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The effectiveness of psychological interventions for post-traumatic stress disorder in children, adolescents and young adults: a systematic review and meta-analysis

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Review Article

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Abstract

Background. Children and adolescents display different symptoms of post-traumatic stress disorder (PTSD) than adults. Whilst evidence for the effectiveness of psychological interventions has been synthesised for adults, this is not directly applicable to younger people. Therefore, this systematic review and meta-analysis synthesised studies investigating the effectiveness of psychological interventions for PTSD in children, adolescents and young adults. It provides an update to previous reviews investigating interventions in children and adolescents, whilst investigating young adults for the first time.

Methods. We searched published and grey literature to obtain randomised control trials assessing psychological interventions for PTSD in young people published between 2011 and 2019. Quality of studies was assessed using the Cochrane Risk of Bias tool. Data were analysed using univariate random-effects meta-analysis.

Results. From 15 373 records, 27 met criteria for inclusion, and 16 were eligible for meta-analysis. There was a medium pooled effect size for all psychological interventions ($d = -0.44$, 95% CI −0.68 to −0.20), as well as for Trauma-Focused Cognitive Behavioural Therapy (TF-CBT) and Eye Movement Desensitisation and Reprocessing (EMDR) ($d = -0.30$, 95% CI −0.58 to −0.02); $d = -0.46$, 95% CI −0.81 to −0.12).

Conclusions. Some, but not all, psychological interventions commonly used to treat PTSD in adults were effective in children, adolescents and young adults. Interventions specifically adapted for younger people were also effective. Our results support the National Institute for Health and Care Excellence guidelines which suggest children and adolescents be offered TF-CBT as a first-line treatment because of a larger evidence base, despite EMDR being more effective.

Adverse experiences during childhood (age 3–12) and adolescence (age 13–18) are a risk factor for developing post-traumatic stress disorder (PTSD) and other adverse mental health outcomes (Ehlert, 2013; Heim & Nemeroff, 2001), including disruption of brain maturation and attachment as well as forming negative schemas (Eiland & Romeo, 2013; O'Dougherty Wright, Crawford, & Del Castillo, 2009; Styron & Janoff-Bulman, 1997). To prevent these negative outcomes effective PTSD treatment is essential.

PTSD is characterised by intrusive recollections of a traumatic event such as flashbacks and nightmares, avoidance of trauma-related stimuli, changes in affect and cognition, and hyperarousal symptoms such as hypervigilance (DSM-5, American Psychiatric Association [APA], 2013). Children and adolescents may also experience symptoms including developmental regression, trauma-specific re-enactment in play and changes in their arousal or reactivity, including externalising behaviour such as temper tantrums (APA, 2013). Interventions need to not only effectively treat these symptoms of PTSD but also need to be developmentally appropriate to be effective with this population (Baggerly & Exum, 2008). This can include being flexible with the content of treatment sessions based on the participant's attention span and their developmental level or including caregivers where appropriate (Foa, Chestman, & Gilboa-Schechtman, 2008; Nevo & Manassis, 2011).

Effectiveness of PTSD interventions in children and adolescents was previously summarised in a systematic review (Gillies, Taylor, Gray, O'Brien, & D'Abrew, 2012). This review demonstrated the effectiveness of psychological interventions, most notably CBT. However, this review only included a small number of studies (14) generally with low numbers of participants and was published in 2012, containing literature published up until 2011. We, therefore, aimed to update this review as well as expand it. Since the publication of the previous review, other studies have been carried out examining the effectiveness of psychological

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interventions for PTSD in children and adolescents. In one study, the effect sizes for PTSD symptom change ranged from large to small depending on the control condition of the study. Cognitive Behavioural Therapy (CBT) was found to be the most effective at reducing PTSD symptoms, particularly when parents were included (Gutermann et al., 2016). In another study, trauma focused (TF) –CBT, in particular, showed large effects at reducing PTSD symptoms after treatment compared to waitlist controls. Eye Movement Desensitisation and Reprocessing (EMDR) was also found to be effective but to a lesser extent (Mavranezouli et al., 2020).

In addition to children and adolescents, the present review included interventions in young adults, up to 25 years of age. As brain maturation continues into the early twenties (Pfefferbaum et al., 1994; Steinberg, 2014) this systematic review and meta-analysis investigated the effectiveness of PTSD interventions in young adults, as well as children and adolescents.

The primary aim of the present review was, therefore, to evaluate the efficacy of psychological interventions for PTSD in children, adolescents and young adults and determine if any intervention is superior. A secondary aim was to evaluate the efficacy of psychological interventions in children compared with psychological interventions in adolescents and young adults.

Methods

Search strategy and selection criteria

This systematic review and meta-analysis followed Preferred Reporting Items for Systematic reviews and Meta-analysis (PRISMA) guidelines. Our protocol was registered with PROSPERO (CRD42019141619). We systematically searched Embase, Medline and PsycINFO as well as Open Grey and Google Scholar to find relevant grey literature. We manually searched biographies of included citations. The final search was run on 17 July 2019 and included free-text and Medical Subject Headings (MeSH) terms and was adapted for each database (see online Supplementary methods). The search was limited to studies carried out in humans and published in the English language between 2011 and 2019, to systematically evaluate studies published after the previous systematic review (Gillies et al., 2012).

PICOS criteria

Studies were considered eligible if they contained data from a randomised control trial (RCT) investigating the effectiveness of any psychological intervention in children (3–12 years of age), adolescents (13–18 years) or young adults (19–25 years) diagnosed with PTSD. Studies were included only if all participants were aged 3–25. Authors were contacted for confirmation if necessary. Our primary outcome was the reduction of PTSD symptoms on a validated scale. We included RCT as well as cluster RCT, but not matched control studies. We listed secondary outcomes investigated by the studies included in our systematic review but did not synthesise these. Included studies used various diagnostic classifications to assess PTSD including Diagnostic and Statistical Manual of Mental disorders (DSM) versions DSM-III, DSM-IV, DSM-IV-TR and DSM-5. We assumed sufficient commonalities to pool effect sizes. Studies with participants with comorbid conditions were included, as were studies with participants with subthreshold symptoms, as subthreshold PTSD can generate distressing symptoms requiring similar levels of treatment to full PTSD (Foa, Riggs, & Gershuny, 1995).

We included any study investigating a psychological therapy, including psychoeducation, as this has shown to be effective at reducing PTSD symptoms compared to those who did not receive psychoeducation (Oflaz, Hatipoglu, & Aydin, 2008). Included studies had to have a control group, including an alternative intervention, treatment as usual, waiting list control or no treatment.

Exclusion criteria

Studies were excluded if they included samples within 1 month of trauma exposure, as they are not able to meet diagnostic criterion F according to DSM-5 (APA, 2013) and research consistently shows that the majority of individuals will recover naturally within the first few weeks after a trauma (Friedman, Resick, Bryant, & Brewin, 2011). Conference papers and studies reporting data from other studies were excluded, as these did not include sufficient information to assess suitability. Studies with mixed participants who were young people and adults (i.e.: age range 15–40) were excluded.

Data extraction and analysis

Two authors (RJ-BB and MK) extracted data independently. Study-level data about study characteristics, rate-level data about treatment effects and meta-level data on study design and study quality were recorded in a standardised spreadsheet (see online Supplementary materials). Quality of yield was assessed using the Cochrane Risk of bias tool (Higgins et al., 2016). Studies assessing the effectiveness of interventions through improvement from a diagnosis of PTSD ascertained via diagnostic interviews or via validated self-report PTSD scales were included in this review. Where available, we extracted summary-level data on effect sizes by age group (children, adolescents, young adults) and type of intervention used. We assessed small study effects (including publication bias) through visual inspection of a funnel plot and use of Egger's test where possible (Harbord, Harris, & Sterne, 2009).

