American (20), Caucasian (72), Hispanic (6), Other (2)	TF-CBT	Individual	TAU	Multiple	Yes	—	K-SADS-E	—
Dorsey *et al.* (2020)[48]	Kenya and Tanzania	640	7-13 (10.62)	NR	TF-CBT	Group	TAU	Single	No	12 mo	CPSS	CBC
Foa *et al.* (2013)[49]	US	61	13-18 (15.3)	Biracial (3.3), Black (55.7), Hispanic (16.4), Other/No response (6.6), White (18.0)	TF-CBT	Individual	SC	Multiple	Yes	12 mo	CPSS-I	CDI
Gilboa-Schechtman *et al.* (2010)[50]	Israel	30	12-18 (14.05)	NR	TF-CBT	Individual	TLDP-A	Single	No	6 mo	CPSS	BDI
Goldbeck *et al.* (2016)[51]	Germany	159	7-17 (13.03)	NR	TF-CBT	Individual	WL	Multiple	No	—	CAPS-CA	CDI
Hitchcock *et al.* (2021)[52]	UK	28	3-8 (6.26)	NR	TF-CBT	Individual	TAU	Single	No	—	YC-PTSD-C	—
Jensen *et al.* (2014)[53]/ Jensen *et al.* (2017)[54]	Norway	122	10-18 (15.1)	African (1.9), Asian (10.9), Eastern European (1.3), Nordic (0.6), Norwegian (73.7), one parent Norwegian (8.3), Other (0.6), South/ Central American (1.3), Western European (1.3),	TF-CBT	Individual	TAU	Multiple	No	9 mo	CPSS	—

(*continued*)

TABLE 1 Continued

Study	Country	Sample size	Age, y, range (mean)	Ethnicity (%)	Psychological therapy	Therapy format	Control condition	Trauma frequency	Exclusively sexual trauma	Follow-up timepoints	PTSD measure	Depression measure
Kameoka *et al.* (2020)[55]	Japan	30	6-18 (13.9)	NR	TF-CBT	Individual	WL	Multiple	No	—	K-SADS-PL	DSRSC
Kaminer *et al.* (2023)[56]	South Africa	75	11-19 (14.92)	Black African (17.3), Mixed race (73.3), White (9.3)	TF-CBT	Individual	TAU	Multiple	No	3 mo	CPSS-5	BDI-II
Kemp *et al.* (2009)[57]	Australia	27	6-12 (8.93)	NR	EMDR	Individual	WL	Single	No	—	CPTS-RI	CDS
King *et al.* (2000)[58]	Australia	24	5-17 (11.5)	NR	TF-CBT	Individual	WL	Multiple	Yes	3 mo	ADIS-C	CDI
Kramer *et al.* (2014)[59] 2-6y	Switzerland	49	2-6 (4.27)	NR	TF-CBT	Individual	TAU	Single	No	3 mo	PTSDSSI	—
Kramer *et al.* (2014)[59] 7-16y	Switzerland	51	7-16 (11)	NR	TF-CBT	Individual	TAU	Single	No	3 mo	CAB	—
Langley *et al.* (2015)[60]	US	71	5-11 (7.65)	African American (17.57), African American/Hispanic (1.35), Asian (1.35), Asian/Caucasian (1.35), Caucasian (27.03), Hispanic (48.65), Hispanic/ Caucasian (2.70),	TF-CBT	Group	WL	Multiple	No	—	UCLA PTSD-RI	CDI
Layne *et al.* (2008)[61]	Bosnia	127	13-18 (15.9)	NR	TF-CBT	Group	Psycho-education	Multiple	No	4 mo	PTSD-RI	DSRS
Li *et al.* (2022)[62]	China	87	9-12 (11)	NR	TF-CBT	Group	TAU	Multiple	No	3 mo	UCLA PTSD-RI-5	CDI
Li *et al.* (2023)[63]	China	234	9-12 (10.41)	NR	TF-CBT	Group	TAU	Multiple	No	3 mo	UCLA PTSD-RI-5	CDI-S
McMullen *et al.* (2013)[64]	DRC	48	13-17 (15.8)	NR	TF-CBT	Group	WL	Multiple	No	—	UCLA PTSD-RI	AYPA
Meentken *et al.* (2020)[65]/ Meentken *et al.* (2021)[66]	Netherlands	65	4-15 (9.6)	Dutch (81.9), Other Western (5.6), Non-Western (12.5)	EMDR	Individual	TAU	Multiple	No	6 mo	CRTI	—
Meiser-Stedman *et al.* (2017)[67]	UK	26	8-17 (13.3)	Minority ethnicity (13.8), White British (86.2)	TF-CBT	Individual	WL	Single	No	—	CPTSDI	MFQ

(*continued*)

