Clinical Psychology Review xxx (2015) xxx–xxx

Contents lists available at ScienceDirect

Clinical Psychology Review

Psychological treatments for adults with posttraumatic stress disorder: A systematic review and meta-analysis☆,☆☆

Karen Cusack [a,*], Daniel E. Jonas [b,c], Catherine A. Forneris [d], Candi Wines [c], Jeffrey Sonis [e,f], Jennifer Cook Middleton [c], Cynthia Feltner [b,c], Kimberly A. Brownley [d], Kristine Rae Olmsted [g], Amy Greenblatt [g], Amy Weil [b], Bradley N. Gaynes [c,d]

[a] Raymond G. Murphy VA Medical Center, Albuquerque, NM, United States
[b] University of North Carolina (UNC) Department of Medicine, Chapel Hill, NC, United States
[c] UNC, Cecil G. Sheps Center for Health Services Research, Chapel Hill, NC, United States
[d] UNC Department of Psychiatry, Chapel Hill, NC, United States
[e] UNC Department of Social Medicine, Chapel Hill, NC, United States
[f] UNC Department of Family Medicine, Chapel Hill, NC, United States
[g] Triangle Institute (RTI) International, Research Triangle Park, NC, United States

HIGHLIGHTS

- We conducted a meta-analysis of psychological treatments for adults with PTSD.
- We examined efficacy, comparative effectiveness, and harms.
- Several therapies demonstrated efficacy, with strongest support for exposure.
- Evidence was insufficient to determine comparative effectiveness.
- Information on adverse events was generally not reported.

ARTICLE INFO

Article history:
Received 28 February 2015
Received in revised form 28 October 2015
Accepted 29 October 2015
Available online xxxx

Keywords:
PTSD
Psychotherapy
Meta-analysis

ABSTRACT

Numerous guidelines have been developed over the past decade regarding treatments for Posttraumatic stress disorder (PTSD). However, given differences in guideline recommendations, some uncertainty exists regarding the selection of effective PTSD therapies. The current manuscript assessed the efficacy, comparative effectiveness, and adverse effects of psychological treatments for adults with PTSD. We searched MEDLINE, Cochrane Library, PILOTS, Embase, CINAHL, PsycINFO, and the Web of Science. Two reviewers independently selected trials. Two reviewers assessed risk of bias and graded strength of evidence (SOE). We included 64 trials; patients generally had severe PTSD. Evidence supports efficacy of exposure therapy (high SOE) including the manualized version Prolonged Exposure (PE); cognitive therapy (CT), cognitive processing therapy (CPT), cognitive behavioral therapy (CBT)-mixed therapies (moderate SOE); eye movement desensitization and reprocessing (EMDR) and narrative exposure therapy (low–moderate SOE). Effect sizes for reducing PTSD symptoms were large (e.g., Cohen's d ~− 1.0 or more compared with controls). Numbers needed to treat (NNTs) were <4 to achieve loss of PTSD diagnosis for exposure therapy, CPT, CT, CBT-mixed, and EMDR. Several psychological treatments are effective for adults with PTSD. Head-to-head evidence was insufficient to determine these treatments' comparative effectiveness, and data regarding adverse events was absent from most studies.

Published by Elsevier Ltd.

☆ Funding/Support: Some of the work for this review was supported by an American Recovery and Reinvestment Act (ARRA) contract from the Agency for Healthcare Research and Quality (AHRQ), Contract No. 290 2007 10056 I.

☆☆ Role of the sponsor: This review was funded in part by AHRQ. Staff at AHRQ participated in development of the scope of work and reviewed draft manuscripts. Copyright assertion from AHRQ was required before the manuscript could be submitted for publication, but the authors are solely responsible for the content and the decision to submit it for publication.

* Corresponding author at: Raymond G. Murphy VA Medical Center, 1501 San Pedro Dr. SE (116), Albuquerque, NM 87108, United States.
E-mail address: Karen.cusack@va.gov (K. Cusack).

http://dx.doi.org/10.1016/j.cpr.2015.10.003
0272-7358/Published by Elsevier Ltd.

Contents

1. Introduction

Posttraumatic stress disorder (PTSD) is an anxiety disorder that may develop following exposure to a traumatic event. The diagnosis of PTSD has undergone a number of changes since initial inclusion in the Diagnostic and Statistical Manual of Mental Disorders (DSM-III) (American Psychiatric Association, 2015). Some of the changes center on the definition of what constitutes a traumatic event. In DSM-III, PTSD was diagnosed following a "catastrophic stressor that was outside the range of usual human experience." However, given the prevalence of many types of trauma, distinguishing between ordinary and extraordinary events can be challenging. With DSM-IV, the focus turned to the individual's peri-traumatic reaction of experiencing intense fear, helplessness or horror to define the stressor as traumatic. (American Psychiatric Association, 2000). However, many individuals fail to endorse this reaction at the time of the event. The most recent iteration of PTSD in the DSM-5 removes this criteria and instead identifies the types of events capable of producing PTSD (e.g., combat, death, threatened death, serious injury, sexual violence), which are either directly experienced, witnessed, experienced by a close family member or friend, or experienced through repeated or extreme exposure to aversive details of the traumatic event. The DSM-5 categorizes PTSD symptoms as: re-experiencing, avoidance, negative alterations in mood and cognition, and alterations in arousal and reactivity. (American Psychiatric Association, 2015). The addition of "persistent and exaggerated negative beliefs about oneself, others or the world;" and "persistent, distorted cognitions about the cause or consequences of the event(s)" are new in DSM-5 and reflect contemporary cognitive-behavioral theory and research on the after-effects of trauma (Cox, Resnick, & Kilpatrick, 2014).

PTSD develops in up to a third of individuals who are exposed to extreme stressors, and symptoms almost always emerge within days of the exposure (Committee on Treatment of Posttraumatic Stress Disorder, & Institute of Medicine, 2008). Shortly after exposure, many people experience some symptoms of PTSD. In most people, those symptoms resolve within several weeks. However, in approximately 10 to 20%, PTSD symptoms persist and are associated with impairment in functioning (Norris & Sloane, 2007). Although approximately 50% of those diagnosed with PTSD improve without treatment in 1 year, 10 to 20% develop a chronic unremitting course (Fletcher, Creamer, & Forbes, 2010). In 2000, the estimated lifetime prevalence of PTSD among adults in the United States was 6.8% and current (12-month) prevalence was 3.6% (Dohrenwend et al., 2006).

Many people with PTSD never receive treatment. For example, less than half of individuals who screened positive for PTSD after serving with the US military in Iraq or Afghanistan were referred for further evaluation or treatment, and of these, only 65% received care (Committee on the Assessment of Ongoing Effects in the Treatment of Posttraumatic Stress Disorder, I. o. M., 2012). Some possible reasons for never receiving treatment include stigma, access barriers, and uncertainty about which treatments are available and effective (Kuehn, 2012).

Treatments available for PTSD span a variety of psychological and pharmacological categories.

Among the psychological therapies are trauma-focused psychological interventions that treat PTSD by directly addressing thoughts, feelings, or memories of the traumatic event (e.g., exposure therapy, cognitive therapy); and non-trauma-focused psychological interventions, which aim to help the individual's experience of PTSD symptoms but do not directly target thoughts and feelings related to the trauma (e.g., relaxation, Stress Inoculation Training, and interpersonal therapy).

Numerous organizations have produced guidelines for the treatment of patients with PTSD, including the American Psychiatric Association (APA), the U.S. Department of Veterans Affairs (VA)/Department of Defense (DoD), the United Kingdom's National Institute for Health and Clinical Excellence (NICE), ISTSS, the Institute of Medicine (IOM), the American Academy of Child and Adolescent Psychiatry (AACAP), and the Australian National Health and Medical Research Council (NHMRC). Table 1 summarizes the previous guidelines. In addition to employing a wide range of methodologies, the various guidelines differ in the level of rigor of studies included in their review. For instance, some were based on expert review of the literature (VA/DoD, APA, and ISTSS). Other guidelines were based on meta-analysis of RCTs but

Please cite this article as: Cusack, K., et al., Psychological treatments for adults with posttraumatic stress disorder: A systematic review and meta-analysis, *Clinical Psychology Review* (2015), http://dx.doi.org/10.1016/j.cpr.2015.10.003

Table 1
Clinical Practice Guidelines for PTSD.

Clinical Practice Guideline	Methodology	Criteria for level I rating	Level I therapies	Criteria for Level II rating	Level II therapies
VA/DoD Clinical Practice Guideline Working Group (2004)	Expert review; RCTs, lower levels if no RCT available	At least 1 well-conducted RCT demonstrating efficacy	CT, Exp, SIT, EMDR	Well-designed controlled trial without randomization	IRT, Psychodynamic therapy
American Psychiatric Association (2004)	Expert review; RCTs, lower levels if no RCT available	Randomized, double-blinded clinical trial	TF-CBT	RCT not double-blinded	EMDR, SIT, IRT
National Institute for Health and Clinical Excellence (2005)	Meta-analysis; RCTs	Medium effect size or better from at least 1 RCT	TF-CBT, EMDR	Evidence from at least 1 well-designed study (non-RCT)	N/A
Australian National Health and Medical Research Council (NHMRC) Guidelines, and Australian Centre for Posttraumatic Mental Health (2007)	Meta-analysis; RCTs	Medium effect size or better from at least 1 RCT	TF-CBT, EMDR with in vivo	Evidence from at least 1 well-designed study (non-RCT)	Stress Management
ISTSS (Foa et al., 2008)	Expert review; All levels of studies	Well controlled RCTs	Exp, CPT, CT, SIT, EMDR	Well-designed clinical studies w/o randomization or control condition	Psychodynamic therapy
Institute of Medicine (2007)	Independent review; rigorous criteria for RCTs	More than 1 study indicating clinically meaningful effect; high confidence in presence and magnitude of effect	Exp (includes CPT studies)	Controlled trial w/o randomization	N/A

CT = Cognitive therapy; EXP = exposure therapy; SIT = stress inoculation therapy; EMDR = eye movement desensitization and reprocessing; TF-CBT = trauma focused CBT; CPT = cognitive processing therapy; IRT = imagery rehearsal therapy; RCT = randomized control trial.

did not have strict criteria for study inclusion (NICE, NHMRC). Finally, the IOM report had strict inclusion criteria based on randomized controlled trials, adequate sample sizes, minimal level of dropout, blinding of assessors, and adequate methods used to handle missing data. Each of the guidelines identified therapies that warranted a highest level of recommendation (Level I), followed by a second-level recommendation (Level II). The guidelines used different criteria for determining what merited a Level I recommendation, ranging from having at least one RCT (e.g., VA/DoD) to having at least one RCT meeting all of the strict criteria as outlined above (e.g., IOM). All of the existing guidelines agree that trauma-focused psychological interventions including exposure therapy and cognitive therapy are effective, empirically supported first-line treatments for PTSD. (American Psychiatric Association, 2004; Foa, Keane, Friedman, & Cohen, 2008; Forbes et al., 2010; National Institute for Health and Clinical Excellence, 2005; VA/DoD Clinical Practice Guideline Working Group, 2004). In addition, four of the six guidelines (VA/DoD, NICE, NHMRC, and ISTSS) agree that EMDR is a first-line treatment for PTSD, and two of the guidelines agree that Stress Inoculation Therapy is a first-line treatment for PTSD. The IOM report concluded that only exposure therapy was efficacious and recommended as a first line treatment (Committee on Treatment of Posttraumatic Stress Disorder, & Institute of Medicine, 2008).

Most guidelines identify trauma-focused psychological treatments over pharmacological treatments as a preferred first step and view medications as an adjunct or a next line treatment (American Psychiatric Association, 2004; Australian National Health and Medical Research Council (NHMRC) Guidelines, & Australian Centre for Posttraumatic Mental Health, 2007; National Institute for Health and Clinical Excellence, 2005; VA/DoD Clinical Practice Guideline Working Group, 2004. Most recognize at least some benefit of pharmacologic treatment for PTSD, with the exception of one from the IOM. The IOM report found insufficient evidence to recommend any medication owing to poor study design or inconsistent results. Some guidelines acknowledge that practical considerations, such as unavailability of trauma-focused psychological treatment or patient preferences, may guide treatment decisions (Foa et al., 2008).

As a result of differences in methodologies and categorization of therapies, the available guidelines leave important questions unanswered. One important question is the relative magnitude of effect for exposure therapy and cognitive therapies separately, as previous reviews analyzed them together. Another question concerns the degree to which EMDR is beneficial, as all guidelines except for the more rigorous IOM report gave EMDR a primary or secondary level of recommendation. Further, these guidelines were developed between 7 and 11 years ago, and new trials have since been published that can add to the evidence base. Finally, the current manuscript attempted to address the potential adverse effects of treatments for PTSD, which had not been addressed in previous reviews.

In this article, we updated our prior meta-analyses of psychological treatments for PTSD that were conducted for the Effective Health Care Program of the Agency for Healthcare Research and Quality (AHRQ) (Jonas et al., 2013). The prior meta-analyses were part of a larger technical report on the efficacy, comparative effectiveness, and adverse effects of psychological and pharmacological treatments for adults with PTSD.

2. Methods

We developed and followed a standard protocol. Our previous technical report that further details methods and includes search strategies and additional evidence tables is available at: http://effectivehealthcare.ahrq.gov/ehc/products/347/1435/PTSD-adult-treatment-report-130403.pdf. The technical report addressed six questions (Table S1) (Jonas et al., 2013).

2.1. Data sources and searches

We searched MEDLINE, the Cochrane Library, the PILOTS database, CINAHL, PsycINFO, EMBASE, Web of Science, and International Pharmaceutical Abstracts for English-language articles from January 1, 1980, to May 24, 2012, for the technical report. The current article was updated to include studies published through May 20, 2014. The start date was selected based on the introduction of PTSD as a clinical entity, previous reviews, and expert opinion. We used Medical Subject Headings as search terms when available and key words when appropriate, focusing on terms to describe relevant populations and treatments. We manually searched reference lists of reviews and included trials to look for citations that our searches missed. We searched for unpublished studies using ClinicalTrials.gov, the Web site for the Food and Drug Administration, and the World Health Organization's International Clinical Trials Registry Platform.