Measures of treatment effect

Based on the previous meta-analysis, we anticipated a high level of heterogeneity and specified use of random-effects meta-analysis. We calculated Cohen's D effect size for each study using means and standard deviations of post-intervention PTSD symptoms. When no standard deviation was reported, we computed the standard error using 95% confidence intervals. We pooled Cohen's D effect sizes when three or more studies were available, grouping studies by the intervention.

We assessed statistical heterogeneity using the Q test and quantified using the I^2 statistic, which identifies the proportion of the observed variance that reflects real differences in effect size. We carried out a subgroup analysis by comparing the effectiveness of different psychological interventions to each other when more than two studies assessed the effectiveness of any particular intervention (Valentine, Pigott, & Rothstein, 2010). We also carried out subgroup analysis comparing the effects of treatment on children (all participants under the age of 12) compared with the effects of the treatment on adolescents and young adults (participants between age 13 and 25) (Curtis, 2015; Jawroska & MacQueen, 2015).

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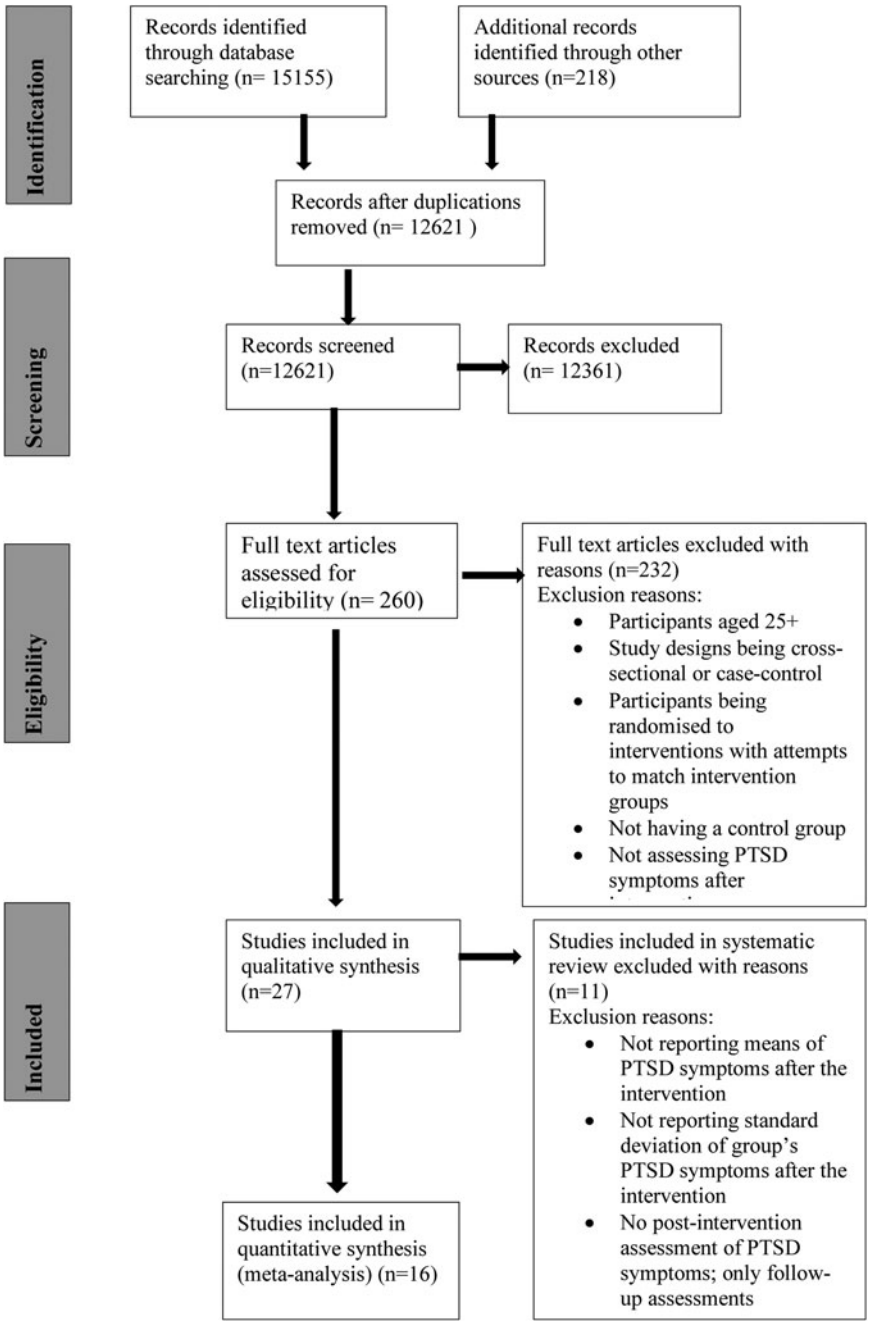

Fig. 1. PRISMA flow chart depicting study selection for systematic review and meta-analysis.

We checked for normality of data and conducted a sensitivity analysis with only those studies including normally distributed data.

Results

Characteristics of included studies

We retrieved 15 155 studies, of which 27 met our inclusion criteria (see Fig. 1). We achieved good inter-rater reliability between the two reviewers at 'title and abstract' and 'full text' screening stages ($k = 0.714$, $p < 0.001$; $k = 1.000$, $p < 0.001$).

The 27 eligible studies included 2187 participants. Included studies had child populations ($n = 3$, 11%), adolescent and young adult populations ($n = 7$, 26%) and mixed populations ($n = 17$, 63%; Table 1). As indicated in Table 1, four studies (15%) included participants exposed to warfare (Barron et al., 2016; Barron, Abdallah, & Smith, 2013; Dawson et al., 2018; Ertl, Pfeiffer, Elbert, & Neuner, 2011). In these studies, the most frequently reported traumas were witnessing someone being killed and being used as a human shield. Two studies (7%) included participants exposed to natural disasters (Chen et al., 2014; De Roos et al., 2011). Chen et al. (2014) did not report the types of trauma participants were exposed to except the inclusion criteria: losing a parent in the earthquake. In De Roos et al. (2011), the most frequently reported trauma was a thought they were going to die. Six studies (22%) included participants exposed to abuse (Church, Piña, Reategui, & Brooks, 2012; Cohen, Mannarino, & Iyengar, 2011; Deblinger, Mannarino, Cohen, Runyon, & Steer, 2011; Dorsey et al., 2014; Foa, McLean,

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Table 1. Characteristics, effect sizes and key findings of reviewed studies