TABLE 1 Continued

Study	Country	Sample size	Age, y, range (mean)	Ethnicity (%)	Psychological therapy	Therapy format	Control condition	Trauma frequency	Exclusively sexual trauma	Follow-up timepoints	PTSD measure	Depression measure
Molero *et al.* (2019)[68]	Spain	63	13-17 (16.36)	NR	EMDR	Group	CG	Multiple	No	3m	PCL-5	HADS
Murray *et al.* (2015)[69]	Zambia	257	5-18 (13.66)	Bemba (31.8), Ngoni (21.6), Other (46.7)	TF-CBT	Individual	TAU	Multiple	No	—	PTSD-RI	—
O'Callaghan *et al.* (2013)[70]	DRC	46	12-17 (16.02)	NR	TF-CBT	Group	WL	Multiple	Yes	—	UCLA PTSD-RI	—
O'Callaghan *et al.* (2015)[71]	DRC	50	8-17 (14.69)	NR	TF-CBT	Group	CFS	Multiple	No	6 mo	UCLA PTSD-RI	—
Osorio *et al.* (2018)[72]	Mexico	23	13-22 (16.71)	NR	EMDR	Group	CG	Multiple	No	3 mo	PCL-5	HADS
Peltonen *et al.* (2019)[73]	Finland	38	9-17 (13.2)	Afghan (27), Finnish (23), Iraqi (27), Other (20)	TF-CBT	Individual	TAU	Multiple	No	—	CRIES-13	DSRS
Pfeiffer *et al.* (2018)[74]	Germany	99	13-21 (16.96)	Afghan (45.5), Angolan (2.0), Eritrean (3.0), Ethiopian (2.0), Gambian (10.1), Iranian (7.1), Iraqi (2.0), Other (6.1), Pakistani (2.0), Senegalese (2.0), Somalian (7.1), Syrian (11.1)	TF-CBT	Group	TAU	Multiple	No	—	CATS-S	PHQ-8
Pityaratstian *et al.* (2015)[75]	Thailand	36	10-15 (12.25)	NR	TF-CBT	Group	WL	Single	No	1 mo	PTSD-RI	—
Robjant *et al.* (2019)[76]	DRC	88	11-22 (18)	Banyarbwisha (34), Banyarwanda (62), Other (3)	TF-CBT	Individual	TAU	Multiple	No	6 mo	PSS-I-5	PHQ-9
Roque-Lopez *et al.* (2021)[77]	Colombia	44	13-16 (14.05)	NR	EMDR	Group	TAU	Multiple	No	2 mo	CPSS	—
Rossouw *et al.* (2018)[78]	South Africa	63	13-18 (15.35)	African (30.2), Mixed parentage (69.8)	TF-CBT	Individual	SC	Single	No	3 mo and 6 mo	CPSS-I	BDI
Ruf *et al.* (2010)[79]	Germany	26	7-16 (11.45)	Balkan (23.1), Chechen (11.5), Georgian (3.8), German (3.8), Russian (7.7), Syrian (19.2), Turkey (Kurdish) (30.8)	TF-CBT	Individual	WL	Multiple	No	—	UCLA PTSD-RI	—

(*continued*)

TABLE 1 Continued

Study	Country	Sample size	Age, y, range (mean)	Ethnicity (%)	Psychological therapy	Therapy format	Control condition	Trauma frequency	Exclusively sexual trauma	Follow-up timepoints	PTSD measure	Depression measure
Santiago *et al.* (2018)[80]	US	52	6-10 (7.76)	African American/ Black (3.8), Latino (55.8), Latino/ Caucasian (23.1), Latino/Native American (5.9), Missing (5.9), White/ Caucasian (5.9),	TF-CBT	Group	WL	Multiple	No	—	UCLA PTSD-RI	—
Schauer (2008)[81]	Sri Lanka	47	11-15 (13.1)	NR	TF-CBT	Individual	MED-RELAX	Multiple	No	—	CAPS-CA	MINI KID
Scheeringa *et al.* (2011)[82]	US	28	3-6 (5.3)	Black/African American (59.5), Other (5.4), White (35.1)	TF-CBT	Individual	WL	Multiple	No	—	PAPA	PAPA
Schottelkorb *et al.* (2012)[83]	US	26	6-13 (9.16)	African (67.7), Asian (9.7), European (6.5), Middle East (16.1)	TF-CBT	Individual	CCPT	Multiple	No	—	UCLA PTSD Index	—
Shein-Szydlo *et al.* (2016)[84]	Mexico	98	12-18 (14.89)	NR	TF-CBT	Individual	WL	Multiple	No	—	CPTS-RI	BDI
Smith *et al.* (2007)[85]	UK	24	8-18 (13.69)	Asian British (5.3), Black British (26.3), Other (7.9), White British (60.5)	TF-CBT	Individual	WL	Single	No	—	CAPS-CA	DSRS
Stein *et al.* (2003)[86]	US	117	10-12 (10.95)	NR	TF-CBT	Group	WL	Multiple	No	—	CPSS	CDI
Tol *et al.* (2012)[87]	Sri Lanka	397	9-12 (11.03)	NR	TF-CBT	Group	WL	Multiple	No	—	CPSS	DSRS

Note: Ethnicities are reported as stated in respective articles. ADIS–C = Anxiety Disorders Interview Schedule—Child Version; AYPA = African Youth Psychosocial Assessment; BDI = Beck Depression Inventory; BDI-II = Beck Depression Inventory II; CAB = Acute Stress Checklist for Children—German Version; CAPS-CA = Clinician-Administered PTSD Scale For DSM-5-*Child/ Adolescent Version; CATS-S = Child And Adolescent Trauma Screen; CBC = Child Behavior Checklist; CDI = Children's Depression Inventory; CDI-S = Children's Depression Inventory—Short Version; CDS = Children's Depression Scale; CES-D = Center For Epidemiologic Studies Depression Scale; CG = control group; CPTSD = Children's PTSD Inventory; CPTS-RI = Child Posttraumatic Stress Reaction Index; CRIES-13 = Child Revised Impact of Events Scale (13-Item Version); CRTI = Revised Children's Responses to Trauma Inventory; CPSS = Child PTSD Symptom Scale; CPSS-I = Child PTSD Symptom Scale—Interview Version; DSRS = Depression Self-Rating Scale; DSRSC = Depression Self-Rating Scale For Children; HADS = Hospital Anxiety and Depression Scale; K-SADS-E = Schedule for Affective Disorders and Schizophrenia for School-Age Children—Epidemiological Version; K-SADS-PL = Schedule for Affective Disorders and Schizophrenia for School-Age Children—Present and Lifetime Version; MDI = Major Depression Inventory; MFQ-SF = Mood and Feelings Questionnaire—Short Form; MINI KID = Mini-International Neuropsychiatric Interview for Children and Adolescents; NR = not reported; PAPA = Preschool Age Psychiatric Assessment; PCL-5 = Posttraumatic Stress Disorder Checklist for* DSM-5*; PEDS = Pediatric Emotional Distress Scale; PHQ-8 = Patient Health Questionnaire 8; PSS-I-5 = PTSD Symptom Scale Interview for* DSM-5*; PSS-SR = PTSD Symptom Scale Self-Report; PTSD-RI = Posttraumatic Stress Disorder Reaction Index; PTSDSSI = PTSD Semi-Structured Interview and Observational Record for Infants and Young Children; PTSS-C = Posttraumatic Stress Symptom Scale for Child; TAU = treatment as usual; TSC-C = Trauma Symptom Checklist for Children; UCLA PTSD-RI = UCLA Posttraumatic Stress Disorder Reaction Index; UPID = UCLA PTSD Index for* DSM-IV*; WL = waitlist; YC-PTSD-C = Young Child PTSD Checklist.*