2.2. Study selection

We developed inclusion and exclusion criteria with respect to populations, interventions, comparators, outcomes, timing, settings, and study designs. We included randomized controlled trials of at least 4 weeks in duration enrolling adults with PTSD based on DSM criteria

Please cite this article as: Cusack, K., et al., Psychological treatments for adults with posttraumatic stress disorder: A systematic review and meta-analysis, *Clinical Psychology Review* (2015), http://dx.doi.org/10.1016/j.cpr.2015.10.003

(up through DSM-IV) that evaluated an eligible psychological intervention compared with waitlist, usual care, no intervention, placebo, or another psychological or pharmacological intervention. We included trials where the follow-up period was at least 4 weeks post-treatment in order to capture change in PTSD symptoms.

The following psychological treatments were eligible: brief eclectic psychotherapy; cognitive behavioral therapies (CBT) such as cognitive therapy (CT), including cognitive processing therapy (CPT), cognitive restructuring (CR), coping skills therapy (including stress inoculation therapy), and exposure therapy, including prolonged exposure; eye movement desensitization and reprocessing (EMDR); hypnotherapy; interpersonal therapy; psychodynamic therapy; and narrative exposure therapy (NET). These therapies are designed to minimize the intrusion, avoidance, and hyperarousal symptoms of PTSD by some combination of re-experiencing and working through trauma-related memories and emotions and teaching better methods of managing trauma-related stressors (Committee on Treatment of Posttraumatic Stress Disorder, & Institute of Medicine, 2008).

Brief eclectic psychotherapy is a 16-session manualized treatment for PTSD that combines cognitive-behavioral and psychodynamic approaches (Gersons, Carlier, Lamberts, & van der Kolk, 2000; Gersons, Carlier, & Olff, 2004). It consists of (1) psychoeducation, together with a partner or close friend; (2) imaginal exposure preceded by relaxation exercises, focused on catharsis of emotions of grief and helplessness; (3) writing tasks to express aggressive feelings and the use of mementos; (4) domain of meaning, focused on learning from the trauma; and (5) a farewell ritual, to end treatment. It was originally developed as a treatment for police officers, but it has also been used with other trauma samples.

CBT is a broad category of therapies based on principles of learning and conditioning and/or cognitive theory to treat disorders and includes components from both behavioral and cognitive therapy. In CBT, components such as exposure, cognitive restructuring, and various coping skills have been used either alone or in combination. Most forms of CBT consist of a minimum of 8 to 12 weekly sessions lasting 60 to 90 min. CBT can be administered either as group or individual therapy (Committee on Treatment of Posttraumatic Stress Disorder,, & Institute of Medicine, 2008; Foa et al., 2008; Friedman, 2003; Harvey, Bryant, & Tarrier, 2003). It has both specific and nonspecific (i.e., more general or *mixed*) types; three specific types are described below.

Cognitive therapy is used to describe interventions that are largely based on the cognitive model, which states that an individual's perception of a situation influences his or her emotional response to it. The general goal of cognitive therapy is to help people identify distorted thinking and to modify existing beliefs, so that they are better able to cope and change problematic behaviors. Cognitive therapy is generally considered to be brief, goal oriented, and time limited. Variants of cognitive therapy have been developed. Among these are cognitive restructuring and CPT.

Cognitive processing therapy includes psychoeducation, written accounts about the traumatic event, and cognitive restructuring addressing the beliefs about the event's meaning and the implications of the trauma for one's life (Resick & Schnicke, 1993). The treatment is based on the idea that negative emotional reactions can interfere with emotional and cognitive processing of the trauma memory, which can lead to traumatic symptomatology. The manualized treatment is generally delivered over 12 sessions lasting 60 to 90 min (Resick & Schnicke, 1993). (A manualized treatment is based on a guidebook that defines the specific procedures and tactics used to implement the treatment; the use of a manual facilitates standardization of a therapy across settings and therapists.)

Cognitive restructuring is based on the theory that the interpretation of the event, rather than the event itself, determines an individual's emotional reactions. It aims to facilitate relearning thoughts and beliefs generated from a traumatic event, to increase awareness of dysfunctional trauma-related thoughts, and to correct or replace those thoughts with more adaptive and rational cognitions. Cognitive restructuring generally takes place over 8 to 12 sessions of 60 to 90 min (Committee on Treatment of Posttraumatic Stress Disorder, & Institute of Medicine, 2008; Foa et al., 2008).

Coping skills therapies may include components such as stress inoculation training, assertiveness training, biofeedback (including brainwave neurofeedback), or relaxation training. These therapies may use techniques such as education, muscle relaxation training, breathing retraining, role playing, or similar interventions to manage anxiety or correct misunderstandings that developed at the time of trauma. The therapy is designed to increase coping skills for current situations and intentionally does not target trauma-related memories or cognitions. Most types of coping skills therapies require at least eight sessions of 60 to 90 min; more comprehensive interventions such as stress inoculation training require 10 to 14 sessions (Committee on Treatment of Posttraumatic Stress Disorder, & Institute of Medicine, 2008; Foa et al., 2008). Of note, this category includes a range of active psychotherapeutic treatments (e.g., stress inoculation training) and some comparison treatments that are generally intended as a control group (e.g., relaxation). Consequently, in this report we do not attempt to determine any overall effect for this category (as one would not have sufficient clinical relevance); rather we determine results separately for the various therapies we have included in this category. In addition, not all of these coping skills are CBT—for example, a CBT protocol might include relaxation training, but relaxation is not exclusively CBT.

Exposure-based therapy is based on the emotional processing theory of PTSD and involves confrontation with distressing stimuli related to the trauma and is continued until anxiety is reduced (Foa et al., 2008). Imaginal exposure uses mental imagery from memory or introduced in scenes presented to the patient by the therapist. In some cases, exposure is to the actual scene or similar events in life: in vivo exposure involves confronting real life situations that provoke anxiety and are avoided because of their association with the traumatic event (e.g., avoidance of tall buildings following experiencing an earthquake). The aim is to extinguish the conditioned emotional response to traumatic stimuli. By learning that nothing "bad" will happen during a traumatic event, the patient experiences less anxiety when confronted by stimuli related to the trauma and reduces or eliminates avoidance of feared situations. Exposure therapy is typically conducted for 8 to 12 weekly or biweekly sessions lasting 60 to 90 min (Committee on Treatment of Posttraumatic Stress Disorder, & Institute of Medicine, 2008; Foa et al., 2008; Wood et al., 2009). Prolonged exposure is a manualized intervention including both imaginal and in vivo exposure components (Foa et al., 2005).

In this report, we include a category for CBT-mixed therapies for studies of interventions that use components of CBT, but that don't quite fit cleanly into one of the other categories. The interventions in this category are somewhat heterogeneous in several ways, including how the authors defined and described "cognitive behavioral therapy." Elements of CBT-mixed interventions may include psychoeducation, self-monitoring, stress management, relaxation training, skills training, exposure (imaginal, in vivo, or both), cognitive restructuring, guided imagery, mindfulness training, breathing retraining, crisis/safety planning, and relapse prevention. The studies varied as to how many sessions (if any) were dedicated to these elements and whether homework was assigned as part of the intervention.

In EMDR the patient is asked to hold the distressing image in mind, along with the associated negative cognition and bodily sensations, while engaging in saccadic eye movements. After approximately 20 s, the therapist asks the patient to "blank it out," take a deep breath, and note any changes occurring in the image, sensations, thoughts, or emotions. The process is repeated until desensitization has occurred (i.e., patient reports little or no distress on the Subjective Units of Distress Scale), at which time the patient is asked to hold in mind a previously identified positive cognition, while engaging in saccadic eye movements, and rating the validity of this cognition while going

Please cite this article as: Cusack, K., et al., Psychological treatments for adults with posttraumatic stress disorder: A systematic review and meta-analysis, *Clinical Psychology Review* (2015), http://dx.doi.org/10.1016/j.cpr.2015.10.003

through the procedure as outlined above. The saccadic eye movements were initially theorized to both interfere with working memory and elicit an orienting response, which lowers emotional arousal so that the trauma can be resolved. Although earlier versions of EMDR consisted of 1 to 3 sessions, current standards consist of 8 to 12 weekly 90-minute sessions (Committee on Treatment of Posttraumatic Stress Disorder, & Institute of Medicine, 2008; Friedman, 2003).

Hypnosis may be used as an adjunct to psychodynamic, cognitive-behavioral, or other therapies. It has been shown to enhance their efficacy for many clinical conditions (Committee on Treatment of Posttraumatic Stress Disorder, & Institute of Medicine, 2008; Foa et al., 2008). Number and length of sessions vary widely.

Interpersonal therapy is a time-limited, dynamically informed psychotherapy that aims to alleviate patients' suffering and improve their interpersonal functioning. This type of therapy focuses specifically on interpersonal relationships; its goal is to help patients either improve their interpersonal relationships or change their expectations about them. In addition, it aims to help patients improve their social support so they can better manage their current interpersonal distress. Interpersonal therapy generally requires 10 to 20 weekly sessions in the "acute phase" followed by a time-unlimited "maintenance phase" (Stuart, 2006).

Psychodynamic therapy explores the psychological meaning of a traumatic event. The goal is to bring unconscious memories into conscious awareness so that PTSD symptoms are reduced. The therapy presumes that the PTSD symptoms are the result of the unconscious memories. Psychodynamic therapy traditionally lasts from 3 months to 7 years (Friedman, 2003).

Narrative exposure therapy is described as a standardized short-term approach based on principles of exposure therapy that adapted exposure therapy to meet the needs of traumatized survivors of war and torture. The therapy has been applied to a number of civilian samples who have experienced multiple traumatic events. NET is also based on testimony therapy, where instead of defining a single traumatic event, the patient constructs a narrative about their whole life from birth to the present, while focusing on the detailed report of the traumatic experiences (Neuner, Schauer, Klaschik, Karunakara, & Elbert, 2004).

A preliminary scheme for classifying psychological treatments for PTSD was based on review of all of the articles on psychological treatments that met inclusion criteria. Two investigators on our team (KC and CAF) with expertise in cognitive behavioral interventions assessed each psychological intervention in the included studies to determine the most appropriate categorization of each intervention based on the theoretical model and core components of the therapy. The classification scheme and the categorization of each study was then refined based on input by members of our technical expert panel, peer reviewers, and public reviewers. We included a category for CBT-mixed therapies for interventions that used various components of CBT, but that were heterogeneous enough to prevent their inclusion into one of the other categories.

Studies were required to assess at least one of the following outcomes: PTSD symptoms, remission (no longer having symptoms), loss of PTSD diagnosis, quality of life, disability or functional impairment, return to work or active duty, or adverse events.

2.3. Data extraction and risk of bias assessment

Two investigators independently reviewed titles and abstracts for study inclusion. Two investigators then independently reviewed the full text of articles marked for possible inclusion to determine final inclusion/exclusion. If the reviewers disagreed, conflicts were resolved with a third experienced team member. We designed and used structured forms to extract pertinent information from each article, including information about the populations, interventions, comparators, outcomes, timing, settings, and study designs. All data extractions were reviewed for completeness and accuracy by a second team member. Risk of bias for each study was also determined independently by two investigators; one of the two reviewers was always an experienced, senior investigator. Disagreements between the two reviewers were resolved by discussion and consensus or by consulting a third member of the team. We excluded studies deemed high risk of bias from our main data synthesis and main analyses; we included them only in sensitivity analyses.

To assess the risk of bias of studies, we used predefined criteria based on the AHRQ Methods Guide for Comparative Effectiveness Reviews,(Viswanathan et al., 2012) rating studies as low, medium, or high risk of bias. We included questions to assess selection bias, confounding, performance bias, detection bias, and attrition bias (i.e., those about adequacy of randomization, allocation concealment, similarity of groups at baseline, masking, attrition, whether intention to treat analysis was used, method of handling dropouts and missing data, validity and reliability of outcome measures, and treatment fidelity).

In general terms, results from a study assessed as having low risk of bias are considered to be valid. A study with moderate risk of bias is susceptible to some risk of bias but probably not enough to invalidate its results. A study assessed as high risk of bias has significant risk of bias (e.g., stemming from serious issues in design, conduct, or analysis) that may invalidate its results. We determined the risk of bias rating via appraisal of responses to all 12 questions assessing the various types of bias listed above. We did not use a quantitative approach (e.g., adding up how many favorable or unfavorable responses were given), but we did require favorable responses to at least 10 questions to give a low risk of bias rating, with any unfavorable responses being of relatively minor concern (e.g., lack of patient masking in studies of psychological interventions, which is generally not considered possible).

We gave high risk of bias ratings to studies that we determined to have a fatal flaw (defined as a methodological shortcoming that leads to a very high risk of bias) in one or more categories based on our qualitative assessment. Reasons for high risk of bias ratings included high risk of selection bias due to inadequate method of randomization (e.g., alternating) and resulting baseline differences between groups with no subsequent approach to handle potential confounders, attrition ≥40% or differential attrition ≥30%, risk of attrition bias (attrition over 20% or differential attrition over 15%) along with inadequate handling of missing data (e.g., completers analysis with nothing done to address missing data), and other combinations of multiple risk of bias concerns.

The majority of studies that we rated as high risk of bias had numerous problems. On average, they received unfavorable responses to 8 of our specific risk of bias assessment questions. Each of the studies rated as high risk of bias had unfavorable responses to 5 or more questions. The most common methodological shortcomings contributing to high risk of bias ratings were high rates of attrition or differential attrition, inadequate methods used to handle missing data, and lack of intention-to-treat analysis.