Study	Country	Mean age (years) (range/s.d.)	Description of trauma	Sample size	Number of females (%); number of males%)	Description of Intervention/(s)	Description of control	Primary outcome measures	Post-treatment effect sizes (*d*)	Follow-up period (months)	Follow-up Treatment effect size (*d*)	Key Findings
Barron et al. (2013)	Palestine	TRT 11.09; WL 11.06 (11-14)	Students with highest CRIES scores in each class	140 (90 TRT; 50 WL)	60 F (44%); 73 M (52%)	TRT	WL	CRIES-13 (DSM-IV)	*d* = 0.76 for reducing PTSD	–	–	Reductions in number of students meeting the cut off for PTSD after treatment [53 students in TRT (63.9%) v. 28 students in WL (33.7%)]
Barron et al. (2016)	Palestine	TRT 13.6 (11–15)	Villages were selected based on high exposure to violence. Scores of ⩾17 on CRIES	139 (75 TRT; 69 WL)	83 F(60%); 56 M (40%)	TRT	WL	CRIES-13 (DSM-IV)	*d* = 0.66 (−1.00 to −0.33)	–	–	Evidence of lower PTSS found in TRT compared with WL (18.57 *v.* 24.16) 29 (41%) of those in TRT no longer met criteria for PTSD compared with 9 in WL (13%).
Chen et al. (2014)	China	14.50 (0.71)	Children who had lost a parent in the earthquake. Scored ⩾18 on CRIES-13	40 (16 CBT; 12 General support; 12 non-treatment control)	27 F (68%); 13 M (32%)	Short Term CBT group intervention; General Supportive intervention	No-treatment control	CRIES-13 (DSM-IV)	−0.48 (−1.33 to 0.37)	3	−0.84 (−1.75 to 0.07)	CBT was more effective in reducing PTSD symptoms than the supportive intervention and no treatment group
Church et al. (2012)	Peru	13.9 (12–17)	Youths with a history of abuse or parental abandonment specifying this[a]	16 (8 EFT; 8 WL)	16 F (100%)	Single session of EFT	WL	IES (DSM-III)	–	1	−8.54 (−11.66 to −5.42)	Post-intervention scores for all EFT participants improved and they were all nonclinical
Cohen et al. (2011)	USA	9.64 (7–14)	Children with ⩾5 Intimate Partner Violence related PTSD symptoms, with 1 in each cluster specified by K-SADS-PL	124 (64 TF-CBT; 60 CCT)	63 F (50.8%); 61 M (49.2%)	8 sessions TF-CBT	CCT	K-SADS-PL (DSM-V)	−0.15 (−0.50 to 0.20)	–	–	TF-CBT completers had significantly greater PTSD remission compared with CCT (75% *v.* 44% remission)
Dawson et al. (2018)	Indonesia	TF-CBT 10.87; PS 10.53 (7–14)	Conflict-exposed children with probable PTSD based on UCLA-PTSD-RI	64 (32 TF-CBT; 32 PS)	30 F (47%);34 M (53%)	TF-CBT	PS	UCLA PTSD RI(Child rated) (DSM-V) UCLA PTSD RI (Caregiver report) (DSM-V)	– –	3	−0.17 (−0.79 to 0.45) 0.03 (−0.77 to 0.83)	In both conditions, there were reductions in PTSD on self-reported and caregiver-reported scales. There were no differences across both groups

(*Continued*)

Table 1. (*Continued.*)

Study	Country	Mean age (years) (range/s.d.)	Description of trauma	Sample size	Number of females (%); number of males%)	Description of Intervention/(s)	Description of control	Primary outcome measures	Post-treatment effect sizes (*d*)	Follow-up period (months)	Follow-up Treatment effect size (*d*)	Key Findings
De Roos et al. (2011)	Netherlands	CBT 10.0; EMDR 10.2 (4–18)	Disaster-exposed children (explosion of factory) showing symptoms related to the explosion	52 (26 CBT; 26 EMDR)	23 F (44.2%); 29 M (55.8%)	4 sessions exposure-based CBT	4 sessions of EMDR	UCLA PTSD RI (Child rated ages 6 +) (DSM-V) UCLA PTSD RI (Parent rated) (DSM-V)	0.09 (−0.53 to 0.71) 0.26 (−0.29 to 0.80)	3	0.27(−0.35 to 0.90) 0.81 (0.24 to 1.37)	There were improvements in PTSD symptoms in both CBT and EMDR groups. EMDR was more efficient than CBT
De Roos et al. (2017)	Netherlands	13.06 (8–18)	Single incident trauma resulting in probable diagnosis	43 EMDR; 42 CWBT; 18 WL	59 F (57.3%); 54 M (42.7%)	EMDR CBWT	WL	CRTI –C (DSM-IV-TR)	EMDR *v.* WL: −1.42 (−2.02 to −0.81) CWBT *v.* WL: −1.05 (−1.63 to −0.46) EMDR *v.* CWBT: −0.27 (−0.70 to 0.16)	3 12	−0.11 (−0.54 to 0.31 (EMDR treat *v.* CWBT cont −0.27 (−0.69 to 0.16) [a]EMDR treat *v.* CWBT cont	After treatment 92% of EMDR group and 90.2% of CBWT no longer met the diagnostic criteria for PTSD-equally large remission rates All gains were maintained at follow up
Deblinger et al. (2011)	USA	Nr (4–11)	CSA survivors experiencing ⩾5 PTSD symptoms including avoidance, re-experiencing and hyperarousal	210 children and 164 parents (52 8 Yes TN; 52 16 Yes TN; 52 8 No TN; 54 16 No TN17).	Nr	TF-CBT + TN (8 sessions) to children and non-offending parents TF-CBT + TN (16 sessions) to children and non-offending parents	TF-CBT – TN (8 sessions) to children and non-offending parents TF-CBT – TN (16 sessions) to children and non-offending parents	K-SADS (DSM-IV)	–	6 12	–	All the TF-CBT conditions were efficacious. Children who received 16 sessions were rated as having fewer symptoms of Re-experiencing and Avoidance after TF-CBT compared with those with eight sessions.
Diehle et al. (2015)	Netherlands	13 (8–18 years)	Exposure to a traumatic event and at least partial PTSD	48 (23 TF-CBT; 25 EMDR)	30 F (62.5%); 18 M (37.5%)	8 weekly sessions of TF-CBT	8 weekly sessions of EMDR	CAPS-CA (DSM-IV)	*d* = −0.06 (−0.62 to 0.51)	–	–	Children in the TF-CBT and EMDR groups showed large reductions on the CAPS-CA after treatment. The difference in reduction was small and weak evidence to suggest the superiority of one treatment.
Dorsey et al. (2014)	USA	9.52 (6–15)	Children in foster care with trauma histories and symptoms from each criterion according to DSM-IV	49 (25 TF-CBT + E; 24 TF-CBT)	26 F (55.3%); 21 M (44.7%)	TF-CBT + E	TF-CBT	UCLA PTSD-RI (Child Report) (DSM-V) UCLA PTSD- RI (Foster parent report) (DSM-V)	nr	3	nr	There was no difference in PTSD symptoms in those who received engagement strategies and those who did not, although there was greater retention throughout treatment.

Ertl et al. (2011)	Uganda	18 (12–25)	Former child soldiers with positive screening for PTSD and diagnosis by clinicians according to CAPS	85 (29 NET; 28 Academic catch up + SC; 28 WL)	47 F (55.3%); 38 M (44.7%)	8 sessions of NET	Academic Catch up with SC WL	CAPS (DSM-IV)	–	3 12	NET *v.* SC at 3 months: 0.05 (−0.50 to 0.61) NET *v.* WL at 3 months: −0.31 (−0.85 to 0.23) NET *v.* SC at 12 months: −0.41 (−0.98 to 0.17) NET *v.* WL at 12 months: -0.45 (−0.99 to 0.10)	PTSD symptoms improved in the NET group more than in the academic catch-up and WL
Foa et al. (2013)	USA	15.34 (13–18)	Adolescent girls seeking treatment at a rape centre with a diagnosis of chronic or subthreshold PTSD defined as ⩾14 on CPSS	61 (30 PE; 31 SC)	61 F (100%)	14 sessions of PE	SC	CPSS-I (DSM-IV)	–	6 12	–	Strong evidence PTSS improved greater in PE compared with SC
Ford et al. (2012)	USA	14.7 (13–17)	Delinquent girls who all met the criteria for full/ partial PTSD	59 (33 TARGET; 26 ETAU)	59 F(100%)	TARGET	ETAU	CAPS-CA (DSM-IV)	0.24 (−0.34 to 0.83)	–	–	Both therapies were effectiveness in reducing post-traumatic symptoms. Those in the TARGET intervention had a greater change in PTSD symptoms
Goldbeck et al. (2016)	Germany	13.03 (7–17)	Outpatients at clinics with severity score ⩾ 35 on CAPS-CA	159 (76 TF-CBT; 83 WL)	114 F (71.7%); 45 M (28.3%)	12 sessions of TF-CBT	WL	CAPS-CA (DSM-IV)	–	4	−0.43 (−0.75 to −0.12)	TF-CBT was superior to WL at reducing PTSD symptoms. Younger children with less comorbid disorders showed most improvement