TABLE 2 Absolute Proportion of Participants Showing Improvement and Reliable Change in Posttraumatic Stress Disorder (PTSD) Symptoms at Posttreatment

Analysis	K	n	Proportion	95% CI	95% PI	Cochran Q	I^2 (%)	95% CI	Moderator *p*
TF-CBT and EMDR									
50% Improvement									
All	59	2,480	0.46	0.39, 0.52	0.09, 0.86	482.3***	89.1	84.3, 92.7	
All, dropouts as nonresponders	59	2,608	0.43	0.37, 0.49	0.08, 0.82	469.4***	88.8	83.9, 92.6	
TF-CBT vs EMDR									.08
TF-CBT	51	2,270	0.48	0.41, 0.55	0.09, 0.88	450.8***	90.3	85.7, 93.8	
EMDR	8	210	0.30	0.24, 0.37	0.24, 0.37	6.7	0.02	0.0, 78.9	
20% Improvement									
All	59	2,480	0.75	0.70, 0.80	0.34, 0.99	472.9***	88.6	83.5, 92.4	
All, dropouts as nonresponders	59	2,608	0.71	0.65, 0.76	0.30, 0.98	465.1***	88.4	83.4, 92.4	
TF-CBT vs EMDR									.16
TF-CBT	51	2,270	0.77	0.71, 0.82	0.33, 1.00	458.0	90.1	85.4, 93.7	
EMDR	8	210	0.67	0.60, 0.73	0.59, 0.75	6.5	5.7	0.0, 73.2	
Reliable change									
Improvement									
All studies	58	2,437	0.53	0.45, 0.61	0.05, 0.98	823.8***	93.7	91.1, 95.9	
TF-CBT vs EMDR									.25
TF-CBT	50	2,227	0.55	0.46, 0.64	0.04, 0.99	797.1***	94.5	92.0, 96.5	
EMDR	8	210	0.42	0.30, 0.55	0.14, 0.74	21.4*	70.7	29.1, 93.7	
Deterioration									
All studies	58	2,437	0.01	0.01, 0.02	0.00, 0.07	106.5***	47.7	24.3, 68.8	
TF-CBT vs EMDR									.64
TF-CBT	50	2,227	0.01	0.01, 0.02	0.00, 0.07	98.2***	52.6	28.2, 72.2	
EMDR	8	210	0.01	0.00, 0.03	0.00, 0.03	8.01	0.0	0.0, 85.1	
Control conditions									
50% Improvement									
All	60	2,372	0.20	0.16, 0.24	0.01, 0.51	307.6***	81.8	73.7, 88.2	
All, dropouts as nonresponders	60	2,495	0.19	0.15, 0.23	0.01, 0.50	343.0***	83.2	75.6, 88.9	
Active vs passive									<.0001
Active	31	1,421	0.28	0.22, 0.34	0.06, 0.58	125.9***	81.1	69.3, 90.5	
Passive	29	951	0.12	0.08, 0.16	0.01, 0.33	133.9***	66.8	42.5, 78.6	
20% Improvement									
All	60	2,372	0.48	0.42, 0.53	0.14, 0.83	357.4***	85.0	78.2, 90.0	
All, dropouts as nonresponders	60	2,495	0.45	0.40, 0.51	0.11, 0.82	411.0***	86.7	80.7, 91.1	
Reliable change									
Improvement									
All studies	59	2,340	0.25	0.20, 0.30	0.01, 0.64	362.6***	86.6	80.7, 91.3	
Active conditions	30	1,389	0.32	0.23, 0.41	0.01, 0.78	255.9***	91.2	85.6, 95.3	
Passive conditions	29	951	0.19	0.15, 0.23	0.05, 0.39	67.2***	61.3	34.0, 79.8	
Deterioration									
All studies	59	2,340	0.13	0.08, 0.20	0.00, 0.77	836.5***	95.0	93.0, 96.7	
Active conditions	30	1,389	0.07	0.02, 0.14	0.00, 0.57	281.4***	93.8	90.1, 96.8	
Passive conditions	29	951	0.21	0.11, 0.34	0.00, 0.89	484.3***	94.7	91.4, 97.1	