2.4. Data synthesis and analysis

We used random effects models to conduct meta-analyses of outcomes reported by multiple studies that were sufficiently homogeneous to justify combining their results (Sutton, Abrams, Jones, et al., 2000). For continuous outcomes, we report the weighted mean difference (WMD) between intervention and control or the standardized mean difference (SMD), Cohen's d (when multiple scales were combined in one meta-analysis). For binary outcomes, we calculated risk differences between groups and we calculated numbers needed to treat (NNTs) when pooled risk differences found a statistically significant result. In this context, the NNT represents the number of patients with PTSD who need to be treated to achieve one good outcome (e.g. to achieve loss of PTSD diagnosis), which is calculated as 1/Absolute Risk Reduction. The chi-squared statistic and the I^2 statistic were calculated to assess statistical heterogeneity in effects between studies (Higgins

Please cite this article as: Cusack, K., et al., Psychological treatments for adults with posttraumatic stress disorder: A systematic review and meta-analysis, *Clinical Psychology Review* (2015), http://dx.doi.org/10.1016/j.cpr.2015.10.003

& Thompson, 2002; Higgins, Thompson, Deeks, & Altman, 2003). When quantitative analyses were not appropriate (e.g., because of clinical heterogeneity, insufficient numbers of similar studies, or insufficiency or variation in outcome reporting), we synthesized data qualitatively. Pairwise meta-analyses were conducted using Stata version 11.1 (StataCorp LP, College Station, TX).

We graded the strength of evidence (SOE) as high, moderate, low, or insufficient based on guidance established for the Evidence-based Practice Center Program (Table S2) (Owens et al., 2010). Developed to grade the overall strength of a body of evidence, the approach incorporates four key domains: risk of bias, consistency, directness, and precision of the evidence. It also considers optional domains, such as strength of association (a large magnitude of effect can increase the SOE). Two reviewers assessed each key domain for each outcome, and differences were resolved by consensus. We graded the SOE as high when our assessments for all key domains were favorable. For each key domain with an unfavorable assessment, we downgraded the SOE by at least one category. For example, if evidence for a treatment was inconsistent (e.g., studies with conflicting results) and the estimate of effect was imprecise (e.g., confidence interval wide enough to contain clinically distinct conclusions), we typically graded the SOE as low. Substantial concerns related to a single domain (e.g., substantially high risk of bias) can result in downgrading by more than a single SOE category.

3. Results

We included 64 randomized controlled trials (Fig. 1). Sample sizes ranged from 10 to 563, and study duration ranged from 4 weeks to 2 years. Sixty trials evaluated psychological treatments, one (van der Kolk et al., 2007) compared psychological and pharmacological treatments, and three (Foa et al., 2013; Rothbaum et al., 2006; Schneier et al., 2012) evaluated combinations of psychological and pharmacological treatments compared with either one alone (Table S3). The included studies generally enrolled people with severe PTSD and with a mean age in the 30s–40s.

3.1. Efficacy of psychological treatments

First, we examined studies with inactive comparison groups (e.g., waitlist, usual care) to determine whether evidence supports the efficacy of each type of intervention. We then examined studies with active comparison groups (i.e., head-to-head comparative evidence) to address questions regarding comparative effectiveness. Findings are presented below, and are summarized in Table 2.

3.2. Cognitive therapy

Evidence supports the efficacy of cognitive therapy, including cognitive processing therapy, for improving PTSD symptoms, achieving loss of PTSD diagnosis, improving depression and anxiety symptoms, and reducing disability for adults with PTSD (moderate SOE, Fig. 2). For achieving loss of diagnosis, 50% more subjects treated with cognitive therapy than subjects in control groups achieved the outcome. This translates to a number needed to treat (NNT) of 2. For CPT in particular, 44% more subjects treated with this modality than subjects in the control group achieved loss of diagnosis, translating to a NNT of 2. Evidence was insufficient for remission and for other outcomes (such as anxiety symptoms, quality of life, disability or functioning, and return to work or active duty) for CPT.

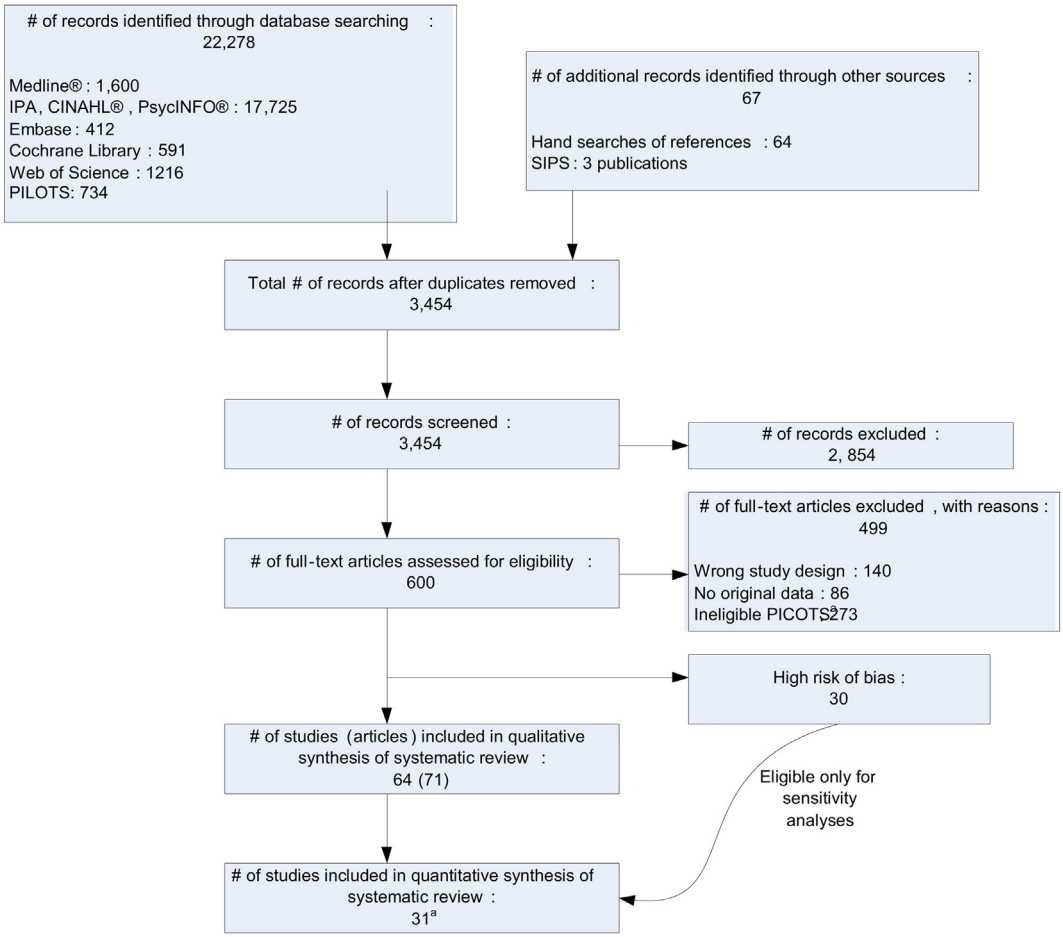

Fig. 1. Disposition of Articles Identified by Searches [a]PICOTS refers to population, intervention, comparators, outcome measures, timing, settings and study designs.

Table 2
Summary of findings and strength of evidence for efficacy of psychological treatments.

Intervention	Outcome	Results Effect size (95% CI)[a]	Strength of evidence
Cognitive processing therapy	PTSD symptoms	SMD −1.40 (−1.95 to −0.85, 4 trials, N = 299) WMD −32.2 (−46.3 to −18.05, 4 trials, N = 299)	Moderate
	Loss of diagnosis	0.44 (0.26 to 0.62, 4 trials, N = 299); NNT 3	Moderate
	Depression symptoms	WMD −10.7 (−16.5 to −4.9, 4 trials, N = 299)	Moderate
Cognitive therapy[b]	PTSD symptoms	SMD −1.33 (−1.99 to −0.67; 4 trials, N = 282)	Moderate
	Loss of diagnosis	0.56 (0.32 to 0.79; 4 trials, N = 221); NNT 2	Moderate
	Depression symptoms	SMD −0.91 (−1.20 to −0.62; 3 trials, N = 221)	Moderate
Cognitive therapy combined	PTSD symptoms	SMD −1.36 (−1.77 to −0.94; 9 trials, N = 604)	Moderate
	Loss of diagnosis	0.50 (0.36 to 0.64; 9 trials, N = 604); NNT 2	Moderate
	Depression symptoms	SMD −0.96 (−1.23 to −0.69; 9 trials, N = 604)	Moderate
CBT—Exposure	PTSD symptoms	SMD −1.27 (−1.54 to −1.00, 7 trials, N = 387) WMD −28.9 (−35.5 to −22.3, 4 trials, N = 212)	High
	Loss of diagnosis	0.66 (0.42 to 0.91, 3 trials, N = 197); NNT 2	Moderate
	Depression symptoms	WMD −8.2 (−10.3 to −6.1, 6 trials, N = 363)	High
CBT—Mixed (CBT-M)	PTSD symptoms	SMD −1.09 (−1.4 to −0.78, 14 trials, N = 825) WMD −31.1 (−42.6 to −19.6, 8 trials, N = 476)	Moderate
	Loss of diagnosis	0.26 (0.11 to 0.41, 6 trials, N = 290); NNT 4	Moderate
	Depression symptoms	WMD −10.4 (−14.4 to −6.4, 10 trials, N = 662)	Moderate
EMDR	PTSD symptoms	SMD −1.08 (−1.83 to −0.33, 4 trials, N = 117)	Low
	Loss of diagnosis	0.64 (0.46 to 0.81, 3 trials, N = 95); NNT 2	Moderate
	Depression symptoms	SMD −1.13 (−1.52 to −0.74, 4 trials, N = 117)	Moderate
Narrative exposure therapy (NET)	PTSD symptoms	SMD −1.25 (−1.92 to −0.58, 3 trials, N = 227) PDS, WMD −10.2 (−13.1 to −7.4, 3 trials, N = 227)	Moderate
	Loss of diagnosis	0.15 (0.01 to 0.30, 3 trials, N = 227)	Low
	Depression symptoms	Mixed evidence; 1 trial reported efficacy and 1 reported no difference from comparators, 2 trials, N = 75	Insufficient
Brief eclectic psychotherapy (BEP)	PTSD symptoms	Likely small-to-medium effect size (3 trials, N = 96)	Low
	Loss of diagnosis	RD ranged from 0.125 to 0.58 across trials (3 trials, N = 96)	Low
	Depression symptoms	3 trials (N = 96) found benefits, wide range of effect sizes in the 2 trials reporting sufficient data, from medium to very large	Low

CI = confidence interval; EMDR = Eye Movement Desensitization and Reprocessing; N = number of subjects; NNT = number needed to treat; NR = not reported; NS = not statistically significant; PDS = Posttraumatic Diagnostic Scale; RD = risk difference; SOE = strength of evidence; WMD = weighted mean difference.

[a] WMD data for PTSD symptoms are mean change from baseline (95% CI, number of trials and number of subjects contributing data) in CAPS score compared with inactive comparators unless another outcome measure is specified; SMD data are Cohen's d—effect sizes. A small effect size is d = 0.20, medium effect size is d = 0.50, and large effect size is d = 0.80. (41) Negative WMDs and SMDs favor the intervention. Using CAPS, PTSD severity has been categorized as asymptomatic/few symptoms (0 to 19), mild PTSD/subthreshold (20 to 39), moderate PTSD/threshold (40 to 59), severe (CAPS of 60–79), and extreme (CAPS ≥80). (42) Baseline PTSD severity was generally in the severe or extreme range across the included trials. Data for loss of diagnosis are risk difference for treatment compared with inactive comparators unless otherwise specified; positive numbers favor the intervention. WMD data for depression symptoms are mean change from baseline in BDI score compared with inactive comparators unless another outcome measure is specified. SMD data for depression symptoms are Cohen's d.

[b] For the purposes of summarizing results and conclusions, the cognitive therapy category here summarizes evidence from the cognitive therapy studies that were not specifically cognitive processing therapy.

3.3. Coping skills

Evidence was insufficient to determine efficacy of relaxation or stress inoculation training for adults with PTSD. One trial comparing prolonged exposure, stress inoculation training, prolonged exposure plus stress inoculation training, and waitlist suggests that stress inoculation training may be efficacious (Foa et al., 2005).

3.4. Exposure therapy

Evidence supports the efficacy of exposure therapy for improving PTSD symptoms (high SOE, Fig. 3), achieving loss of PTSD diagnosis (moderate SOE), and improving depression symptoms for adults with PTSD (high SOE). For achieving loss of PTSD diagnosis, 66% more subjects treated with exposure than subjects in waitlist control groups achieved the outcome. This translates to a NNT of 2. Evidence was insufficient for other outcomes (remission, anxiety, quality of life, disability or functional impairment, and return to work or active duty). With the exception of one study (Basoglu, Salcioglu, & Livanou, 2007) the efficacy evidence comes from trials of Prolonged Exposure, a manualized therapy combining imaginal and in vivo exposure.

3.5. CBT-mixed

Evidence supports the efficacy of CBT-mixed treatments for improving PTSD symptoms (moderate SOE). Evidence also supports the efficacy of CBT-mixed interventions for achieving loss of PTSD diagnosis (moderate SOE), remission (moderate SOE), reduction of depression symptoms (moderate SOE), reduction of disability or functional impairment (low SOE), and anxiety symptoms (low SOE). For achieving loss of diagnosis, 26% more subjects treated with CBT-mixed therapies than subjects in inactive control groups achieved the outcome. This translates to a NNT of 4 (Fig. 4).

3.6. Eye movement desensitization and reprocessing (EMDR)

Evidence supports the efficacy of EMDR for reduction of PTSD symptoms, but SOE is low because of some inconsistency and imprecision. Evidence supports the efficacy of EMDR for achieving loss of PTSD diagnosis and improving depression symptoms (moderate SOE for both); 64% more subjects treated with EMDR experienced this outcome than did subjects in waitlist control groups. This translates to a NNT of 2. Evidence was insufficient to determine efficacy of EMDR for other outcomes (remission, anxiety, quality of life, disability or functioning, and return to work or active duty) (Fig. 5).

3.7. Other psychological therapies

Evidence supports the efficacy of NET for improving PTSD symptoms (moderate SOE, Fig. 6) and for achieving loss of PTSD diagnosis (low SOE). Some evidence supports the efficacy of brief eclectic psychotherapy for improving PTSD symptoms, achieving loss of diagnosis, reducing depression and anxiety symptoms, and returning to work (all low SOE). Evidence was insufficient to determine the efficacy of Seeking Safety (Hien, Cohen, Miele, Litt, & Capstick, 2004), COPE (Mills et al., 2012), or imagery rehearsal therapy (Krakow et al., 2001).