(*Continued*)

Table 1. (*Continued.*)

Study	Country	Mean age (years) (range/s.d.)	Description of trauma	Sample size	Number of females (%); number of males%)	Description of Intervention/(s)	Description of control	Primary outcome measures	Post-treatment effect sizes (*d*)	Follow-up period (months)	Follow-up Treatment effect size (*d*)	Key Findings
Jensen et al. (2014)	Norway	15.1 (10–18)	Traumatised youth with ⩾ 15 on CPSS	156 (79 TF-CBT; 77 TAU)	124 F (79.5%); 32 M (20.5%)	15 sessions of TF-CBT for children and participating parents in the community	TAU	CPSS (DSM-IV) CAPS-CA (DSM-IV)	−0.50 (−0.86 to −0.14) −0.44 (−0.81 to −0.07)	–	–	Evidence that fewer youths in the TF-CBT condition were diagnosed with PTSD compared with those in TAU after treatment TF-CBT is effective in community settings
Mannarino et al. (2012)	USA	7.6 (4–11)	Follow up of Deblinger et al. (2011) participants who had completed a structured interview at the end of treatment	210 children and 164 parents (52 8 Yes TN; 52 16 Yes TN; 52 8 No TN; 54 16 No TN)	98 F (62%); 60 M (38%)	8 sessions of TF-CBT with TN 16 sessions of TF-CBT with TN	8 sessions of TF-CBT without TN 16 sessions of TF-CBT without TN	K-SADS-(Reexperiencing) (DSM-IV) K-SADS- (Avoidance) (DSM-IV) K-SADS-(Hypervigilance) (DSM-IV)	Nr	6 12	Nr	Improvements in the original study had been sustained at 6 and 12 months. There were additional improvements at 12 months.
Murray et al. (2015)	Zambia	14.02 TF-CBT; 13.29 TAU (5–18)	History of ⩾ 1 traumatic event and significant trauma-related symptoms on UCLA-PTSD-RI	257 (131 TF-CBT; 126 TAU)	128 F (49.8%);129 M (50%)	10 to 16 sessions of TF-CBT	TAU	UCLA-PTSD-RI (DSM-V)	−1.17 (−1.45 to −0.89)	–	–	There was greater reduction in PTSS in TF-CBT than in TAU group.
Nixon et al. (2012)	–	11.59 CBT; 10.0 CT (7–17)	Single-incident trauma and met PTSD diagnostic criteria	33 (17 CBT; 16 CT)	12 F (36.3%); 21 M (63.6%)	9 weekly sessions of TF-CBT	CT	CAPS-CA (DSM-IV) CPSS (DSM-IV)	−0.02 (−0.71 to 0.66) 0.00 (−0.68 to 0.69)	6	0.30(−0.39 to 0.99) 0.26 (−0.43 to 0.94)	65% of CBT and 56% of the CT group no longer met criteria for PTSD.
Nixon et al. (2017).	–	11.59 CBT; 10.0 CT (7–17)	Follow-up of Nixon et al. (2012)	33 (17 CBT; 16 CT)[b]	12 F (36.3%); 21 M (63.6%)	9 weekly sessions of TF-CBT	CT	CAPS-CA (DSM-IV) CPSS (DSM-IV)	–	12	−0.18 (−0.86 to 0.50) 0.01(−0.67 to 0.69)	Both groups maintained Post-treatment improvements in PTSD at 1-year follow-up, with no child meeting criteria for PTSD.
Pfeiffer et al. (2018)	Germany	17.00 MW; 16.92 UC (13–21)	Children with scores ⩾ 19 on the CATS	99 (50 MW; 49 UC)	7 F (7.1%); 92 M (92.9%)	MW	UC	CATS-S (DSM-V) CATS-C (DSM-V)	−0.55 (−0.95 to −0.15) −0.13 (−0.52 to 0.27)	2	Nr	MW group was superior at reducing PTSS compared with usual care
Pityaratstian et al. (2015)	Thailand	12.25 (10–15)	Children with a primary diagnosis of PTSD	36 (18 CBT; 18 WL)	26 F (72.2%); 10 M (27.8%)	Group CBT	WL	CRIES (DSM-IV) UCLA PTSD-RI (DSM-V)	−0.06 (−0.72 to 0.59) −0.15 (−0.80 to 0.50)	1	−0.59 (−1.25 to 0.08) −0.48 (−1.15 to 0.18)	Participants who had CBT had greater improvement in symptoms of PTSD at 1 month compared with a wait list.

Rosner et al. (2019)	Germany	18.1 (14–21)	Young adults with childhood abuse-related PTSD diagnosis	88 (44 D-CPT; 44 WL)	75 F (85%); 13 M (15%)	D-CPT	WL	CAPS-CA (DSM-IV)	Nc	3	Nc	Those who received D-CPT had greater improvement in PTSD symptoms compared with those in WL conditions (24.7 *v.* 47.5) This difference was maintained at follow-up
Rossouw et al. (2016)	South Africa	16 (14–18)	Adolescents from low SES schools with a diagnosis or subthreshold PTSD	11 (6 PE; 5 SC)	10 F (90.9%); 1 M (9.09%)	PE	SC	CPSS-I (DSM-IV)	Nc	12	Nc	PTSD symptoms improved in the PE group and this was maintained at follow-up SC group also improved at post-treatment, but these gains were not maintained
Rossouw et al. (2018)	South Africa	15.35 (13–18)	Adolescents who had experienced a trauma and had chronic PTSD (>3 months)	63 (31 PE; 32 SC)	55 F (87.3%); 8 M (12.7%)	PE	SC	MINI-KID (DSM-IV and ICD-10)	Nr	3 6	nr	PE group had greater improvements in PTSD symptoms compared with SC group
Scheeringa et al. (2011)	USA	5.3 (3–6)	Children with life-threatening traumatic event with ⩾ 4 PTSD symptoms including at ⩾ 1 from criteria B (re-experiencing) or criteria C (avoidance)	64 (40 TF-CBT; 24 WL)	24 F (33.8%); 42 M (66.2%)	TF-CBT	WL	PAPA (DSM-IV-TR and ICD-10)	−1.10 (−1.64 to −0.56)	6	–	TF-CBT was more effective at reducing PTSD symptoms than those in the WL group, who showed no decrease in PTSD symptoms
Schottelkorb et al. (2012)	USA	9.16 (6–13)	Refugees full or partial PTSD diagnosis on UCLA-PTSD-RI	31 (14 CCPT; 17 TF-CBT)	14 F (45.2%); 17 M (54.8%)	CCPT	TF-CBT	UCLA-PTSD (DSM-V) PROPS (DSM-IV)	−0.22 (−0.99 to 0.56)	–	–	Both groups demonstrated improvement in PTS symptoms and there was no difference between the groups