Note: *EMDR = eye movement desensitization and reprocessing; TF-CBT = trauma-focused cognitive–behavioral therapy.*
***p < .0001, **p < .001, *p < .05.*

psychological therapies (k = 59; TF-CBT and EMDR combined) were 0.46 (0.39-0.52); for all control conditions combined, the pooled response rate was 0.20 (0.16-0.24). The 20% improvement pooled response rates were 0.77 (0.71-0.82) for TF-CBT alone, 0.67 (0.60-0.73) for EMDR alone, and 0.75 (0.70-0.80) for all psychological

TABLE 3 Risk Ratio for Improvement and Reliable Change in Posttraumatic Stress Disorder (PTSD) Symptoms at Posttreatment, Psychological Therapy (TF-CBT or EMDR) vs Control

Analysis	k	N	Risk ratio	95% CI	95% PI	Risk ratio *p*	Cochran Q	I^2 (%)	95% CI	Moderator *p*	NNT
50% Improvement											
All	59	4,840	1.55	1.44, 1.67	0.98, 2.44	<.0001	379.1***	88.4	83.4, 92.4		9.1
All, dropouts as nonresponders	59	5,091	1.51	1.40, 1.63	0.96, 2.39	<.0001	383.6***	83.7			10.3
TF-CBT vs EMDR										.16	
TF-CBT	51	4,463	1.60	1.47, 1.75	0.97, 2.65	<.0001	369.0***	90.1	85.5, 93.8		8.3
EMDR	8	377	1.32	1.21, 1.45	1.21, 1.45	<.0001	6.74	16.6	0.0, 78.0		15.6
Active vs passive[a]										.64	
Active control	29	2,867	1.62	1.46, 1.81	1.01, 2.60	<.0001	104.1***	79.0	60.6, 90.6		5.8
Passive control	21	1,596	1.61	1.37, 1.89	0.87, 2.96	<.0001	156.6***	97.6	92.1, 99.2		13.7
20% Improvement											
All	59	4,840	2.81	2.40, 3.29	1.07, 7.41	<.0001	265.6***	83.1	72.8, 90.7		1.2
All, dropouts as nonresponders	59	5,091	2.47	2.14, 2.84	1.03, 5.93	<.0001	255.2***	83.5	73.7, 90.6		1.5
TF-CBT vs EMDR										.33	
TF-CBT	51	4,463	2.97	2.47, 3.58	1.02, 8.65	<.0001	254.8***	86.1	77.0, 92.5		—
EMDR	8	377	2.33	1.84, 2.94	1.52, 3.57	<.0001	9.4	38.1	0.0, 85.4		—
Active vs passive[a]										.97	
Active control	30	2,867	2.97	2.36, 3.74	1.04, 8.51	<.0001	146.9***	82.0	68.5, 91.5		—
Passive control	21	1,596	3.05	2.20, 4.24	0.91, 10.24	<.0001	93.1***	90.2	75.1, 97.0		—
Reliable change											
Improvement											
All	58	4,765	1.43	1.29, 1.57	0.80, 2.55	<.0001	223.7***	83.3	71.4, 91.3		9.3
TF-CBT vs EMDR										.66	
TF-CBT	50	4,388	1.45	1.30, 1.63	0.77, 2.74	<.0001	208.4***	86.1	74.9, 93.3		—
EMDR	8	377	1.34	1.10, 1.62	0.87, 2.04	<.01	15.1*	43.5	0.0, 86.5		—
Active vs passive[a]										.69	
Active control	29	2,792	1.42	1.23 1.64	0.77, 2.62	<.0001	115.6***	81.7	64.3, 92.5		7.4
Passive control	21	1,596	1.54	1.25, 1.90	0.72, 3.30	<.0001	85.4***	90.2	74.4, 97.4		9.7
Deterioration											
All	58	4,765	1.00	1.00, 1.01	0.99, 1.01	.88	186.1***	99.4	98.7, 99.7		N/A
TF-CBT vs EMDR										.53	
TF-CBT	50	4,388	1.00	1.00, 1.01	1.00, 1.01	.74	147.0***	99.3	98.1, 99.7		—
EMDR	8	377	0.73	0.57, 0.93	0.40, 1.35	.01	38.8***	97.9	85.6, 99.7		—
Active vs passive[a]										.85	
Active control	29	2,792	1.00	0.99, 1.01	0.99, 1.01	.83	55.5*	97.7	80.3, 99.5		N/A
Passive control	21	1,596	0.84	0.76, 0.94	0.55, 1.29	<.01	91.5***	99.1	97.2, 99.7		N/A

Note: *EMDR = eye movement desensitization and reprocessing; TF-CBT = trauma-focused cognitive–behavioral therapy; N/A = not available (ie, could not be calculated as rates of reliable deterioration were too low); NNT = number needed to treat.*

[a]*Using only the TF-CBT studies.*

***p < .0001, **p < .001, *p < .05.*

therapies; the 20% improvement rate was 0.48 (0.42-0.53) for control conditions.

Reliable improvement pooled response rates were 0.55 (0.46-0.64) for TF-CBT alone, 0.42 (0.30-0.55) for EMDR alone, and 0.53 (0.45-0.61) for all psychological therapies; the response rate was 0.25 (0.20-0.30) for control conditions. Reliable deterioration rates were 0.01 (0.01-0.02) for TF-CBT alone, 0.01 (0.00-0.03) for EMDR alone, and 0.01 (0.01-0.02) for all psychological therapies; the reliable deterioration rate was 0.13 (0.08-0.20) for control conditions. Sensitivity analyses were conducted whereby dropouts were assumed to be nonresponders; this resulted in a small reduction in absolute response rates (Tables 2 and 3). Figure 2 provides a forest plot and Figure S1, available online, a the funnel plot for 50% improvement response rates.