Please cite this article as: Cusack, K., et al., Psychological treatments for adults with posttraumatic stress disorder: A systematic review and meta-analysis, *Clinical Psychology Review* (2015), http://dx.doi.org/10.1016/j.cpr.2015.10.003

Evidence was insufficient to determine efficacy for achieving remission for all psychological treatments except for CBT-mixed treatments (moderate SOE), because trials typically did not report remission as an outcome. Similarly, evidence for improving anxiety symptoms, quality of life, disability or functional impairment, or return to work or active duty was generally insufficient (often with no trials reporting those outcomes) with a few exceptions: some evidence supported efficacy of cognitive therapy for improving anxiety symptoms and disability (moderate SOE), efficacy of CBT-mixed treatments and brief eclectic psychotherapy for improving anxiety symptoms (low SOE), CBT-mixed treatments for improving disability and functional impairment (low SOE), and brief eclectic psychotherapy for improving return to work (low SOE).

3.8. Comparative effectiveness of treatments

Most of the head-to-head evidence was insufficient to determine ifpsychotherapies differ in effectiveness (Table 3), with a few exceptions. There was moderate strength of evidence to suggest that exposure therapy was superior to relaxation for reducing PTSD symptoms. There was moderate strength of evidence that exposure therapy and cognitive therapy were similar in loss of PTSD diagnosis, and moderate strength of evidence that Seeking Safety is more effective than substance abuse treatment as usual for improving PTSD symptoms.

One trial (N = 88) meeting inclusion criteria compared a psychological treatment (EMDR) with a pharmacological treatment (fluoxetine) (van der Kolk, et al.). EMDR- and fluoxetine-treated subjects had similar improvements in PTSD symptoms, rates of remission, and loss of PTSD diagnosis at the end of treatment. At 6-month follow-up, those treated with EMDR had higher remission rates and greater reductions in depression symptoms compared with those who received fluoxetine. But, this head-to-head evidence was insufficient to draw any firm conclusions about comparative effectiveness, primarily due to unknown consistency (with data from just one study) and lack of precision.

3.9. Adverse effects

The vast majority of studies did not report information about adverse effects. A total of 17 studies reported any information on

Table 3
Summary of findings and strength of evidence for comparative effectiveness of psychological treatments.

Comparison	Outcome	Results Effect size (95% CI)[a]	Strength of Evidence
CR vs. Relaxation	PTSD symptoms	50% vs. 20% of subjects improved, p = 0.04, 1 trial, N = 34	Insufficient
	Loss of diagnosis	65% vs. 55% of subjects, p = NS, 1 trial, N = 34	Insufficient
	Depression symptoms	7 (3 to 11) vs. 17 (11 to 22), 1 trial, N = 34	Insufficient
CT vs. Exposure	PTSD symptoms	WMD 4.8 (−4.5 to 14.2; 2 trials, N = 100)	Insufficient
	Loss of diagnosis	RD 0.13 (−0.06 to 0.32; 2 trials, N = 100)	Insufficient
	Depression symptoms	WMD 2.75 (−1.94 to 7.43; 2 trials, N = 100)	Insufficient
Exposure vs. CPT	PTSD symptoms	WMD 3.97 (−5.95 to 13.9; 1 trial, N = 124)	Insufficient
	Loss of diagnosis	0.00 (−0.18 to 0.18; 1 trial, N = 124)	Insufficient
	Depression symptoms	WMD 2.94 (−0.75 to 6.63; 1 trial, N = 124)	
Exposure vs. Relaxation	PTSD symptoms	WMD −9.7 (−22.3, 2.9; 2 trials, N = 85)	Insufficient
	Loss of diagnosis	Favors exposure: RD 0.31 (0.04, 0.58; 2 trials, N = 85)	Moderate
	Depression symptoms	WMD −5.5 (−10.2 to −0.79; 2 trials, N = 85)	Moderate
Exposure vs. SIT	PTSD symptoms	SMD −0.14 (−0.69 to 0.41; 1 trial, N = 51)	Insufficient
	Loss of diagnosis	RD 0.18 (−0.09 to 0.45; 1 trial, N = 51)	Insufficient
	Depression symptoms	WMD −0.15 (−5.8 to 5.5; 1 trial, N = 51)	Insufficient
Relaxation vs. EMDR	PTSD symptoms	SMD −0.57 (−1.4 to 0.29; 2 trials, N = 64)	Insufficient
	Loss of diagnosis	0.34 (−0.04 to 0.72; 2 trials, N = 64)	Insufficient
	Depression symptoms	Conflicting findings (2 trials, N = 64)	Insufficient
Relaxation vs. CBT-M	PTSD symptoms	Favors CBT-M (2 trials, N = 85)[b]	Moderate
	Loss of diagnosis	No included studies reported the outcome	Insufficient
	Depression symptoms	No included studies reported the outcome	Insufficient
Exposure vs. EMDR	PTSD symptoms	No difference found (2 trials, N = 91)	Insufficient
	Loss of diagnosis	Both trials favor exposure, but meta-analysis did not find a statistically significant difference and results were imprecise: RD 0.14 (−0.01 to 0.29; 2 trials, N = 91)	Insufficient
	Depression symptoms	No difference (2 trials, N = 91)	Insufficient
Exposure vs. Exposure plus CR	PTSD symptoms	SMD 0.25 (−0.29 to 0.80; 3 trials, N = 259)	Insufficient
	Loss of diagnosis	Similar benefits: RD -0.01 (−0.17 to 0.14; 3 trials, N = 259)	Moderate
	Depression symptoms	WMD 2.78 (−1.68 to 7.25; 4 trials N = 299)	Insufficient
Brief eclectic psychotherapy vs. EMDR	PTSD symptoms	1 trial (N = 140) reported more rapid improvement with EMDR, but no difference after completion of treatment	Insufficient
	Loss of diagnosis	1 trial (N = 140) reported more rapid improvement with EMDR, but no difference after treatment	Insufficient
	Depression symptoms	1 trial (N = 140) reported more rapid improvement with EMDR, but no difference after treatment	Insufficient
Seeking safety vs. active controls[c]	PTSD symptoms	SMD 0.04 (−0.12 to 0.20; 4 trials, N = 594) WMD 1.45 (−2.5 to 5.4; 3 trials, N = 477)	Moderate
	Loss of diagnosis	OR 1.22 (0.48 to 3.13; 1 trial, N = 49)	Insufficient
	Depression symptoms	No trials	Insufficient

CI = confidence interval; CR = cognitive restructuring; EMDR = Eye Movement Desensitization and Reprocessing; N = number of subjects; NR = not reported; NS = not statistically significant; SIT = stress inoculation training; SOE = strength of evidence; WMD = weighted mean difference.
Table only includes rows for comparisons with any available trials. We found no low or medium risk-of-bias trials making other head-to-head comparisons.

[a] For PTSD symptoms, WMD data are mean change from baseline (95% CI, number of trials and number of subjects contributing data) in CAPS score compared with inactive comparators unless another outcome measure is specified; SMD data are Cohen's d—effect sizes. Using CAPS, PTSD severity has been categorized as asymptomatic/few symptoms (0 to 19), mild PTSD/subthreshold (20 to 39), moderate PTSD/threshold (40 to 59), severe (CAPS of 60 to 79), and extreme (CAPS ≥80). (42) Baseline PTSD severity was generally in the severe or extreme range across the included trials. For loss of diagnosis, data are risk difference (95% CI, number of trials and number of subjects contributing data) for the comparison between the two therapies unless otherwise specified. For depression symptoms, WMD data are between-group difference for mean change from baseline in BDI score unless another outcome measure is specified. SMD data for depression symptoms are Cohen's d.

[b] Mean CAPS improvement: 38 (95% CI, 26 to 50) vs. 14 (95% CI, 4 to 25) in one trial; (80) between group effect size was very large favoring CBT-M (Cohen's d = 1.6) in another (70).

[c] Active controls were relapse prevention, psychoeducation, and treatment as usual in a VA substance use disorders clinic.

Please cite this article as: Cusack, K., et al., Psychological treatments for adults with posttraumatic stress disorder: A systematic review and meta-analysis, *Clinical Psychology Review* (2015), http://dx.doi.org/10.1016/j.cpr.2015.10.003

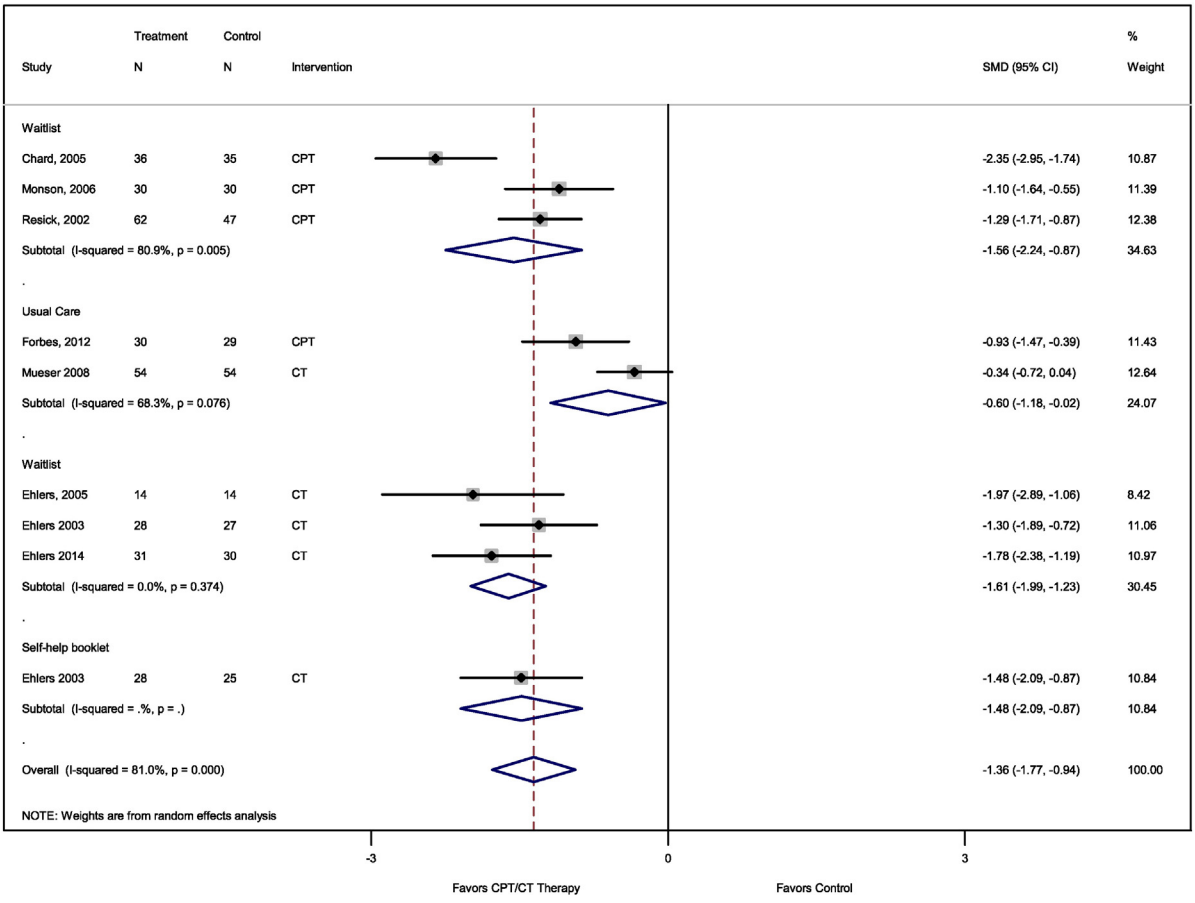

Fig. 2. Change in CAPS for cognitive therapy compared with control, by type of comparator.

adverse events. Three CBT-mixed, one PE, one COPE, and one EMDR study reported withdrawals from the study due to adverse effects (Blanchard et al., 2003; Cottraux et al., 2008; Foa et al., 2013; Hogberg et al., 2007; Hollifield, Sinclair-Lian, Warner, & Hammerschlag, 2007; Sannibale et al., 2013). Two cognitive therapy and two "other" psychological interventions reported that there were no treatment-related adverse events (Boden et al., 2012; Ehlers et al., 2014; Forbes et al., 2012; Ford, Steinberg, & Zhang, 2011). Three studies reported deaths due to medical illness that were unrelated to the intervention (Foa et al., 2005; Schnurr et al.,

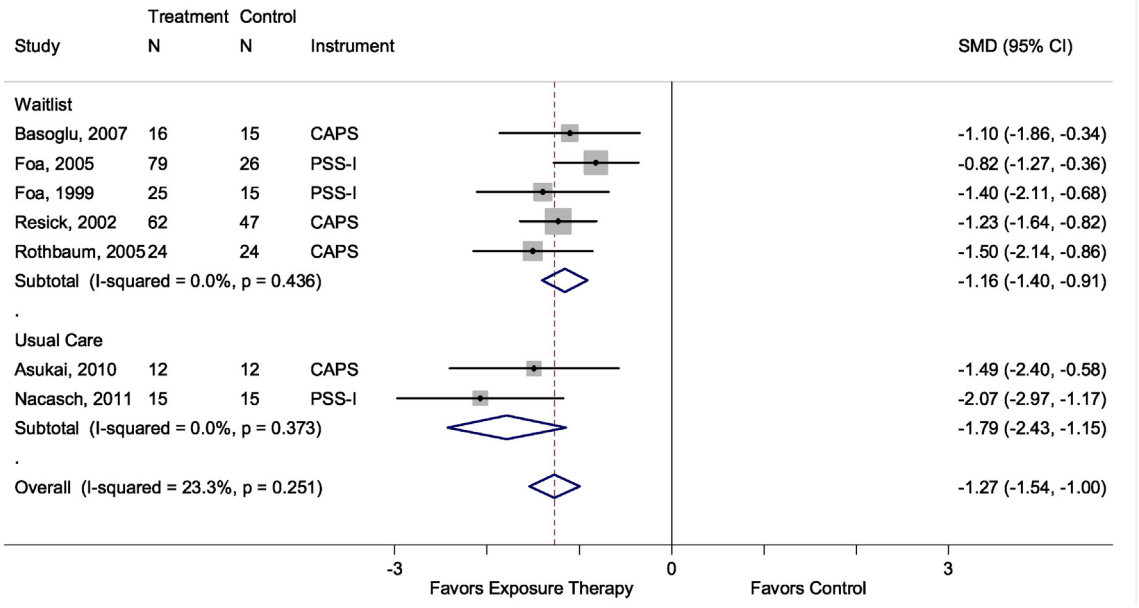

Fig. 3. Mean change from baseline to end of treatment in PTSD symptoms (any measure) for exposure therapy compared with control, by type of comparator.