TRT, Teaching Recovery Techniques; WL, Waiting List; CRIES-13, Children's Revised Impact of Events Scale; PTSS, Post-traumatic stress symptoms; CBT, Cognitive Behavioural Therapy; EFT, Emotional Freedom techniques; IES, Impact of Events Scale; TF-CBT, Trauma-focused Cognitive Behavioural Therapy; CCT, Child-centred therapy; K-SADS-PL, Kiddie-Schedule for Affective Disorders and Schizophrenia-Present and Lifetime Version; PS, Problem Solving; UCLA PTSD RI, University of California at Lost Angeles Post-traumatic Stress Disorder Reaction Index; EMDR, Eye Movement Desensitive Reprocessing; CBWT, Cognitive Behaviour Writing Therapy; CRTI, Revised Children's Responses to Trauma Inventory; CSA, Child Sexual Abuse; TN, Trauma Narrative; CAPS-CA, Clinician-Administered PTSD Scale for Children and Adolescents; DSM, The Diagnostic and Statistical Manual of Mental Disorders; TF-CBT + E, Trauma-focused therapy with engagement strategies; NET, Narrative Exposure Therapy; CAPS, Clinician-Administered PTSD Scale; PE, Prolonged Exposure; CPSS–I, Child PTSD Symptom Scale-Interview; TARGET, Trauma Affect Regulation: Guide for Education and Therapy; ETAU, Enhanced Treatment as Usual; TLPT, Time-Limited Dynamic Therapy for Adolescents; CT, Trauma-Focused therapy without exposure; MW, Mein Weg Program – psychoeducation, narrative work and relaxation; CATS-S, Child-and Adolescent Trauma Screen- Self Report; CATS-C, Child and Adolescent Trauma Screen-Caregiver report; D-CPT, Developmentally Adapted Cognitive Processing Therapy; MINI-KID, Mini International Neuropsychiatric Interview for Children and Adolescents; PAPA, Preschool Age Psychiatric Assessment; CCPT, Child-centred play therapy; PROPS, Parent Report of Post-traumatic Stress Symptoms.

[a]Baseline characteristics indicate all participants had IES scores in moderate clinical range (27–42) despite no inclusion criteria specifying PTSD symptoms.

[b]Only 10 participants were assessed in each condition at 6 months in Nixon et al. (2012).

Capaldi, & Rosenfield, 2013; Rosner et al., 2019). Two studies reported on sexual abuse (Deblinger et al., 2011; Foa et al., 2013) and one study on exposure to intimate partner violence specifically (Cohen et al., 2011).

Trauma Focused-Cognitive Behavioural therapy (TF-CBT) was the most commonly researched intervention with 13 studies (48%, see Table 1) evaluating its effectiveness. A further two studies (7%) investigated the effectiveness of Teaching Recovery Techniques (TRT), an intervention program based on cognitive behavioural principles and three studies (11%) investigated the effectiveness of standard (non-trauma-focused) CBT. In addition to TF-CBT, three studies investigated Prolonged Exposure (PE) (11%), three studies investigated Eye Movement Densistisation and Reprocessing (EMDR) (11%) and one study investigated Narrative Exposure Therapy (NET) (4%).

Twenty-four studies investigated the effectiveness of the intervention on additional outcomes besides PTSD symptoms or diagnosis (all except Church *et al.* 2012; Pityaratstian *et al.* 2015; Schottelkorb, Doumas, & Garcia, 2012). The most common secondary outcome assessed was depressive symptoms ($n = 22$). A table displaying key findings for the effectiveness of the psychological interventions for the additional outcomes can be seen in online Supplementary materials.

Quality of included studies

As indicated in Table 2, one study was rated as low risk of bias (4%), 16 studies were rated as having some concerns (59%) and 10 studies were rated as having a high risk of bias (37%). All studies used valid and reliable outcome measures, however, only 19 studies reported using blind assessors at follow up (70%). There was a high risk of bias in three studies (11%) regarding deviations from the intended interventions, six studies (22%) regarding missing outcome data and three studies (11%) regarding the risk of bias in the measurement of the outcome. One study (4%) had a risk of bias in the selection of the reported result (full results in Table 2).

Meta-analysis

The meta-analysis included 16 studies (59%) (Barron, Abdallah, & Heltne, 2016; Chen et al., 2014; Church et al., 2012; Cohen et al., 2011; De Roos et al., 2011, 2017; Diehle, Opmeer, Boer, Mannarino, & Lindauer, 2015; Ertl et al., 2011; Foa et al., 2013; Ford, Steinberg, Hawke, Levine, & Zhang, 2012; Goldbeck, Muche, Sachser, Tutus, & Rosner, 2016; Jensen et al., 2014; Nixon, Sterk, & Pearce, 2012; Pityaratstian et al., 2015; Scheeringa, Weems, Cohen, Amaya-Jackson, & Guthrie, 2011; Schottelkorb et al., 2012). For the remaining 11 studies (39%), insufficient data were available to be able to include them (Barron et al., 2013; Dawson et al., 2018; Deblinger et al., 2011; Dorsey et al., 2014; Mannarino, Cohen, Deblinger, Runyon, & Steer, 2012; Murray et al., 2015; Nixon, Sterk, Pearce, & Weber, 2017; Pfeiffer, Sachser, Rohlmann, & Goldbeck, 2018; Rosner et al., 2019; Rossouw et al., 2016; Rossouw, Yadin, Alexander, & Seedat, 2018).

Negative effect sizes indicate the superiority of the intervention over the control condition at reducing PTSD symptoms, positive effect sizes the opposite. The individual effect sizes for the 16 eligible studies can be seen in online Supplementary materials.

Pooling 19 effect sizes from 16 studies showed psychological interventions were better than control conditions at reducing PTSD symptoms ($d = -0.44$, 95% CI −0.68 to −0.20) (see Fig. 2). There was moderate heterogeneity between the studies ($I^2 = 70.1\%$). This heterogeneity was anticipated given temporal, geographic and methodological differences and also justifies the use of a random-effects model.

Subgroup analyses

Thirteen studies were eligible for inclusion in the subgroup analysis investigating the effectiveness of specific interventions. Three studies investigated general (non-trauma-focused) CBT (Chen et al., 2014; De Roos et al., 2011; Pityaratstian et al., 2015) which was no more effective at reducing PTSD symptoms compared to the control conditions($d = -0.09$, 95% CI −0.49 to 0.30). There was low heterogeneity between the studies ($I^2 = 0\%$). Three studies investigated EMDR (De Roos et al., 2011; De Roos et al., 2017; Diehle et al., 2015). Seven studies investigated TF-CBT (Cohen et al., 2011; Diehle et al., 2015; Goldbeck et al., 2016; Jensen et al., 2014; Nixon et al., 2012; Scheeringa et al., 2011; Schottelkorb et al., 2012). Both EMDR and TF-CBT were superior at reducing PTSD symptoms compared with general CBT. EMDR was superior at reducing PTSD symptoms compared with TF-CBT ($d = -0.46$, 95% CI −0.81 to −0.12 *v.* $d = -0.30$, 95% CI −0.58 to −0.02) (see Fig. 3). There was high heterogeneity between the EMDR studies ($I^2 = 85.9\%$) and low heterogeneity between the TF-CBT studies ($I^2 = 10.7\%$).

The subgroup analysis, pertaining to our secondary aim of comparing psychological interventions in children with psychological interventions in adolescents and young adults, included five effect sizes from four studies. One effect size was evaluating interventions in children exclusively (Scheeringa et al., 2011). Four effect sizes were evaluating interventions in adolescents and young adults exclusively (Ertl et al., 2011; Foa et al., 2013; Ford et al., 2012). Pooling the four effect sizes in adolescents and young adults, showed interventions were better than control conditions in reducing PTSD symptoms in adolescents and young adults ($d = -0.30$, 95% CI −0.58 to −0.02) (see online Supplementary materials for forest plot). There was low heterogeneity between the studies included in this meta-analysis ($I^2 = 47.6\%$). The effect size for the only eligible study investigating the effectiveness of psychological interventions in children was $d = -1.18$, 95% CI −2.50 to 0.14.