PTSD Symptoms, Follow-up. Table S2, available online, lists absolute response rates for TF-CBT and EMDR, and Table S3, available online, provides absolute response rates for control conditions. Data for follow-up window 1 (1-5 months after the posttreatment assessment) showed that the pooled absolute response rate for 50% improvement was similar to that at posttreatment: 0.44 (0.32-0.56; k = 16) for TF-CBT, and 0.44 (0.34, 0.55; k = 19) for all psychological therapies; the 50% improvement rate was 0.22 (0.15-0.31) for control conditions, with no overlap of CIs between psychological therapies and controls.

At follow-up window 2 (at least 6 months after posttreatment assessment), the pooled response rate for 50% improvement was 0.62 (0.44-0.78; k = 12) for TF-CBT alone (only one study was available for EMDR in this time window) and 0.43 (0.29-0.57) for control conditions. The overlapping CIs suggest that there may be no significant difference between the arms at this timepoint.

Depression Symptoms, Posttreatment. Table S5, available online, lists absolute response rates for TF-CBT and EMDR, and Table S6, available online, provides absolute response rates for control conditions. At posttreatment, pooled 50% improvement response rates for TF-CBT were 0.33 (0.25-0.41, k = 35), for EMDR were 0.33 (0.09-0.63; k = 5) and for all psychological therapies 0.33 (0.26-0.41; k = 40); for all control conditions combined, the pooled response rate was 0.18 (0.13-0.23).

Pooled 20% improvement response rates were 0.60 (0.52-0.68) for TF-CBT alone, 0.58 (0.30-0.82) for EMDR alone, and 0.60 (0.52-0.68) for all psychological therapies; the 20% improvement response rate was 0.37 (0.31-0.43) for control conditions.

Pooled reliable improvement response rates were 0.25 (0.19-0.31) for TF-CBT alone, 0.24 (0.05-0.50) for EMDR alone, and 0.25 (0.19-0.31) for all psychological therapies. The rate was 0.13 (0.10-0.17) for control conditions. Pooled reliable deterioration rates were 0.02(0.01-0.03) for TF-CBT alone, 0.01 (0.00-0.04) for EMDR alone, and 0.02 (0.01-0.03) for all psychological therapies; the rate was 0.10 (0.02-0.21) for control conditions. CIs were nonoverlapping between psychological therapies and control conditions, apart from for reliable deterioration. Sensitivity analyses were conducted whereby dropouts were assumed to be nonresponders, resulting in a small reduction in absolute response rates (Tables S5 and S6, available online).

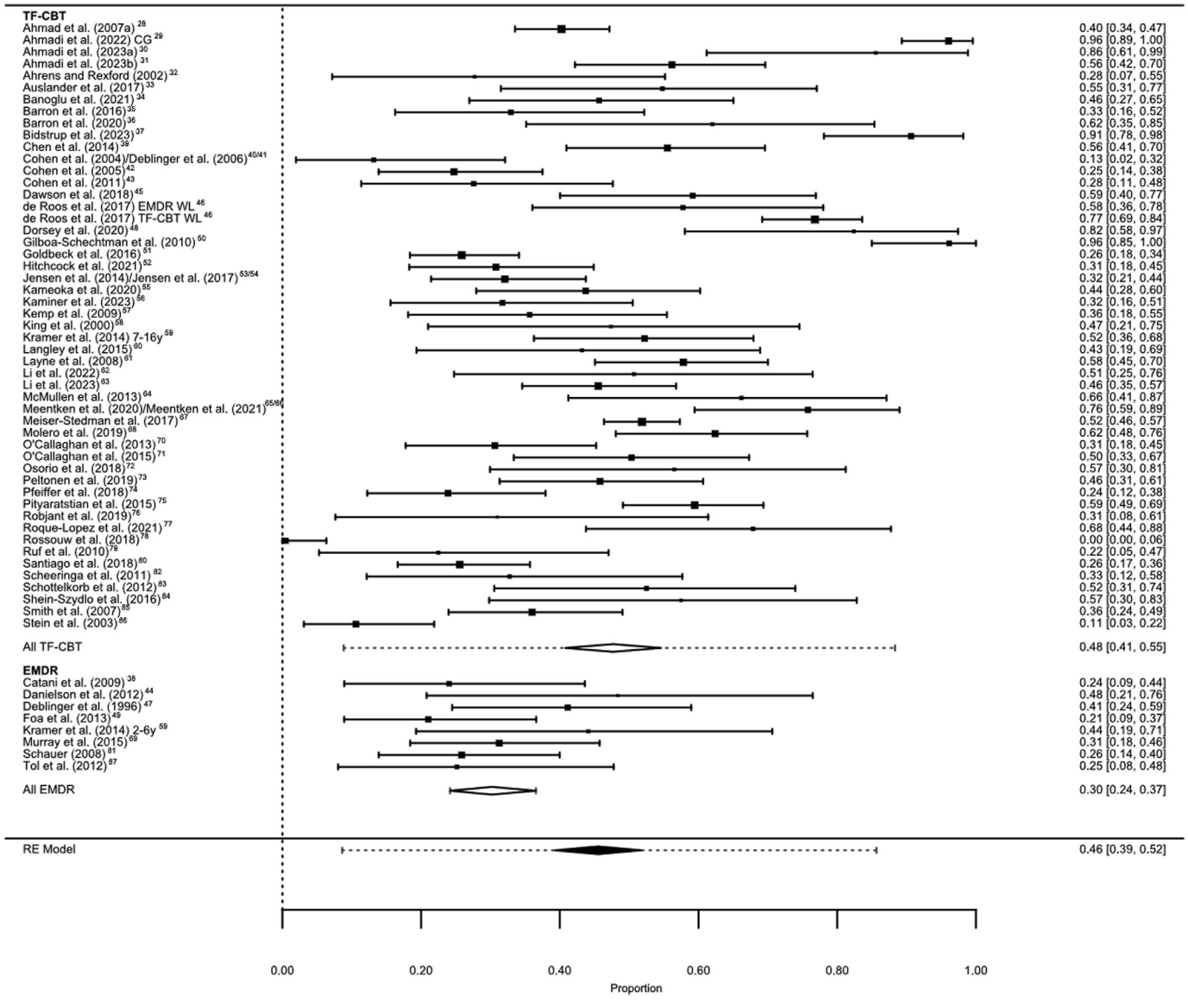
Depression Symptoms, Follow-up. Table S8, available online, gives absolute response rates for TF-CBT and EMDR, and Table S9, available online, lists absolute response rates for control conditions. Data for follow-up window 1 (1-5 months after posttreatment assessment) showed that absolute response rate for 50% improvement was 0.26 (0.10-0.46; k = 13) for TF-CBT (only 2 trials reported data for EMDR) and 0.19 (0.10-0.29) for control conditions. At follow up window 2 (at least 6 months after posttreatment assessment), response rate for 50% improvement was 0.48 (0.29-0.68; k = 6) for TF-CBT (only 2 trials reported data for EMDR) and 0.36 (0.26-0.46) for control conditions. Overlapping confidence intervals indicate that there may be no significant difference between response rates for depression symptoms for psychological therapies and control conditions at follow-up.