Please cite this article as: Cusack, K., et al., Psychological treatments for adults with posttraumatic stress disorder: A systematic review and meta-analysis, *Clinical Psychology Review* (2015), http://dx.doi.org/10.1016/j.cpr.2015.10.003

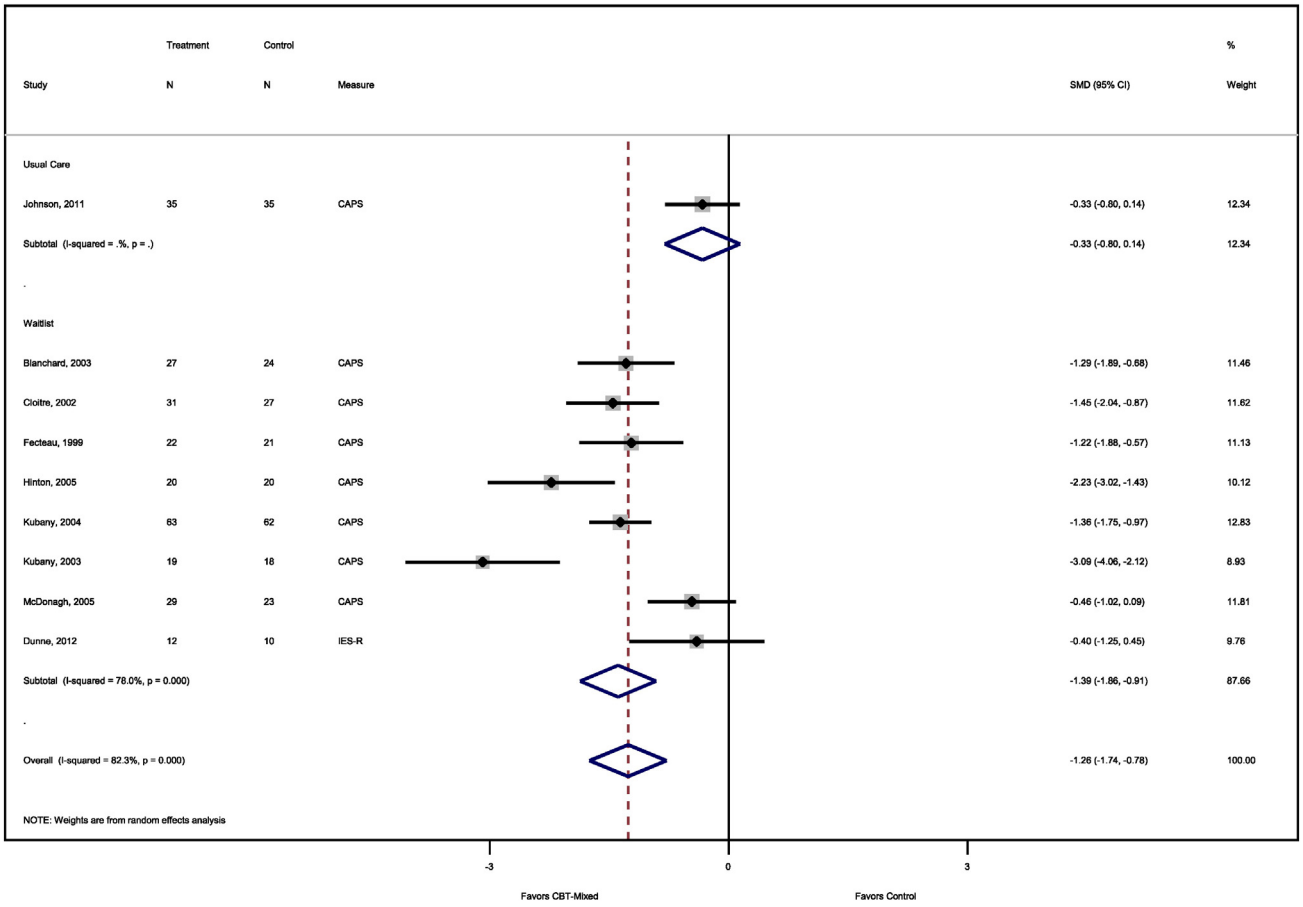

Fig. 4. Mean change from baseline to end of treatment in PTSD symptoms for CBT-mixed compared with control, by type of comparator.

2007; Schnurr et al., 2003) three studies reported on suicide attempts (N = 1 in PE condition and N = 3 in PCT condition), completed suicide (N = 1 in PCT), and hospital admissions for serious suicidal ideation (N = 2 in NET group) (Neuner et al., 2010; Schnurr et al., 2007; Schnurr et al., 2003). Evidence was insufficient to draw conclusions about withdrawals due to adverse events, mortality, suicide, suicidal ideation, self-harmful behaviors, or other specific adverse events.

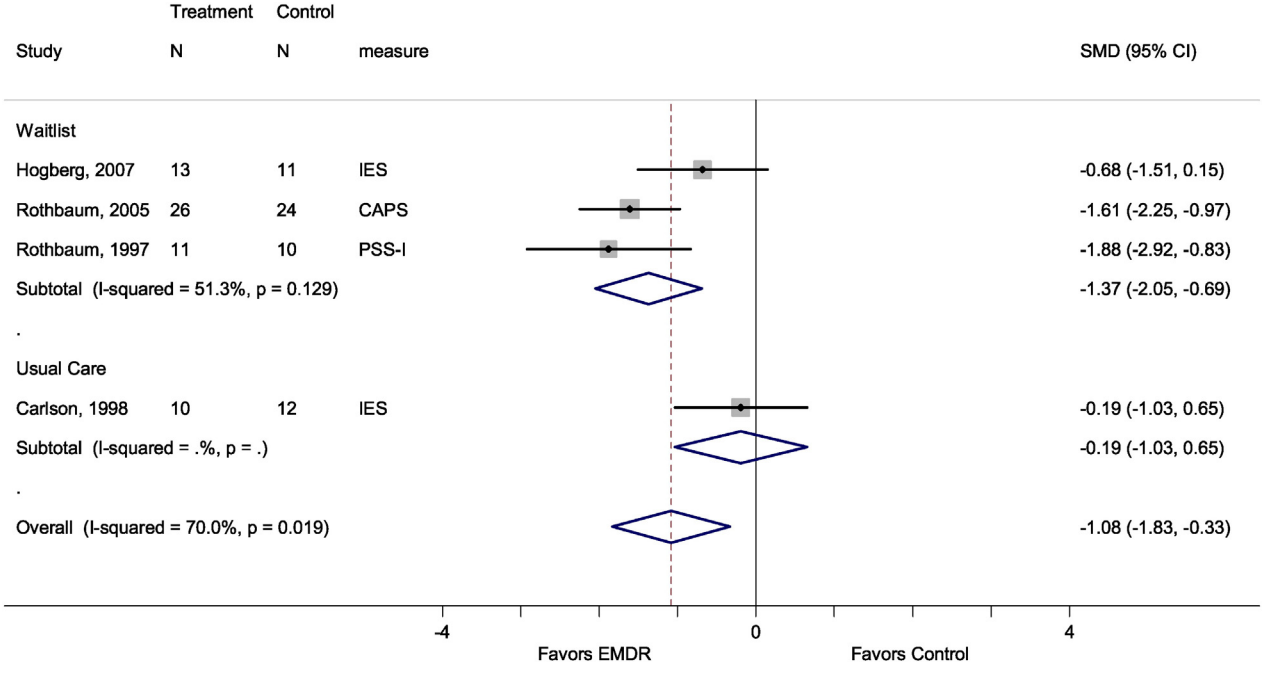

Fig. 5. Mean change from baseline to end of treatment in PTSD symptoms for EMDR compared with control, by type of comparator.

Please cite this article as: Cusack, K., et al., Psychological treatments for adults with posttraumatic stress disorder: A systematic review and meta-analysis, *Clinical Psychology Review* (2015), http://dx.doi.org/10.1016/j.cpr.2015.10.003

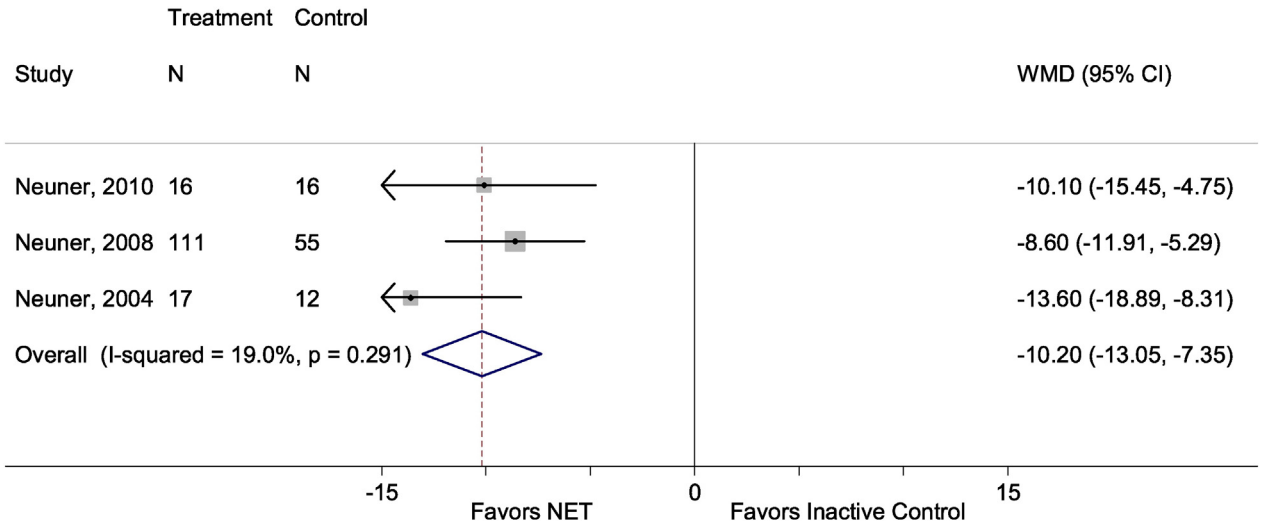

Fig. 6. Mean change from baseline to end of treatment in PTSD symptoms for NET compared with control.

3.10. Sensitivity analyses

The sensitivity analyses including studies rated as high risk of bias did not produce significantly different results; point estimates and confidence intervals were generally very similar, and the sensitivity analyses did not alter any of our main conclusions.

4. Discussion

Our meta-analysis demonstrates efficacy of exposure therapy (including prolonged exposure) for improving PTSD symptoms (high SOE), and for number needed to treat and loss of diagnosis (moderate SOE). Evidence also supports efficacy of cognitive therapy, including CPT, and CBT-mixed therapies, (moderate SOE for all), eye movement desensitization and reprocessing (EMDR) (low SOE for PTSD symptom reduction, moderate SOE for loss of diagnosis) and NET (moderate SOE for PTSD symptom reduction, low SOE for loss of diagnosis). Effect sizes were large and the NNT was ≤4 for each of these therapies. Head-to-head comparative effectiveness evidence was limited.

The magnitude of benefit and SOE for exposure therapy supports its use as a first-line treatment for PTSD. However, other factors must be considered in selecting a treatment for PTSD, including patient preference, access to treatment, and clinical judgment about the appropriateness of an intervention. For instance, exposure therapy and CPT are now readily available in most VAMC outpatient settings, but are less likely to be available in community-based mental health centers. A majority of the studies we reviewed excluded patients with substance dependence or suicidality. Most clinicians would agree that stabilization of suicidality and, at a minimum, detoxification from substances should occur prior to initiating a trauma-focused psychotherapy such as exposure therapy. There is less consensus on whether substance use disorder therapy should be integrated with PTSD therapy or conducted prior to or concomitantly with PTSD therapy, although emerging research shows promise for integrated therapies (Mills et al., 2012; Sannibale et al., 2013). Given the magnitude of benefit and SOE for cognitive therapy (including CPT), CBT-mixed, NET, and EMDR, we recommend that these therapies should also be considered based on the above considerations. Our review did not identify studies that inform matching patients to treatment, consistent with the findings of a recent study of moderators for the treatment of anxiety disorders (Schneider, Arch, & Wolitsky-Taylor, 2015).

Consistent with existing guidelines and systematic reviews, our findings indicate that there are efficacious psychological treatments for PTSD. We reached a few notably different conclusions than those presented in the IOM report (Committee on Treatment of Posttraumatic Stress Disorder, & Institute of Medicine, 2008). First, we concluded that CPT has moderate evidence supporting efficacy for improving some outcomes for adults with PTSD, whereas the IOM report did not make a specific conclusion about CPT. We believe this difference was due to misclassification (in the IOM report) of three trials of CPT that provided the bulk of the evidence supporting the efficacy of CPT. The IOM report classified these three trials as exposure therapy whereas we classified them as cognitive therapy. Although the current version of CPT includes components that are similar to exposure therapy, we classified CPT as cognitive therapy because the therapy is based on social-cognitive theory, the core components are classic cognitive therapy techniques, and dismantling studies of CPT do suggest a critical contribution of the cognitive components (Resick et al., 2008). Second, we concluded that evidence supports the efficacy of EMDR (low SOE for PTSD symptom reduction and moderate SOE for loss of diagnosis) whereas the IOM report indicated that evidence was inadequate to determine EMDR's efficacy. We likely reached a different conclusion because we synthesized the data quantitatively (with meta-analysis) rather than qualitatively — increasing precision and ability to find a difference. Finally, our conclusions differ from those of the APA and the ISTSS guidelines regarding stress inoculation training. We determined that there was insufficient evidence to determine its efficacy based on one medium risk of bias trial (N = 41 total subjects in the stress inoculation training and waitlist arms, combined), and one study we rated high risk of bias (N = 27 total subjects in the stress inoculation training and waitlist arms, combined). Further, the APA used a different approach to data synthesis (qualitative rather than quantitative) and relied more on expert opinion to develop guidelines.