Sensitivity analyses

Eight effect sizes from five studies with normally distributed data (Barron et al., 2016; Chen et al., 2014; De Roos et al., 2017; Ertl et al., 2011; Pityaratstian et al., 2015) were entered into a sensitivity analysis. The pooled effect size was $d = -0.59$, 95% CI −0.89 to −0.29 indicating a medium effect at reducing PTSD symptoms. There was moderate heterogeneity between these studies ($I^2 =$ 53%) (see online Supplementary materials for forest plot).

A funnel plot was created to visually assess asymmetry and was plotted with negative effect sizes indicating the superiority of the intervention (see online Supplementary materials). There was evidence of asymmetry and evidence of small-study effects. The Egger's test demonstrated some evidence of small study effects (bias = 0.539 95% CI −0.134 to 1.21, $p = 0.109$). This was driven by one outlier (Church et al., 2012). This study had a large effect size ($d = -8.54$) and small sample size ($n = 16$). Once this study was removed there was no longer any evidence of small-study effects (bias = 0.299 95% CI −0.982 to 0.158, $p = 0.627$).

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Table 2. Cochrane Risk of Bias assessment for included studies

Risk of Bias domain	Randomisation process	Deviations from the intended interventions	Missing outcome data	Measurement of the outcome	Selection of the reported result	Overall rating
Study						
Barron et al. (2013)	Some concerns	Low risk	Low risk	Some concerns	Some concerns	**Some concerns**
Barron et al. (2016)	Some concerns	Low risk	Low risk	Some concerns	Some concerns	**Some concerns**
Chen et al. (2014)	Some concerns	Some concerns	High risk	Some concerns	Some concerns	**High risk**
Church et al. (2012)	Low risk	Low risk	Low risk	Low risk	Some concerns	**Some concerns**
Cohen et al. (2011)	Low risk	Low risk	High Risk	Low risk	Some concerns	**High risk**
Dawson et al. (2018)	Low risk	Low risk	Low risk	Low risk	Some concerns	**Some concerns**
De Roos et al. (2011)	Some concerns	Low risk	Low risk	Low risk	Some concerns	**Some concerns**
De Roos et al. (2017)	Low risk	Low risk	Some concerns	Low risk	Some concerns	**Some concerns**
Deblinger et al. (2011)	Low risk	Some concerns	Some concerns	Low risk	Some concerns	**Some concerns**
Diehle et al. (2015)	Low risk	Low risk	Some concerns	Low risk	Some concerns	**Some concerns**
Dorsey et al. (2014)	Low risk	Low risk	High risk	High risk	Some concerns	**High risk**
Ertl et al. (2011)	Low risk	High risk	Some concerns	Low risk	Some concerns	**High risk**
Foa et al. (2013)	Low risk	Low risk	Some concerns	Low risk	Some concerns	**Some concerns**
Ford et al. (2012)	Some concerns	Low risk	Low risk	Some concerns	Some concerns	**Some concerns**
Goldbeck et al. (2016)	Low risk	Low risk	Some concerns	Low risk	Some concerns	**Some concerns**
Jensen et al. (2014)	Low risk	Low risk	Some concerns	Low risk	Some concerns	**Some concerns**
Mannarino et al. (2012)	Low risk	Low risk	High risk	Low risk	Some concerns	**High risk**
Murray et al. (2015)	Low risk	Low risk	Low risk	High risk	Some concerns	**High risk**
Nixon et al. (2012)	Low risk	Low risk	Some concerns	Low risk	Some concerns	**Some concerns**
Nixon et al. (2017).	Low risk	Low risk	Low risk	Low risk	Low risk	**Low risk**
Pfeiffer et al. (2018)	Low risk	Low risk	Low risk	Some concerns	Some concerns	**Some concerns**
Pityaratstian et al. (2015)	Low risk	Low risk	Low risk	Low risk	Some concerns	**Some concerns**
Rosner et al. (2019)	Low risk	Low risk	Low risk	Low risk	High risk	**High risk**
Rossouw et al. (2016)	Low risk	Low risk	Low risk	Low risk	Some concerns	**Some concerns**
Rossouw et al. (2018)	Low risk	High risk	Some concerns	Low risk	Some concerns	**High risk**
Scheeringa et al. (2011)	Low risk	High risk	High risk	High risk	Some concerns	**High risk**
Schottelkorb et al. (2012)	Low risk	Some concerns	High risk	Some concerns	Some concerns	**High risk**

Discussion

Summary of main findings

This systematic review included 27 studies. The psychological intervention investigated most frequently was TF-CBT. Most studies had mixed populations spanning childhood, adolescents and young adulthood, although seven studies investigated the effectiveness of psychological interventions in adolescents and young adults exclusively and three studies investigated the effectiveness of interventions in children exclusively.

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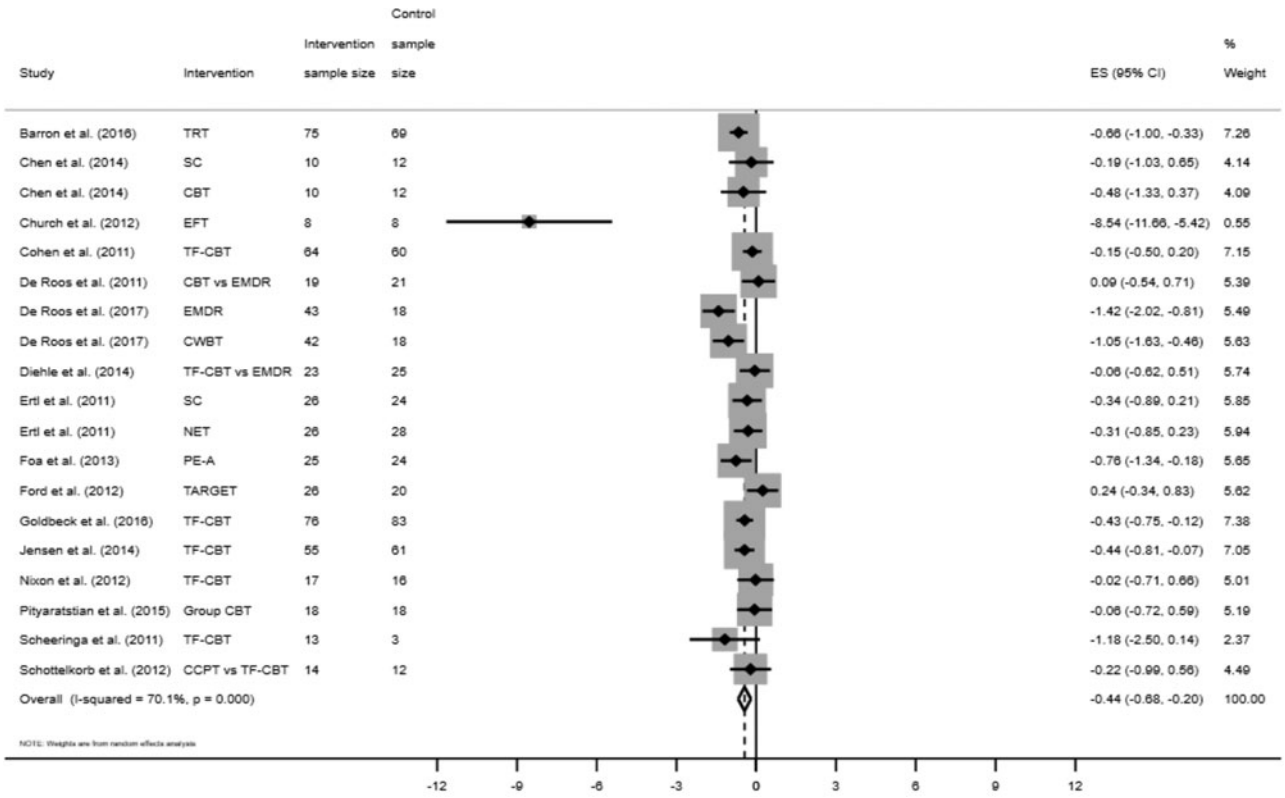

Fig. 2. Forest plot showing Cohen's D effect size for all included studies.