Risk Ratio

PTSD Symptoms. Table 3 provides pooled risk ratio data comparing psychological therapies with control conditions at posttreatment. The pooled risk ratio for 50% improvement for TF-CBT alone was 1.60 (1.47-1.75), for EMDR alone was 1.32 (1.21-1.45) and for all psychological therapies was 1.55 (CI = 1.44-1.67); for 20% improvement, the pooled ratio for TF-CBT alone was 2.97 (2.47-3.58), for EMDR alone was 2.33 (1.84, 2.94), and all psychological therapies was 2.81 (2.40-3.29). The pooled risk ratio for reliable improvement for TF-CBT alone was 1.45 (1.30, 1.63), for EMDR alone was 1.34 (1.10, 1.62), and for all psychological therapies was 1.43 (1.29-1.57). For reliable deterioration, the pooled risk ratio TF-CBT alone was 1.00 (1.00, 1.01), for EMDR alone was 0.73 (0.57-0.93), and for all psychological therapies was 1.00 and nonsignificant (1.00-1.01).

Table S4, available online, provides risk ratio data comparing psychological therapy with control conditions at follow-up. At follow-up window 1 (1-5 months after

FIGURE 2 Forest Plot for 50% Improvement in Posttraumatic Stress Disorder (PTSD) Symptoms, Trauma-Focused Cognitive–Behavioral Therapy (TF-CBT), and Eye Movement Desensitization and Reprocessing (EMDR)



posttreatment assessment), the pooled risk ratio for 50% improvement for TF-CBT was 1.20 (1.08-1.33, k = 16; only 3 EMDR trials). For 20% improvement, the pooled risk ratio for TF-CBT was 1.30 (1.06-1.60, k = 16; only 3 EMDR trials). The pooled risk ratio for reliable improvement for TF-CBT was 1.25 (1.08-1.46, k = 16) and for all psychological therapies was 1.37 (1.16-1.61, k = 19); for reliable deterioration, the pooled risk ratio for TF-CBT was 1.00 and nonsignificant (0.97-1.03, k = 16), and for all psychological treatments was 0.97 and nonsignificant (0.92-1.01, k = 19).

At follow-up window 2 (at least 6 months after posttreatment assessment), the risk ratio for 50% improvement was 1.38 (1.10-1.73) and for 20% improvement was 2.13 (1.32-3.44). The risk ratio for reliable improvement was 1.63 (1.15-2.30) and for reliable deterioration was 1.00 (0.99-1.01).

Sensitivity analyses were conducted whereby dropouts were assumed to be nonresponders, resulting in a small reduction in risk ratios, ALthough they remained statistically significant (results shown in tables).

Figures S3 and S4, available online, show the funnel plot and forest plot for 50% improvement risk ratio data.

Depression Symptoms. Table S7, available online, provides risk ratio data comparing psychological therapy with

control conditions at posttreatment. The risk ratio for 50% improvement was 1.18 (1.10-1.25) and for 20% improvement was 1.39 (1.25-1.55). The risk ratio for reliable improvement was 1.11 (1.06-1.16) and for reliable deterioration was 1.01 and nonsignificant (1.00-1.02).

Table S10, available online, provides risk ratio data comparing psychological therapy with control conditions at follow-up. At follow-up window 1 (1-5 months after posttreatment assessment), the risk ratio for 50% improvement was 1.01 and nonsignificant (0.97-1.04) and for 20% improvement was 1.25 (1.04-1.52). The risk ratio for reliable improvement was 1.16 (1.05-1.29) and for reliable deterioration was 1.02 and nonsignificant (0.97-1.08). At follow-up window 2 (at least 6 months after posttreatment assessment), the risk ratio for 50% improvement was 1.29 (1.06-1.58) and for 20% improvement was 1.58 (1.21-2.06). The risk ratio for reliable improvement was 1.29 (1.07-1.54) and for reliable deterioration was 1.00 and nonsignificant (0.99-1.02).

Sensitivity analyses were conducted whereby dropouts were assumed to be nonresponders, resulting in a small reduction in risk ratios; the tables show results.

