The effectiveness of psychological interventions for post-traumatic stress disorder in children, adolescents and young adults: A Systematic Review and Meta-Analysis

Rayanne John-Baptiste Bastien¹, Hannah E. Jongsma¹, Melissa Kabadayi¹, Jo Billings¹

¹Division of Psychiatry, UCL, London, England

Word Count: 4595
Abstract

Background

Children and adolescents display different symptoms of posttraumatic 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 a previous review 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 was 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.

**Main manuscript (4572 words)**

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 cognitions, 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 reenactment 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, Chrestman, & Gilboa-Schechtman, 2008; Nevo & Manassiss, 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 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 publication of the previous review, other studies have been carried out examining the effectiveness of psychological 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 (Guttermann 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 (Mavranzouli et al., 2019).

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 there is a superiority of any intervention. 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 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 17th July 2019 and included free-text and Medical Subject Headings (MeSH) terms and was adapted for each database (see 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 reduction of PTSD symptoms on a validated scale. We included randomised control trials as well as cluster randomised control trials, 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 (Carlier & Gersons, 1995; 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 didn’t 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 one 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 standardized spreadsheet (see supplementary materials). Quality of yield was assessed using Cochrane Risk of bias tool. 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 3 or more studies were available, grouping studies by 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 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 same treatment on adolescents and young adults (participants between age 13 and 25) (Curtis, 2015; Jawroska & MacQueen, 2015).

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 Figure 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 2,187 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, Abdallah, & Smith, 2013; Barron, Abdalla, & Heltne, 2016; 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 reported traumas were thinking 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, 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 thirteen 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 Densitisation 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 supplementary materials.

Quality of Included Studies

As indicated in Table 2, one study was rated as Low risk of bias (4%), sixteen studies were rated as having some concerns (59%) and ten studies were rated as having high risk of bias (37%). All studies used valid and reliable outcome measures, however, only nineteen 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 risk of bias in measurement of the outcome. One study (4%) had risk of bias in selection of the reported result (full results in Table 2).

Meta-analysis

The meta-analysis included sixteen studies (59%) (Barron et al., 2016; Chen et al., 2014; Church et al., 2012; Cohen et al., 2011; De Roos et al., 2011; De Roos et al., 2017; Diehle, Opmeer, Boer, Mannarino, & Lindauer, 2014; 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 eleven studies (39%) insufficient data was 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 et al., 2017; Pfeiffer et al., 2018; Rosner et al., 2019; Roussouw et al., 2016; Rossouw, Yadin, Alexander, & Seedat, 2018).

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

Pooling nineteen effect sizes from sixteen studies showed psychological interventions were better than control conditions at reducing PTSD symptoms [d= -0.44, 95% CI (-0.68 to -0.20)] (see Figure 2). There was moderate heterogeneity between the studies (I²=70.1%). This heterogeneity was anticipated given temporal, geographic and methodological differences and also justifies the use of a random effects model.

Subgroup analyses

Ten 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 (I²=0%). Three studies investigated EMDR (De Roos et al., 2011; De Roos et al., 2017; Diehle et al., 2014). Seven studies investigated TF-CBT (Cohen et al., 2011; Diehle et
al., 2014; 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 was superior at reducing PTSD symptoms compared with general CBT. EMDR was superior at reducing PTSD symptoms compared with TF-CBT \[d = -0.46, 95\% \text{ CI } (-0.81 \text{ to } -0.12) \text{ vs } d = -0.30, 95\% \text{ CI } (-0.58 \text{ to } -0.02)\] (see Figure 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 4 effect sizes in adolescents and young adults, showed interventions were better than control conditions in reducing PTSD symptoms in adolescents and young adults \[d = -0.30, 95\% \text{ CI } (-0.58 \text{ to } -0.02)\] (see 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 a psychological intervention in children was \(d = -1.18, 95\% \text{ CI } (-2.50 \text{ to } 0.14)\).

*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 \(d = -0.59, 95\% \text{ CI } (-0.89 \text{ to } -0.29)\) indicating a medium effect at reducing PTSD symptoms. There was
moderate heterogeneity between these studies ($I^2=53\%$) (see supplementary materials for forest plot).

A funnel plot was created to visually assess asymmetry and was plotted with negative effect sizes indicating superiority of the intervention (see supplementary materials). There was evidence of asymmetry and evidence of small study effects. The Egger’s test demonstrated some evidence of small study effects [$\text{bias}= 0.539 \ 95\% \ CI= -0.134 \text{ to } 1.21], \ p=0.109$. 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 a small study effects [$\text{bias}= 0.299 \ 95\% \ CI= -0.982 \text{ to } 0.158], \ p=0.627$.

**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 7 studies investigated the effectiveness of a psychological intervention in adolescents and young adults exclusively and 3 studies investigated the effectiveness of interventions in children exclusively.

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, I²=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, Bejamin, De Roos, Meijer, & 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, I²=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 also 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 Gilles 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 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 to 0.79, p=0.01). Furthermore, this systematic review found Trauma-Focused CBT to be more effective than EMDR at reducing PTSD symptoms unlike previous meta-analyses (Guttermann et al., 2016; Mavranezouli et al., 2019).

In this systematic review we found limited support for Narrative Exposure Therapy 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 Gilles 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 a first line of treatment to children and adolescents who present with PTSD symptoms, with EMDR being offered if there is non-
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 (Gauthie, 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 Narrative Exposure therapy 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 Prolonged Exposure therapy there were adaptations made for children and adolescents (Foa et al., 2008). The individual studies found greater PTSD symptom reduction in Prolonged Exposure conditions compared to control conditions (Foa et al., 2013; Rossouw et al., 2016; Rossouw et al., 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, were helpful in improving 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 Prolonged Exposure therapy and Narrative Exposure Therapy as we found mixed results regarding their 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 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 in 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 & Manassiss, 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 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 (Higgins & Green, 2011).

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 inflation of effect sizes due to negative results being more likely to be published in languages other than English (Grégoire et al.,1995). However, research examining this language bias has conflicting results and there are
suggestions the effect of studies published in non-English language in a meta-analysis may be minimal (Higgins & Green, 2011). 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 there is superiority of any intervention, was met. Though hampered by a relatively small
number of included studies and small sample sizes, this systematic review and meta-analysis provides 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 there were limited studies assessing the effectiveness of psychological interventions in children we were unable to meet this aim. This review did demonstrate established treatments for adults should not be assumed to be effective in children, adolescents and young adults such as Narrative Exposure Therapy with no adaptations 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, 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.
References

*European Journal of General Practice, 20* (1), 61-64.


Doi: 10.3402/ejpt.v2i0.5694


Randomized Clinical Trial. *Journal of the American Medical Association, 310* (24), 2650-2657.