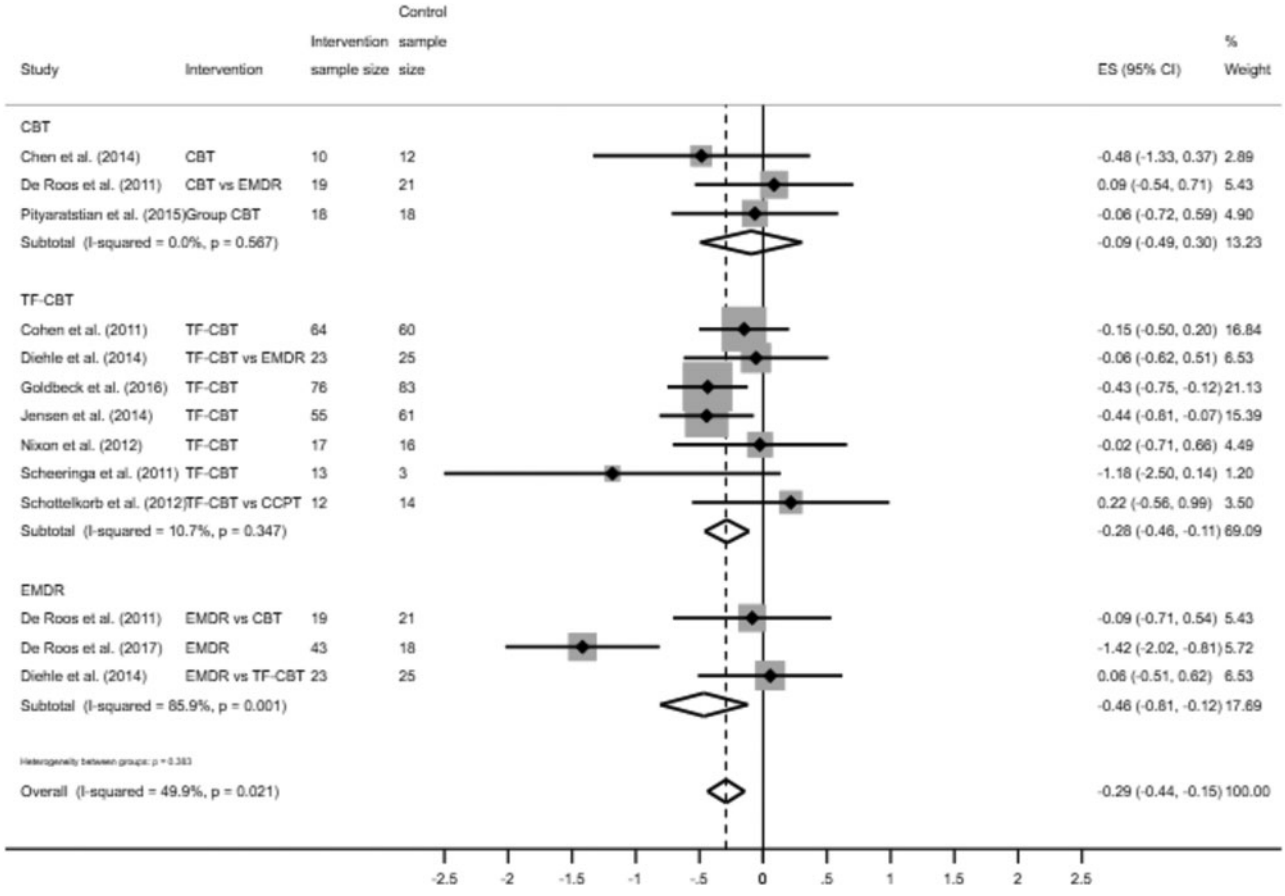

Fig. 3. Forest plot for subgroup analysis showing the individual effect sizes of non-trauma focused CBT, trauma-focused CBT and EMDR.

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The meta-analysis included 16 eligible RCTs. There was a moderate effect of the included interventions at reducing PTSD symptoms in children, adolescents and young adults. TF-CBT and EMDR both had a moderate effect size and were superior to general (non-trauma-focused) CBT at reducing PTSD symptoms in this population. EMDR had the greatest effect at reducing PTSD symptoms. Interventions for adolescents and young adults exclusively had a low effect on PTSD symptoms. In the one study eligible for the meta-analysis investigating psychological interventions for children exclusively, TF-CBT was no more effective than the waiting list control.

Comparison with existing literature

This review showed psychological interventions were superior to controls at reducing PTSD symptoms. Similarly, in Gillies et al. (2012) those receiving psychological therapies had a greater reduction in PTSD symptoms compared with the control interventions (SMD −1.05, 95% CI −1.52 to −0.58, $I^2 = 62$).

This review found EMDR to be most effective at reducing PTSD symptoms although with fewer studies investigating this intervention compared to TF-CBT. A previous meta-analysis looking at the effectiveness of EMDR for PTSD in children found EMDR had a medium effect at reducing PTSD symptoms when this intervention was compared with non-established treatments and no-treatment controls ($d = 0.56$; Rodenburg, Benjamin, De Roos, Meijer, and Stams, 2009). In contrast, in Gillies et al. (2012) there was no difference in reduction in PTSD symptoms between those receiving EMDR and those receiving the control condition in the only study investigating EMDR (SMD −0.61, 95% CI −1.96 to 0.74, $I^2 = 85\%$). This discrepancy may be due to inadequate power to detect differences between intervention groups; the only study in the Gillies et al. (2012) review had 33 participants.

The present review supported the effectiveness of TF-CBT at reducing PTSD symptoms in children, adolescents and young adults. This has also been demonstrated to be effective in a systematic review by Cary and McMillen (2012) looking at the effectiveness of TF-CBT specifically, where TF-CBT was superior at reducing PTSD symptoms in children and youth compared with control conditions ($g = 0.671$).

The sub-group analysis carried out in this systematic review found TF-CBT and EMDR both had a moderate effect at reducing PTSD symptoms, whilst general CBT was no more effective than the control interventions it was compared to. EMDR was the psychological intervention that had the greatest effect at reducing PTSD symptoms in children, adolescents and young adults. Similarly, in adults, trauma-focused psychological treatments including TF-CBT and EMDR have been found to be effective for PTSD in adults (Ehlers et al., 2010). Whereas, interventions not focusing on patients' trauma were less effective at reducing PTSD symptoms in adults or have not been sufficiently studied (Ehlers et al., 2010).

In contrast to the results of this review, in Gillies et al. (2012), general CBT was found to be superior to control conditions at reducing PTSD symptoms (SMD −1.34, 95% CI −1.79 to −0.89). General CBT was also found to have a greater likelihood of recovery compared to EMDR in a systematic review looking at the effectiveness of PTSD interventions in adults (RR = 0.35, 95% CI 0.16–0.79, $p = 0.01$). Furthermore, the systematic review found trauma-focused CBT to be more effective than EMDR at reducing PTSD symptoms unlike previous meta-analyses (Gutermann et al., 2016; Mavranezouli et al., 2020).