Moderator Analysis

PTSD Symptoms. Moderator and subgroup analyses were conducted; the results are reported in Tables 2 and 3 for posttreatment and in Tables S1 to S3, available online, for follow-up data. No moderation effects were significant for response rates in psychological therapy conditions at posttreatment. A significant difference was found for the 50% improvement response rates in control conditions at posttreatment: active control conditions yielded a higher response rate (0.28) than passive control conditions (0.12; $p < .0001$), as would be expected. No significant differences were found for subgroup analyses of risk ratios for psychological therapies vs control conditions at posttreatment.

At follow-up, there were too few studies (<5 per subgroup[88]) to assess the difference between the subgroups in most cases but the significant difference for 50% improvement response rates in control conditions was replicated in follow-up window one (one to five months after posttreatment assessment): active control conditions yielded a higher response rate (0.29) than passive control conditions (0.10; $p = .010$).

Depression Symptoms. Subgroup analyses were conducted and reported in Tables S4 to S6 for posttreatment and in Tables S7 to S9, available online, for follow-up data. No significant differences were found for the response rates in psychological therapy conditions or control conditions at posttreatment or for subgroup analyses of risk ratios for psychological therapies vs control conditions at posttreatment.

At follow-up, groups became too small to assess the difference between subgroups.

Publication Bias

Funnel plots were inspected, and the Egger test of funnel plot asymmetry was implemented for main analyses at posttreatment.

PTSD. The Egger test result was not significant for absolute response rates (50%, 20%, and reliable improvement) for TF-CBT and EMDR or control conditions, and for absolute rates of reliable deterioration for TF-CBT and EMDR. The Egger test suggested significant funnel plot asymmetry for absolute rates of reliable deterioration in control conditions, but the trim-and-fill procedure did not indicate that any studies were missing.

The Egger test also suggested significant funnel plot asymmetry for 50% improvement risk ratio data. The trim-and-fill procedure calculated 21 missing studies on the left side, reducing the reported risk ratio from 1.54 (1.42-1.66) to 1.33 (1.21-1.47). The Egger test was significant for 20% improvement risk ratio data as well; the trim-and-fill procedure calculated 19 missing studies on the left side, reducing the risk ratio from 2.76 (2.34-3.25) to 2.18 (1.82-2.62).

The Egger test indicated significant funnel plot asymmetry for reliable improvement and deterioration risk ratio data. For reliable improvement, the trim-and-fill procedure indicated 8 missing studies on the left side, reducing the risk ratio from 1.43 (1.29-1.57) to 1.38 (1.25-1.52). For reliable deterioration, the trim-and-fill procedure indicated 21 missing studies on the right side, which did not alter the calculated risk ratio or 95% CIs.

Depression. The Egger test was not significant for absolute response rates (50%, 20%, and reliable improvement) or reliable deterioration for TF-CBT and EMDR or control conditions.

The Egger test suggested significant funnel plot asymmetry for 50% improvement risk ratio data. The trim-and-fill procedure calculated 18 missing studies on the left side, reducing the reported risk ratio from 1.18 (1.10-1.25) to 1.05 (0.97-1.14). The Egger test was significant for 20% improvement risk ratio data as well; the trim-and-fill procedure calculated 16 missing studies on the left side, reducing the risk ratio from 1.39 (1.25-1.55) to 1.20 (1.06-1.37).

The Egger test indicated significant funnel plot asymmetry for reliable improvement and deterioration risk ratio data. For reliable improvement, the trim-and-fill procedure indicated 8 missing studies on the left side, reducing the risk ratio from 1.11 (1.06-1.16) to 1.04 (0.98-1.11). For reliable

deterioration, the trim-and-fill procedure indicated 11 missing studies on the right side, which did not alter the calculated risk ratio or 95% CIs.

DISCUSSION

This systematic review and meta-analysis imputed rates of response, reliable improvement, and reliable deterioration for psychological therapies used to treat children and adolescents with PTSD. The results have shown that an average of 48% of young people receiving TF-CBT and 30% of those receiving EMDR (46% for the combined all psychological therapies class) show 50% improvement in PTSD symptoms at posttreatment, compared to 20% of young people in control conditions. The risk ratio of 50% improvement comparing TF-CBT to control conditions was 1.60 and for EMDR relative to control conditions was 1.32 (1.55 for the combined all psychological therapies class). These patterns were consistent (albeit with higher percentages showing response) for 20% improvement in PTSD symptoms. They were also consistent (but with slightly lower percentages) in showing response when dropouts were included as nonresponders in sensitivity analyses. When considering reliable change, 55% of young people receiving TF-CBT (42% of youth receiving EMDR and 53% of those receiving any psychological therapy) exhibited reliable improvement, compared to 25% of young people in control conditions. Of the young people receiving psychological therapy, 1% exhibited reliable deterioration, compared to 13% of young people in control conditions; the risk ratio when comparing TF-CBT or EMDR conditions to control conditions was nonsignificant, however. The comparison between TF-CBT and EMDR was nonsignificant for 50% symptom reduction, despite TF-CBT resulting in a greater proportion (0.48, 95% CI = 0.41-0.55) exhibiting response than EMDR (0.30, 95% CI = 0.24-0.37).