4.1. Applicability of findings

Studies generally enrolled subjects from outpatient settings with severe (60–79 CAPS score) to extreme (≥80 CAPS score) PTSD symptoms. Most studies included participants with chronic PTSD (i.e., symptoms lasting at least three months). However, studies inconsistently reported, and had wide variation in, the time between the occurrence of the traumatic event and trial entry. The mean age of subjects was generally in the 30s to 40s, but some studies enrolled slightly older populations.

We found studies of people with a wide range of trauma exposures, and many studies enrolled a heterogeneous group of subjects with a variety of index trauma types. Evidence was insufficient to determine whether findings are applicable to all those with PTSD or whether they are only applicable to certain groups. Our review was unable to

address questions regarding the effects of trauma type or demographic variables, such as gender or age, on treatment efficacy. This question could be of great benefit to clinicians attempting to recommend a therapy for an individual patient, and future studies should attempt to address this.

We recognize the hypothesis that treatments proven to be effective for adults with PTSD should be applicable to all adults with PTSD, but we did not find evidence to confirm or refute this hypothesis. For example, there was often very little evidence from subjects with combat-related trauma that contributed to assessments of the efficacious treatments—making it difficult to determine with any certainty whether or not findings are applicable to adults with PTSD from combat-related trauma. In addition, just one included trial for each of the following treatments focused on combat-related trauma: EMDR (N = 35),(Carlson, Chemtob, Rusnak, Hedlund, & Muraoka, 1998) CBT-mixed (N = 45),(Litz, Engel, Bryant, & Papa, 2007). For each of the following, two trials focused on combat-related trauma: CPT (total N = 119) (Forbes et al., 2012; Monson et al., 2006), exposure-based therapy (total N = 370) (Gamito et al., 2010; Schnurr et al., 2003); another study of exposure-based therapy enrolled those with combat- and terror-related PTSD) (Nacasch et al., 2011).

4.2. Limitations

Determining the classification of psychological treatments was sometimes challenging. We recognize that experts in psychological treatments sometimes disagree about how to best categorize interventions. Some of the findings might have been slightly different if the psychological treatments were classified differently. Our approach to classifying and categorizing psychological treatments relied on the theoretical model guiding the therapy as well as the core therapy components. Categorization was based on independent review by two investigators with relevant expertise and informed by technical expert panel and reviewer feedback. Our exposure therapy category lumps studies using various types of exposure therapy. The vast majority of these studies that contributed data to our meta-analyses evaluated prolonged exposure; thus the findings for exposure therapy are largely driven by studies of prolonged exposure. All but one study included in this category evaluated prolonged exposure; the other study evaluated in vivo exposure alone. Analyses with and without the in vivo study were virtually identical.

Many of the trials assessing treatments for adults with PTSD had methodological limitations introducing some risk of bias. We excluded 30 articles from our main data synthesis because of high risk of bias. High risk of bias was most frequently due to high rates of attrition or differential attrition and inadequate methods used to handle missing data. High attrition rates are not uncommon in studies of psychiatric conditions (Gartlehner et al., 2011; Khan, Khan, Leventhal, & Brown, 2001a, 2001b). It is unknown to what extent the attrition rates were due to the underlying condition—given that some of the key features of PTSD are avoidance, loss of interest, and detachment—or to the treatments (e.g., adverse effects, worsening of symptoms). Another common methodological limitation was the lack of masking of outcome assessors.

4.3. Conclusions and future directions

Several psychological treatments have evidence of at least moderate strength supporting their efficacy for improving outcomes for adults with PTSD. Effect sizes for PTSD symptom reduction were large for exposure-based therapy, CPT, cognitive restructuring, CBT-mixed therapies, NET, and EMDR. Head-to-head evidence was insufficient to determine the comparative effectiveness of these treatments. Future studies should compare interventions with demonstrated efficacy. Evidence was generally insufficient to determine whether any treatment approaches are more or less effective for particular groups of people. Future studies should examine moderators of treatment efficacy and examine patient preferences. Evidence was insufficient to determine comparative risks of adverse effects. Thus far we have identified a number of efficacious psychological therapies in the treatment of PTSD. Beyond efficacy, it is important to understand the tolerability and potential adverse effects of an intervention, especially when making a choice between medication and psychotherapy. We strongly recommend that this information be reported on PTSD therapy trials to better understand the potential harmful effects of treatment.

Role of funding sources

This review was supported in part by an American Recovery and Reinvestment Act (ARRA) contract from the Agency for Healthcare Research and Quality (AHRQ), Contract No. 290 2007 10056 I and partially funded by AHRQ. Staff at AHRQ participated in development of the scope of work and reviewed draft manuscripts. Copyright assertion from AHRQ was required before the manuscript could be submitted for publication, but the authors are solely responsible for the content and the decision to submit it for publication. The views expressed in this manuscript do not represent and should not be construed to represent a determination or policy of the Agency for Healthcare Research and Quality or the U.S. Department of Health and Human services.

Contributors

Karen Cusack, Ph.D. was involved in study ratings, study categorization, preparation of the manuscript and writing the first draft of the manuscript. Daniel E. Jonas, M.D., M.P.H. was involved in study design and writing of the protocol. He wrote the first draft of the technical report prepared for AHRQ. Catherine A. Forneris, Ph.D., A.B.B.P. was involved in study ratings, study categorization, and preparation of the manuscript. Candi Wines, MPH was involved in statistical analysis. Jeffrey Sonis, M.D., M.P.H. was involved in study design and preparation of the manuscript. Jennifer Cook Middleton, Ph.D. was involved in literature review, study ratings, and preparation of the manuscript. Cynthia Feltner, M.D., M.P.H. was involved in study design and preparation of the manuscript. Kimberly A. Brownley, Ph.D. was involved in literature review and manuscript preparation. Kristine Rae Olmsted, M.S.P.H. was involved in literature review and manuscript preparation. Amy Greenblatt, B.A. was involved in literature review and manuscript preparation. Amy Weil, M.D. was involved in study design and preparation of the manuscript. Bradley N. Gaynes, M.D., M.P.H. was involved in study design and preparation of the manuscript. All authors have contributed to and have approved the final manuscript.

Conflict of interest

None of the investigators has any affiliations or financial involvement that conflicts with the material presented in this report. The authors report no financial relationships with commercial interests that pose a potential conflict of interest.

Acknowledgments

We express appreciation to the other members of the RTI International — University of North Carolina Evidence-based Practice Center who contributed to this effort: Ms. Megan Van Noord, MSIS, and Ms. Christiane Voisin, MSLS, for help in literature searching; Carol Woodell of RTI International for her project management expertise; Kathy Lohr of RTI International for reviewing and editing portions of the full technical report; Ms. Claire Baker for help in article retrieval; and Ms. Loraine Monroe of RTI International for editing and formatting the technical report.

Please cite this article as: Cusack, K., et al., Psychological treatments for adults with posttraumatic stress disorder: A systematic review and meta-analysis, *Clinical Psychology Review* (2015), http://dx.doi.org/10.1016/j.cpr.2015.10.003

Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.cpr.2015.10.003.

References

American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders: DSM-IV-TR Retrieved from www.psychiatryonline.com.*

American Psychiatric Association (2004). Practice guideline for the treatment of patients with acute stress disorder and posttraumatic stress disorder November. Retrieved December 12, 2011, from http://psychiatryonline.org/content.aspx?bookid=28&sectionid=1670530#52282.

American Psychiatric Association (2015). *Diagnostic and Statistical Manual of Mental Disorders* (5th ed). Washington DC: Author.

Australian National Health and Medical Research Council (NHMRC) Guidelines, & Australian Centre for Posttraumatic Mental Health (2007)). *Australian guidelines for the treatment of adults with acute stress disorder and posttraumatic stress disorder Retrieved December 12, 2011, from http://www.nhmrc.gov.au/publications/synopses/mh13syn.htm.*

Basoglu, M., Salcioglu, E., & Livanou, M. (2007). A randomized controlled study of single-session behavioural treatment of earthquake-related post-traumatic stress disorder using an earthquake simulator. *Psychological Medicine*, *37*(2), 203–213. http://dx.doi.org/10.1017/s0033291706009123.

Blanchard, E.B., Hickling, E.J., Devineni, T., Veazey, C.H., Galovski, T.E., Mundy, E., ... Buckley, T.C. (2003). A controlled evaluation of cognitive behavioural therapy for posttraumatic stress in motor vehicle accident survivors. *Behaviour Research and Therapy*, *41*(1), 79–96.

Boden, M.T., Kimerling, R., Jacobs-Lentz, J., Bowman, D., Weaver, C., Carney, D., ... Trafton, J.A. (2012). Seeking safety treatment for male veterans with a substance use disorder and post-traumatic stress disorder symptomatology. *Addiction*, *107*(3), 578–586. http://dx.doi.org/10.1111/j.1360-0443.2011.03658.x.

Carlson, J.G., Chemtob, C.M., Rusnak, K., Hedlund, N.L., & Muraoka, M.Y. (1998). Eye movement desensitization and reprocessing (EDMR) treatment for combat-related post-traumatic stress disorder. *Journal of Traumatic Stress*, *11*(1), 3–24. http://dx.doi.org/10.1023/a:1024448814268.

Committee on the Assessment of Ongoing Effects in the Treatment of Posttraumatic Stress Disorder, I. o. M. (2012t). *Treatment for posttraumatic stress disorder in military and veteran populations: Initial assessment.* The National Academies Press.

Committee on Treatment of Posttraumatic Stress Disorder, & Institute of Medicine (2008t). *Treatment of posttraumatic stress disorder: An assessment of the evidence.* Washington, DC: National Academies Press.

Cottraux, J., Note, I., Yao, S.N., de Mey-Guillard, C., Bonasse, F., Djamoussian, D., ... Chen, Y. (2008). Randomized controlled comparison of cognitive behavior therapy with Rogerian supportive therapy in chronic post-traumatic stress disorder: A 2-year follow-up. *Psychotherapy and Psychosomatics*, *77*(2), 101–110. http://dx.doi.org/10.1159/000112887.

Cox, K.S., Resnick, H.S., & Kilpatrick, D.G. (2014). Prevalence and correlates of posttrauma distorted beliefs: Evaluating DSM-5 PTSD expanded cognitive symptoms in a national sample. *Journal of Traumatic Stress*, *27*, 299–306.

Dohrenwend, B.P., Turner, J.B., Turse, N.A., Adams, B.G., Koenen, K.C., & Marshall, R. (2006). The psychological risks of Vietnam for U.S. veterans: A revisit with new data and methods. *Science*, *313*(5789), 979–982. http://dx.doi.org/10.1126/science.1128944 313/5789/979 [pii].

Ehlers, A., Hackmann, A., Grey, N., Wild, J., Liness, S., Albert, I., ... Clark, D.M. (2014). A randomized controlled trial of 7-day intensive and standard weekly cognitive therapy for PTSD and emotion-focused supportive therapy. *The American Journal of Psychiatry*, *171*(3), 294–304. http://dx.doi.org/10.1176/appi.ajp.2013.13040552.

Fletcher, S., Creamer, M., & Forbes, D. (2010). Preventing post traumatic stress disorder: Are drugs the answer? [Review]. *Australian and New Zealand Journal of Psychiatry*, *44*(12), 1064–1071.

Foa, E.B., Hembree, E.A., Cahill, S.P., Rauch, S.A., Riggs, D.S., Feeny, N.C., & Yadin, E. (2005). Randomized trial of prolonged exposure for posttraumatic stress disorder with and without cognitive restructuring: Outcome at academic and community clinics. *Journal of Consulting and Clinical Psychology*, *73*(5), 953–964. http://dx.doi.org/10.1037/0022-006×.73.5.953.

Foa, E.B., Keane, T.M., Friedman, M.J., & Cohen, J.A. (Eds.). (2008). *Effective treatments for PTSD: Practice guidelines from the international society for traumatic stress studies* (2nd ed.). New York, NY: Guilford Press.

Foa, E.B., Yusko, D.A., McLean, C.P., Suvak, M.K., Bux, D.A., Jr., Oslin, D., ... Volpicelli, J. (2013). Concurrent naltrexone and prolonged exposure therapy for patients with comorbid alcohol dependence and PTSD: A randomized clinical trial. *JAMA*, *310*(5), 488–495. http://dx.doi.org/10.1001/jama.2013.8268.

Forbes, D., Creamer, M., Bisson, J.I., Cohen, J.A., Crow, B.E., Foa, E.B., ... Ursano, R.J. (2010). A guide to guidelines for the treatment of PTSD and related conditions. *Journal of Traumatic Stress*, *23*(5), 537–552. http://dx.doi.org/10.1002/jts.20565.

Forbes, D., Lloyd, D., Nixon, R.D.V., Elliott, P., Varker, T., Perry, D., ... Creamer, M. (2012). A multisite randomized controlled effectiveness trial of cognitive processing therapy for military-related posttraumatic stress disorder. *Journal of Anxiety Disorders*, *26*(3), 442–452.

Ford, J.D., Steinberg, K.L., & Zhang, W. (2011). A randomized clinical trial comparing affect regulation and social problem-solving psychotherapies for mothers with victimization-related PTSD. *Behavior Therapy*, *42*(4), 560–578. http://dx.doi.org/10.1016/j.beth.2010.12.005.

Friedman, M.J. (2003). *Post traumatic stress disorder: the latest assessment and treatment strategies* (3rd ed.). Kansas City, MO: Compact Clinicals.

Gamito, P., Oliveira, J., Rosa, P., Morais, D., Duarte, N., Oliveira, S., & Saraiva, T. (2010). PTSD elderly war veterans: A clinical controlled pilot study. *Cyberpsychology, Behavior and Social Networking*, *13*(1), 43–48.