In the current systematic review, we found limited support for NET which is an established therapy for PTSD in adults (Mendes, Mello, Ventura, Passarela, & Mari, 2008).

The quality of studies in this review is similar to the quality of included studies in the Gillies et al. (2012) systematic review where 59% of the included studies were rated as having some concerns for Risk of Bias.

Interpretation of findings

This review found a strong evidence base for the effectiveness of TF-CBT and some support for the effectiveness of EMDR, which provides further evidence and justification for the National Institute for Health and Care Excellence (NICE) guideline suggesting TF-CBT should be offered as the first line of treatment to children and adolescents who present with PTSD symptoms, with EMDR being offered if there is non-response. (NICE, 2018). The results of the subgroup analysis suggest that general (non-trauma-focused) CBT is no more effective at reducing PTSD symptoms than the interventions it was compared to. Previously, when comparing general CBT to non-active controls it was found to be effective for PTSD in children, adolescents and young adults. It may be that as CBT has previously been demonstrated to be effective at reducing PTSD symptoms compared to non-active controls, more recent studies included in this review have compared CBT to other active treatments, which may explain its lack of superiority to control conditions.

One included study provides evidence that group-based CBT is potentially effective at reducing PTSD symptoms in children, adolescents and young adults. In services with long waiting-lists or financial burden, group interventions may be time and cost-effective as several patients can be treated with a small number of therapists (Gauthier, Dalziel, & Gauthier, 1987). This could be considered superior to patients remaining on waiting lists for individual treatment, but warrants further investigation, as group treatments for PTSD have not previously been recommended in NICE guidance.

The lack of clear evidence supporting the effectiveness of NET in children, adolescents and young adults suggests that for some interventions simply using established protocols for adults may not be sufficient for PTSD symptom reduction. In some studies, investigating PE therapy there were adaptations made for children and adolescents (Foa et al., 2008). The individual studies found greater PTSD symptom reduction in PE conditions compared to control conditions (Foa et al., 2013; Rossouw et al., 2016, 2018). It may be the case that adaptations, such as allowing flexibility for the counsellor to spend more time on modules depending on the adolescent's developmental level and attention span, helped improve the effectiveness of the psychological interventions.

However, it may also be the case that small sample sizes made it difficult to detect small differences between intervention groups in some studies. More and larger individual RCTs are needed to assess the effectiveness of non-TF-CBT interventions for PTSD in children, adolescents and young adults such as NET as we found mixed results regarding its effectiveness from the included studies. Whilst this intervention may be effective in this population, as it is in adults, more research is needed with larger sample sizes in order to detect small differences between intervention groups, before its introduction to the clinic. In addition, a mega-analysis could be conducted which involves aggregating individual-participant data from multiple studies and analysing this data

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jointly (Boedhoe et al., 2018). This overcomes some limitations of traditional meta-analysis research including low statistical power to detect effects (Boedhoe et al., 2018).

There needs to be more research assessing the effectiveness of interventions in children, defined as aged 12 and under only. In the one study which met our criteria for inclusion in the subgroup analysis: where all participants were children between 3 and 12, they defined their population as pre-school children. The majority of the included studies in this review included participants spanning childhood and adolescence. The effect of an intervention may be generalised across the whole sample in mixed population studies, when it may be more effective at particular developmental stages. This meant it was difficult to achieve the second aim of this review and to evaluate the efficacy of psychological interventions in children compared to adolescents and young adults. This research is necessary especially as PTSD manifests differently in children compared with adults (DSM-5, APA, 2013) and therefore by inference between children and young adults. PTSD symptoms may also manifest differently in pre-school children, as used in the study by Scheeringa et al. and children more generally.

In addition, further research investigating the effectiveness of psychological interventions at improving PTSD symptoms in children, adolescents and young adults could look at the young person in the broader context they are involved such as family systems and the school environment. Research has previously shown that including caregivers improves the effectiveness of psychological interventions in children and adolescents (Nevo & Manassis, 2011). It may be the case that including school networks during psychological interventions also has a beneficial impact on PTSD symptoms.

Strengths and limitations

This is the most up-to-date, comprehensive and largest systematic review and meta-analysis of psychological interventions for PTSD in children, adolescents and young adults carried out to date. Furthermore, PRISMA guidelines were followed throughout and a completed PRISMA checklist can be viewed in online Supplementary materials. These guidelines ensure clarity, transparency and key information is properly reported (Liberati et al., 2009) making the review, which provides up to date evidence, useful for both policy and clinical practice. Lastly, the sensitivity analysis also demonstrated a moderate effect of the interventions on PTSD symptoms. A sensitivity analysis, with similar results to the primary analysis, demonstrates the findings from this meta-analysis are not dependent on arbitrary decisions and indicates robust findings (Deeks, Higgins, & Altman, 2019).

This study should also be considered in light of its weaknesses. First, the inclusion criteria were limited to studies in English as it was not feasible to translate non-English studies. This could theoretically lead to an inflation of effect sizes due to negative results being more likely to be published in languages other than English (Grégoire, Derderian, & Le Lorier, 1995). However, research examining this language bias has conflicting results and there are suggestions that the effect of studies published in the non-English language in a meta-analysis may be minimal (Deeks et al., 2019). Furthermore, the funnel plot and Egger's test indicated no evidence of small study effects after removal of a single outlier.

A further limitation is that not all included studies had participants with diagnosed PTSD; some had participants with subthreshold PTSD symptoms. This may reduce the external validity of this research as findings regarding the effectiveness of these interventions may not be applicable to clinical PTSD populations. However, it has been suggested subthreshold PTSD symptoms are often clinically significant and do require treatment (McLaughlin et al., 2015).

Third, the evidence base is still limited particularly for non-CBT interventions. A small number of studies ($n = 14$) investigated such interventions creating uncertainty regarding the precision with which their efficacy could be estimated. Furthermore, some studies had a small sample size which reduces the power to detect differences in PTSD symptoms between the groups following interventions (Donner, 1984). Therefore, it is possible there were differences in PTSD symptoms between groups but due to inadequate power, these differences were missed. Nevertheless, this is still the largest systematic review and meta-analysis to date looking at the effectiveness of psychological interventions in children, adolescents and young adults. Therefore, this review had more statistical power to detect differences between intervention groups than other reviews carried out previously.

Conclusion

The primary aim of this review: to evaluate the efficacy of psychological interventions for PTSD in children, adolescents and young adults and determine if any intervention is superior, was met. Though hampered by a relatively small number of included studies and small sample sizes, this systematic review and meta-analysis provide evidence for the effectiveness of a range of psychological interventions for reducing PTSD symptoms in children, adolescents and young adults particularly TF-CBT and EMDR.

A secondary aim was to evaluate the efficacy of psychological interventions in children compared with psychological interventions in adolescents and young adults. As limited studies were assessing the effectiveness of psychological interventions in children, we were unable to meet this aim. This review did demonstrate that established treatments for adults should not be assumed to be effective in children, adolescents and young adults such as NET with no adaptions to the study protocol specifically targeted towards children. Furthermore, interventions that are not currently recommended for PTSD in adults such as group CBT might be effective in children, adolescents and young adults, however, only a small number of individual studies looked at these interventions so conclusions should be drawn in light of this.

Overall, the present review suggests that current NICE guidelines are appropriate (NICE, 2018), that interventions not currently recommended for use in children, adolescents and young adults might be suitable for this age group, and that there is a clear need for further research into the effectiveness of psychological treatments for PTSD in this age group.

Supplementary material. The supplementary material for this article can be found at https://doi.org/10.1017/S0033291720002007.

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