These results are consistent with findings in the recent meta-analysis by Cuijpers *et al.*,[17] who calculated a response rate of 38% showing a 50% reduction in symptoms in adults receiving psychotherapy for PTSD. The results support the use of psychological therapies as a first-line gold-standard treatment for children and adolescents presenting with PTSD, and demonstrate their effectiveness over and above control conditions, even when dividing into active and passive control conditions. In addition, the rate of reliable deterioration was very low for psychological therapies, further supporting their implementation and addressing concerns regarding retraumatization.[89]

However, the results also demonstrate that a large proportion (over half) of young people do not show 50% improvement in their PTSD symptoms at posttreatment following psychological therapy. Although this is concerning, it is important to note that there may be a floor effect whereby participants with mild-to-moderate symptoms do not show 50% improvement because their symptom score was relatively low to begin with, thereby reducing the scope for improvement. This is somewhat supported by the inclusion of 20% improvement as a threshold; the present research found that 75% of young people receiving TF-CBT or EMDR at least met this threshold for symptom improvement. It is also possible that some participants may experience barriers outside of therapy that reduce their response. However, there is scope for further research and consideration as to how psychological therapies could be made more effective for the treatment of PTSD in youth.

A further consideration is the lack of difference between psychological therapies and control conditions at long-term follow up (6 months or more). This may indicate some level of naturalistic recovery occurring in a proportion of youth with a PTSD diagnosis, as suggested by previous trajectory research.[90,91] Nevertheless, the present research supports the use of psychological therapies to facilitate a faster recovery than may be achieved naturally.

As a sufficient number of studies reported depression data, we were also able to impute response rates for depression symptoms. Of those youth receiving psychological therapies, 33% experienced a 50% reduction in depression symptoms, compared to 18% in control conditions; the risk ratio comparing psychological therapies to control conditions for 50% reduction in symptoms was small (1.18) but statistically significant. This shows that psychological therapies for PTSD go some way to improving depression symptoms, but again do not provide improvement for a large proportion of young people. Cuijpers *et al.*[18] imputed response rates for psychological treatments of depression in children and adolescents and found 39% of young people exhibited 50% symptom reduction. As the results from the present study are broadly comparable to this figure, this suggests that psychological therapies for PTSD may have important transdiagnostic effects with regard to treating depression symptoms. There is also the potential for presence of depression symptoms to reduce response to therapy for PTSD, as depression has previously been identified as a risk factor for nonresponse to cognitive–behavioral treatments for PTSD.[92]

Publication biases for risk ratio data suggested that some studies were missing, but the effect sizes remained significant after implementing the trim-and-fill procedure. As noted in the *Cochrane Handbook for Systematic Reviews,*[88] this may be an artifactual effect as risk ratios are correlated with standard errors.[93,94] This is further supported by the lack of missing studies in previous meta-analyses using the Hedges *g*.[95]

The limitations of this research must be considered. Heterogeneity was found to be high, consistent with similar meta-analyses of psychological treatments.[96] However, moderator analyses did not identify any significant differences between subgroups. As a result of the high degree of heterogeneity, our findings should be considered with caution. This is particularly true for the response rate data, in which methodological features of a trial are not controlled for and heterogeneity therefore tends to be very high. Although response data may be useful for clinicians, we acknowledge that pooling response rates is not without debate.[15] A further consideration is that the pooled response rates are estimates as opposed to measured rates, which would require individual participant data. In addition, dichotomization of the data to impute response rates does require the selection of arbitrary response rates. However, we chose 50% improvement as the main outcome, to be consistent with previous research.[17,18] This limitation was further ameliorated by exploring different levels of response (50% and 20%), as well as reliable improvement and deterioration. Similarly, the use of reliable change indices requires the application of assumptions, although a conservative assumption for the Cronbach alpha was used and the relevant assumptions would affect all extracted data equally. Furthermore, results suggest that there may have been a floor effect for reliable deterioration, given the low numbers reported for psychological therapies. This may have reduced the accuracy of the normal distribution assumption, as these values were likely at the tail end of the theoretical distribution. Finally, we note that there may be issues with pooling TF-CBT and EMDR when considering the evidence for "psychological therapies" as a broad class of intervention. Although there were no differences between these 2 treatment approaches at the conventional level of significance, the bulk of the evidence gathered here pertains to TF-CBT, and the 95% CIs for both absolute prevalences and risk ratios when comparing to control conditions were nonoverlapping, showing some evidence for the superiority of TF-CBT.

The present research also had a considerable number of strengths. It is the first systematic review and meta-analysis of its kind to impute response rates for young people receiving psychological therapy for PTSD, and the use of different levels of symptom improvement as well as reliable improvement and deterioration allow a comprehensive view of how TF-CBT and EMDR compare to control conditions. A range of subgroup analyses were conducted to assess whether any study characteristics influenced results, and extraction and analysis of depression data allowed calculation of response rates for depression symptoms, an important metric given its common comorbidity with PTSD.[2]

The clinical implications of this research are that psychological therapies are appropriate as first-line treatment for children and adolescents with a diagnosis of PTSD. It is also important to note that a proportion of young people may not show large improvements in symptom reduction at posttreatment (although a majority [75%] were found to exhibit at least 20% symptom reduction). This study provides easily interpretable response rates for clinicians and service users to consider, and showcases the very low rates of deterioration in symptoms for young people receiving TF-CBT or EMDR for PTSD.

In conclusion, this meta-analysis has imputed response rates at a range of levels for psychological therapies for PTSD in children and adolescents. The results support the use of psychological therapies to treat PTSD in youth, and show that these are also effective for symptoms of depression and have very low rates of reliable deterioration. However, they also show that a proportion of young people do not exhibit a 50% reduction in their symptoms at posttreatment, warranting further research.

CRediT authorship contribution statement

Katie Lofthouse: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Alana Davies:** Writing – review & editing, Validation, Data curation. **Joanne Hodgekins:** Writing – review & editing, Supervision. **Richard Meiser-Stedman:** Writing – review & editing, Validation, Supervision, Methodology, Conceptualization.

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