Gartlehner, G., Hansen, R.A., Morgan, L.C., Thaler, K., Lux, L.J., Van Noord, M., ... Lohr, K.N. (2011). *Second-generation antidepressants in the pharmacologic treatment of adult depression: An update of the 2007 comparative effectiveness review.* Rockville (MD).

Gersons, B.P., Carlier, I.V.E., & Olff, M. (2004). *Manual brief eclectic psychotherapy (BEP) for posttraumatic stress disorder.* Amsterdam: Academic Medical Centre.

Gersons, B.P., Carlier, I.V., Lamberts, R.D., & van der Kolk, B.A. (2000). Randomized clinical trial of brief eclectic psychotherapy for police officers with posttraumatic stress disorder. *Journal of Traumatic Stress*, *13*(2), 333–347. http://dx.doi.org/10.1023/a:1007793803627.

Harvey, A.G., Bryant, R.A., & Tarrier, N. (2003). Cognitive behaviour therapy for posttraumatic stress disorder. *Clinical Psychology Review*, *23*(3), 501–522.

Hien, D.A., Cohen, L.R., Miele, G.M., Litt, L.C., & Capstick, C. (2004). Promising treatments for women with comorbid PTSD and substance use disorders. *The American Journal of Psychiatry*, *161*(8), 1426–1432. http://dx.doi.org/10.1176/appi.ajp.161.8.1426.

Higgins, J.P., & Thompson, S.G. (2002). Quantifying heterogeneity in a meta-analysis. *Statistics in Medicine*, *21*(11), 1539–1558. http://dx.doi.org/10.1002/sim.1186.

Higgins, J.P., Thompson, S.G., Deeks, J.J., & Altman, D.G. (2003). Measuring inconsistency in meta-analyses. *BMJ*, *327*(7414), 557–560. http://dx.doi.org/10.1136/bmj.327.7414.557.

Hogberg, G., Pagani, M., Sundin, O., Soares, J., Aberg-Wistedt, A., Tarnell, B., & Hallstrom, T. (2007). On treatment with eye movement desensitization and reprocessing of chronic post-traumatic stress disorder in public transportation workers — A randomized controlled trial. [Article]. *Nordic Journal of Psychiatry*, *61*(1), 54–61.

Hollifield, M., Sinclair-Lian, N., Warner, T.D., & Hammerschlag, R. (2007). Acupuncture for posttraumatic stress disorder: A randomized controlled pilot trial. *The Journal of Nervous and Mental Disease*, *195*(6), 504–513. http://dx.doi.org/10.1097/NMD.0b013e31803044f8.

Institute of Medicine (2007). *Treatment of PTSD: Assessment of the evidence.* Washington, DC: National Academies Press.

Jonas, D.E., Cusack, K., Forneris, C.A., Wilkins, T.M., Sonis, J., Middleton, J.C., ... Gaynes, B.N. (2013). Psychological and pharmacological treatments for adults with posttraumatic stress disorder (PTSD) (provisional abstract). *Database of abstracts of reviews of effects*, *4* Retrieved from http://onlinelibrary.wiley.com/o/cochrane/cldare/articles/DARE-12013017989/frame.html.

Khan, A., Khan, S.R., Leventhal, R.M., & Brown, W.A. (2001a). Symptom reduction and suicide risk among patients treated with placebo in antipsychotic clinical trials: An analysis of the food and drug administration database. *American Journal of Psychiatry*, *158*(9), 1449–1454.

Khan, A., Khan, S.R., Leventhal, R.M., & Brown, W.A. (2001b). Symptom reduction and suicide risk in patients treated with placebo in antidepressant clinical trials: A replication analysis of the food and drug administration database. [Clinical trial controlled clinical trial]. *The International Journal of Neuropsychopharmacology*, *4*(2), 113–118. http://dx.doi.org/10.1017/S1461145701002322.

Krakow, B., Hollifield, M., Johnston, L., Koss, M., Schrader, R., Warner, T.D., ... Prince, H. (2001). Imagery rehearsal therapy for chronic nightmares in sexual assault survivors with post-traumatic stress disorder: A randomized controlled trial. *JAMA*, *286*(5), 537–545.

Kuehn, B.M. (2012). Military PTSD care. *JAMA*, *308*(8) 753–753.

Litz, B.T., Engel, C.C., Bryant, R.A., & Papa, A. (2007). A randomized, controlled proof-of-concept trial of an Internet-based, therapist-assisted self-management treatment for posttraumatic stress disorder. *The American Journal of Psychiatry*, *164*(11), 1676–1683. http://dx.doi.org/10.1176/appi.ajp.2007.06122057.

Mills, K.L., Teesson, M., Back, S.E., Brady, K.T., Baker, A.L., Hopwood, S., ... Ewer, P.L. (2012). Integrated exposure-based therapy for co-occurring posttraumatic stress disorder and substance dependence: A randomized controlled trial. *JAMA*, *308*(7), 690–699. http://dx.doi.org/10.1001/jama.2012.9071.

Monson, C.M., Schnurr, P.P., Resick, P.A., Friedman, M.J., Young-Xu, Y., & Stevens, S.P. (2006). Cognitive processing therapy for veterans with military-related posttraumatic stress disorder. *Journal of Consulting and Clinical Psychology*, *74*(5), 898–907. http://dx.doi.org/10.1037/0022-006×.74.5.898.

Nacasch, N., Foa, E.B., Huppert, J.D., Tzur, D., Fostick, L., Dinstein, Y., ... Zohar, J. (2011). Prolonged exposure therapy for combat- and terror-related posttraumatic stress disorder: A randomized control comparison with treatment as usual. *The Journal of Clinical Psychiatry*, *72*(9), 1174–1180. http://dx.doi.org/10.4088/JCP.09m05682blu.

National Institute for Health and Clinical Excellence (2005). *Post-traumatic stress disorder.* London.

Neuner, F., Kurreck, S., Ruf, M., Odenwald, M., Elbert, T., & Schauer, M. (2010). Can asylum-seekers with posttraumatic stress disorder be successfully treated? A randomized controlled pilot study. *Cogn Behav Ther*, *39*(2), 81–91. http://dx.doi.org/10.1080/16506070903121042.

Neuner, F., Schauer, M., Klaschik, C., Karunakara, U., & Elbert, T. (2004). A comparison of narrative exposure therapy, supportive counseling, and psychoeducation for treating posttraumatic stress disorder in an African refugee settlement. *Journal of Consulting and Clinical Psychology*, *72*(4), 579–587. http://dx.doi.org/10.1037/0022-006×.72.4.579.

Norris, F., & Sloane, L.B. (2007). The epidemiology of trauma and PTSD. In M.J. Friedman, T.M. Keane, & P.A. Resick (Eds.), *Handbook of PTSD: Science and practice* (pp. 78–98). New York, NY: Guilford Press.

Owens, D.K., Lohr, K.N., Atkins, D., Treadwell, J.R., Reston, J.T., Bass, E.B., ... Helfand, M. (2010). AHRQ series paper 5: Grading the strength of a body of evidence when comparing medical interventions—Agency for healthcare research and quality and the effective health-care program. *Journal of Clinical Epidemiology*, *63*(5), 513–523. http://dx.doi.org/10.1016/j.jclinepi.2009.03.009.

Please cite this article as: Cusack, K., et al., Psychological treatments for adults with posttraumatic stress disorder: A systematic review and meta-analysis, *Clinical Psychology Review* (2015), http://dx.doi.org/10.1016/j.cpr.2015.10.003

Resick, P., & Schnicke, M. (1993). *Cognitive processing therapy for rape victims: A treatment manual.* Thousand Oaks, CA: Sage Publications.

Resick, P.A., Galovski, T.E., Uhlmansick, M.O., Scher, C.D., Clum, G.A., & Young-Xu, Y. (2008). A randomized clinical trial to dismantle components of cognitive processing therapy for posttraumatic stress disorder in female victims of interpersonal violence. *Journal of Consulting and Clinical Psychology*, *76*(2), 243–258.

Rothbaum, B.O., Cahill, S.P., Foa, E.B., Davidson, J.R., Compton, J., Connor, K.M., ... Hahn, C.G. (2006). Augmentation of sertraline with prolonged exposure in the treatment of posttraumatic stress disorder. *Journal of Traumatic Stress*, *19*(5), 625–638. http://dx.doi.org/10.1002/jts.20170.

Sannibale, C., Teesson, M., Creamer, M.C., Sitharthan, T., Bryant, R.A., Sutherland, K., ... Peek-O'Leary, M. (2013). Randomized controlled trial of cognitive behaviour therapy for comorbid post-traumatic stress disorder and alcohol use disorders. *Addiction*, *108*(8), 1397–1410. http://dx.doi.org/10.1111/add.12167.

Schneider, R.L., Arch, J.J., & Wolitsky-Taylor, K.B. (2015). The state of personalized treatment for anxiety disorders: A systematic review of treatment moderators. *Clinical Psychology Review*, *38*, 39–54.

Schneier, F.R., Neria, Y., Pavlicova, M., Hembree, E., Suh, E.J., Amsel, L., & Marshall, R.D. (2012). Combined prolonged exposure therapy and paroxetine for PTSD related to the World Trade Center attack: A randomized controlled trial. *The American Journal of Psychiatry*, *169*(1), 80–88. http://dx.doi.org/10.1176/appi.ajp.2011.11020321 appi.ajp.2011.11020321 [pii].

Schnurr, P. P., Friedman, M. J., Engel, C. C., Foa, E. B., Shea, M. T., Chow, B. K., ... Bernardy, N. (2007). Cognitive behavioral therapy for posttraumatic stress disorder in women - A randomized controlled trial. [Article]. *Journal of the American Medical Association*, *297*(8), 820–830.

Schnurr, P.P., Friedman, M.J., Foy, D.W., Shea, M.T., Hsieh, F.Y., Lavori, P.W., ... Bernardy, N.C. (2003). Randomized trial of trauma-focused group therapy for posttraumatic stress disorder — Results from a Department of Veterans Affairs cooperative study. [Article; proceedings paper]. *Archives of General Psychiatry*, *60*(5), 481–489.

Stuart, S. (2006). Interpersonal psychotherapy: a guide to the basics. *Psychiatric Annals*, *36*(8), 542–550.

Sutton, A.J., Abrams, K.R., Jones, D.R., et al. (2000). *Methods for meta-analysis in medical research (Wiley series in probability and statistics — Applied probability and statistics section).* London: Wiley.

VA/DoD Clinical Practice Guideline Working Group (2004). *Management of post-traumatic stress.* Washington, DC: VA Office of Quality and Performance.

van der Kolk, B.A., Spinazzola, J., Blaustein, M.E., Hopper, J.W., Hopper, E.K., Korn, D.L., & Simpson, W.B. (2007). A randomized clinical trial of eye movement desensitization and reprocessing (EMDR), fluoxetine, and pill placebo in the treatment of posttraumatic stress disorder: Treatment effects and long-term maintenance. *The Journal of Clinical Psychiatry*, *68*(1), 37–46.

Viswanathan, M., Ansari, M.T., Berkman, N.D., Chang, S., Hartling, L., McPheeters, L.M., ... Treadwell, J.R. (2012). *Assessing the risk of bias of individual studies in systematic reviews of health care interventions.* Rockville, MD: Methods Guide for Comparative Effectiveness Reviews.

Wood, D.P., Murphy, J., McLay, R., Koffman, R., Spira, J., Obrecht, R.E., ... Wiederhold, B.K. (2009). Cost effectiveness of virtual reality graded exposure therapy with physiological monitoring for the treatment of combat related post traumatic stress disorder. *Annual Review of CyberTherapy and Telemedicine*, *7*, 223.

Please cite this article as: Cusack, K., et al., Psychological treatments for adults with posttraumatic stress disorder: A systematic review and meta-analysis, *Clinical Psychology Review* (2015), http://dx.doi.org/10.1016/j.cpr.2015.10.003

TABLE S1. Questions for the Full Technical Report for the Effective Healthcare Program of the Agency for Healthcare Research and Quality	
1	What is the comparative effectiveness of different psychological treatments for adults diagnosed with PTSD?
2	What is the comparative effectiveness of different pharmacological treatments for adults diagnosed with PTSD?
3	What is the comparative effectiveness of different psychological treatments versus pharmacological treatments for adults diagnosed with PTSD?
4	How do combinations of psychological treatments and pharmacological treatments (e.g., CBT plus paroxetine) compare with either one alone (i.e., one psychological or one pharmacological treatment)?
5	Are any of the treatment approaches for PTSD more effective than other approaches for victims of particular types of trauma?
6	What adverse effects are associated with treatments for adults diagnosed with PTSD?

Supplementary Methods. Methodology and WinBUGS Code Used in Our Network Meta-Analysis

We used the methodology and WinBUGS code described in the NICE Evidence Synthesis Technical Support Document 2,(Dias, Welton, Sutton, & Ades, 2011) which details the generalized linear modeling (GLM) framework for conducting a network meta-analysis of randomized controlled trials. Given the continuous nature of our outcome measure, the GLM model was fit with a normal likelihood and identity link function. We used a random effects model that adjusted for correlations between arms within each study, and study effect and treatment effect parameters were modeled by vague (flat) prior distributions that were Normal (0, 10000). For the between-trial variance, we used a uniform prior distribution centered at zero with sufficiently large variance. The first 20,000 simulations were discarded to allow for model convergence and then a further 80,000 simulations were used in estimating the posterior probabilities. Satisfactory convergence was verified by trace plots and calculation of the Monte Carlo error for each parameter. No inconsistencies in the network were detected, and to minimize between-trial heterogeneity, we assessed the clinical and methodological heterogeneity of the studies in the analysis following established guidance.(West et al., 2010) The WinBUGS code used to conduct the MTC meta-analysis is given below. WinBUGS Version 1.4.3 was used for all analyses.

Random Effects Model for Continuous Outcome Data

```
# Normal likelihood, identity link
# Random effects model for multi-arm trials

model{                          # *** PROGRAM STARTS

for(i in 1:ns){                  #   LOOP THROUGH STUDIES
   w[i,1] <- 0    # adjustment for multi-arm trials is zero for control arm
   delta[i,1] <- 0           # treatment effect is zero for control arm
   mu[i] ~ dnorm(0,.0001)          # vague priors for all trial baselines
   for (k in 1:na[i]) {            #  LOOP THROUGH ARMS
      var[i,k] <- pow(se[i,k],2)   # calculate variances
      prec[i,k] <- 1/var[i,k]      # set precisions
      y[i,k] ~ dnorm(theta[i,k],prec[i,k]) # binomial likelihood
      theta[i,k] <- mu[i] + delta[i,k]  # model for linear predictor
#Deviance contribution
      dev[i,k] <- (y[i,k]-theta[i,k])*(y[i,k]-theta[i,k])*prec[i,k]
    }
#  summed residual deviance contribution for this trial
   resdev[i] <- sum(dev[i,1:na[i]])
   for (k in 2:na[i]) {            # LOOP THROUGH ARMS
# trial-specific LOR distributions
```

```
      delta[i,k] ~ dnorm(md[i,k],taud[i,k])
# mean of LOR distributions, with multi-arm trial correction
      md[i,k] <-  d[t[i,k]] - d[t[i,1]] + sw[i,k]
# precision of LOR distributions (with multi-arm trial correction)
      taud[i,k] <- tau *2*(k-1)/k
# adjustment, multi-arm RCTs
      w[i,k] <- (delta[i,k] - d[t[i,k]] + d[t[i,1]])
# cumulative adjustment for multi-arm trials
      sw[i,k] <- sum(w[i,1:k-1])/(k-1)
    }
  }
totresdev <- sum(resdev[])           #Total Residual Deviance
d[1]<-0      # treatment effect is zero for control arm
# vague priors for treatment effects
for (k in 2:nt){  d[k] ~ dnorm(0,.0001) }
sd ~ dunif(0,5)     # vague prior for between-trial SD
tau <- pow(sd,-2)   # between-trial precision = (1/between-trial variance)

# All pairwise comparisons
for (c in 1:(nt-1)) {  for (k in (c+1):nt)  { diff[c,k] <- (d[c] - d[k] )}}
}                              # *** PROGRAM ENDS
```

WinBUGS Dataset

#Description of data inputs

#ns = Number of studies

#nt = Number of treatments (including placebo)

#t[,x] = Treatment indicator

#y[,x] = Mean change from baseline in CAPS Total score

#se[,x]= Standard error of mean change from baseline in CAPS Total score

#na[] = Number of arms in study

list(ns=28, nt=14)

t[,1]	t[,2]	t[,3]	y[,1]	y[,2]	y[,3]	se[,1]	se[,2]	se[,3]	na[]
1	2	NA	-16.99	-12.33	NA	3.5607	5.6851	NA	2
1	3	11	-38.7	-30.72	-41.82	8.0037	4.556	5.2817	3
1	5	NA	-16.5	-15.1	NA	3.6112	3.3211	NA	2
1	6	6	-36.6	-42.9	-42.8	2.7396	1.8093	2.2057	3
1	6	NA	-26.8	-34.6	NA	3.0138	1.8692	NA	2
1	6	NA	-26.75	-31.03	NA	3.6489	3.5219	NA	2
1	6	NA	0	-12.59	NA	4.2028	4.0734	NA	2
1	7	NA	-2.67	-14.8	NA	3.5167	4.4778	NA	2
1	8	8	-25.3	-39.6	-37.9	1.8817	1.8744	2.0988	3
1	8	NA	-24.7	-35.5	NA	1.9748	1.9253	NA	2
1	9	NA	-7	-13	NA	4.9229	5.1105	NA	2
1	9	NA	2.9	-21.8	NA	11.677	12.515	NA	2
1	10	NA	-4.6	-14.3	NA	2.3335	2.9071	NA	2
1	10	NA	-11.04	-13.77	NA	1.3	1.27	NA	2
1	10	NA	-10.1	-9	NA	4.3063	5.4188	NA	2
1	10	NA	-18.6	-29.6	NA	4.1	9.0933	NA	2

1	11	14	-34.17	-39.44	-41.5	2.0865	2.1577	2.1173	3
1	11	NA	-26.2	-33	NA	2.2574	2.38	NA	2
1	11	NA	-32.7	-32.56	NA	4.2858	2.2414	NA	2
1	11	NA	-13.5	-18.7	NA	1.5141	1.397	NA	2
1	11	NA	-15.4	-13.1	NA	3.0997	2.9999	NA	2
1	11	NA	-23.2	-33	NA	2.9004	2.8003	NA	2
1	12	NA	-30.2	-30.7	NA	2.4419	2.3305	NA	2
1	13	NA	-42	-52.7	NA	14.41	18.92	NA	2
1	13	NA	-30.36	-48.35	NA	7.0232	6.526	NA	2
1	13	NA	-2.28	-17.95	NA	1.5615	1.3651	NA	2
1	14	NA	-44.8	-51.8	NA	1.9882	1.7855	NA	2
4	8	NA	-33.22	-36.44	NA	5.3794	4.8915	NA	2

END

#Initial Values
#chain 1
list(d=c(NA,0,0,0,0,0,0,0,0,0,0,0,0,0), sd=1,
mu=c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0,0))

#chain 2
list(d=c(NA, -1, -3, -1, 1, 3, -1, 1, -3, 1, -1, 3, 1, -3), sd=4,
mu=c(-3, -3, -3, -3, -3, -3, -3, -2, -3, -3,
-3, -3, -3, -3, -3, -3, -3, -2, -3, -3,
-3, -3, -3, -3, -3, -3, -3, -3))

#chain 3
list(d=c(NA, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,2), sd=2,
mu=c(-3, 5, -1, -3, 7, -3, -4,
-3, 5, -1, -3, 7, -3, -4,
-3, 5, -1, -3, 7, -3, -4,
-3, 5, -1, -3, 7, -3, -4))

TABLE S2. Definitions of the Grades of Overall Strength of Evidence (Owens et al., 2010)

Grade	Definition
High	High confidence that the evidence reflects the true effect. Further research is very unlikely to change our confidence in the estimate of effect.
Moderate	Moderate confidence that the evidence reflects the true effect. Further research may change our confidence in the estimate of the effect and may change the estimate.
Low	Low confidence that the evidence reflects the true effect. Further research is likely to change our confidence in the estimate of the effect and is likely to change the estimate.
Insufficient	Evidence either is unavailable or does not permit estimation of an effect.

TABLE S3. Characteristics of Included Trials Evaluating Psychological Treatments

Study	Arm (N)	Duration (Followup)	Population Trauma Type	Baseline PTSD Severity[a]	Mean Age (y)	Mean % F	Mean % Non-white	Risk of Bias
Asukai et al., 2010(Asukai, Saito, Tsuruta, Kishimoto, & Nishikawa, 2010)	PE (12) UC (12)	8 to 15 weekly sessions[b] (3 mths, 6 mths, 12 mths)	Male & Female Mixed	84.3 to 84.6	29	88	100	Medium
Basoglu et al., 2007(Basoglu, Salcioglu, & Livanou, 2007)	In vivo (16) WL (15)	1 session[b] (4 wks, 8 wks, 12 wks, 24 wks, 1 year)	Male & Female Natural Disaster	62.3 to 63.1	34	87	NR	Medium
Blanchard et al., 2003(Blanchard et al., 2003)	CBT-M (27) SC (27) WL (24)	8 to 12 weeks (3 mths)	Male & Female MVA	65.0 to 68.2	41	73	10	Medium
Boden et al., 2012(Boden et al., 2012)	SS (59) TAU (58)	12 weeks	Male Combat	IES-R 46.8 to 47.7	54	0	74	Medium
Bryant et al., 2003(Bryant, Moulds, Guthrie, Dang, & Nixon, 2003)	IE (20) CBT-M (Imaginal+CR) (20) SC (18)	8 weeks	Male & Female Mixed	CAPS-I intensity 32.5 to 32.9	35	52	NR	Medium
Bryant et al., 2008(Bryant et al., 2008)	PE (31) CBT-M (PE+CR) (28) IE (31) In vivo exp (28)	8 weeks	Male & Female Mixed	71.4 to 76.8	37	NR	8	Medium
Carlson et al.,	Relax (13) EMDR (10)	6 weeks (3 mths,9 mths)	Male Vietnam combat	M-PTSD 117.5 to 119.4	49	0	46	Medium

1998(Carlson, Chemtob, Rusnak, Hedlund, & Muraoka, 1998)	TAU (12)		veterans					
Chard et al., 2005(Chard, 2005)	CPT (36) MA (35)	17 weeks (3 mths,12 mths)	Female Childhood sexual abuse	65.5 to 68.3	33	100	19	Medium
Cloitre et al., 2002(M. Cloitre, Koenen, Cohen, & Han, 2002)	CBT-M (31) WL (27)	12 months	Female Childhood abuse	69	34	100	54	Medium
Cloitre et al., 2010(M. Cloitre et al., 2010) Cloitre et al., 2012(Marylène Cloitre, Petkova, Wang, & Lu, 2012)	CBT-M (33) CBT-M (38) CBT-M (33)	16 weeks (3 mths, 6 mths)	Female Mixed childhood abuse	63.1 to 64.5	36	100	64	Medium

TABLE S3. Characteristics of Included Trials Evaluating Psychological Treatments (cont)

Study	Arm (N)	Duration (Followup)	Population Trauma Type	Baseline PTSD Severity[a]	Mean Age (y)	Mean % F	Mean % Non-white	Risk of Bias
Cook et al., 2010(Cook et al., 2010)	IRT (61) PsychEd (63)	6 weeks (1 mth, 3 mths,6 mths)	Male Combat	79.5 to 81.3	59	0	58	Medium
Cottraux et al., 2008(Cottraux et al., 2008)	CBT-M (31) SC (29)	16 weeks (1 yr, 2 yrs)	Male & Female Mixed	PCLS 60.8	39	70	NR	Medium
Dunne et al., 2012(Dunne, Kenardy, & Sterling, 2012)	CBT-M (13) WL (13)	10 weeks (6 mths)	Male & Female MVA Whiplash	PDS 21.39 to 23.31	33	50	NR	Medium
Ehlers et al., 2003(Ehlers et al., 2003)	CT (28) SHB (28) RA (29)	Mean 9 weeks, 0 to 3 booster sessions, (3 mths, 6 mths, 9 mths)	Male & Female MVA	PDS (frequency) 30.0 PDS (distress) 30.8	39	72	97	Medium
Ehlers et al., 2005(Ehlers, Clark, Hackmann, McManus, & Fennell, 2005)	CBT-M (14) WL (14)	4 to12 weeks plus up to 3 monthly boosters (3 mths,6 mths)	Male & Female Mixed	CAPS-frequency 31.6 to 42.0 CAPS-intensity 29.0 to 36.5	37	54	4	Medium
Ehlers et al., 2014(Ehlers et al., 2014)	CT – Intensive (30) CT – Weekly (31) SC (30) WL (30)	7 day to 3 months (7 mths, 10 mths)	Male & Female Mixed	69.95 to 78.72	39	59	30	Medium

TABLE S3. Characteristics of Included Trials Evaluating Psychological Treatments (cont)

Study	Arm (N)	Duration (Followup)	Population Trauma Type	Baseline PTSD Severity[a]	Mean Age (y)	Mean % F	Mean % Non-white	Risk of Bias
Fecteau et al., 1999(Fecteau & Nicki, 1999)	CBT-M (22) WL (21)	4 weeks (6 mths)	Male & Female MVA	70.9 to 77.3	41	70	NR	Medium
Foa et al., 1999(Foa et al., 1999) Zoellner et al., 1999(Zoellner, Feeny, Fitzgibbons, & Foa, 1999)	SIT (26) PE (25) CBT-M (PE+SIT) (30) WL (15)	9 weeks (3 mths, 6 mths, 9 mths)	Female Assault	PSS-I 29.4 to 32.9	35	100	36	Medium
Foa et al., 2005(Foa et al., 2005)	Total 190 PE (NR) CBT-M (PE+CR) (NR) WL (NR)	9 to 12 weeks	Female Assault	PSS-I 31.1 to 34.0	31	100	51	Medium
Foa et al., 2013(Foa et al., 2013)	PE + Naltrexone (40) PE + Placebo (40) SC + Naltrexone (42) SC + Placebo (43)	12 weeks + 6 bi-weekly (3mths, 6 mths)	Male & Female Comorbid SUD Mixed	PSS-I 27.1 to 30.3	43	35	70	Medium
Forbes et al., 2012(Forbes et al., 2012)	CPT (30) TAU (29)	12 weeks (3mths)	Male & Female Combat/Military Related	65.8 to 75.5	53	3	0	Medium

TABLE S3. Characteristics of Included Trials Evaluating Psychological Treatments (cont)

Study	Arm (N)	Duration (Followup)	Population Trauma Type	Baseline PTSD Severity[a]	Mean Age (y)	Mean % F	Mean % Non-white	Risk of Bias
Ford et al., 2011(Ford, Steinberg, & Zhang, 2011)	Trauma Affect Regulation (48) PCT (53) WL (45)	12 sessions[b] (3mths, 6mths)	Female Victimization or incarceration	61.9 to 68.7	31	100	59	Medium
Gamito et al., 2010(Gamito et al., 2010)	VR (5) IE (2) WL (3)	12 sessions[b]	Male Combat	NR	64	0	NR	Medium
Gersons et al., 2000(Gersons, Carlier, Lamberts, & van der Kolk, 2000)	BEP (22) WL (20)	16 weeks (3 mths)	Male & Female Police officers; Trauma type NR	NR	37	12	NR	Medium
Hien et al., 2004(D. A. Hien, Cohen, Miele, Litt, & Capstick, 2004)	Total 107 SS (unclear) RPC (unclear) UC (unclear)	12 weeks	Female Mixed w/Substance Abuse Disorders	70.4 to 73.9	37	100	63	Medium
Hien et al., 2009(D. A. Hien et al., 2009) Hien et al., 2012(Denise A. Hien et al., 2012)	SS (176) PsychEd[c] (177)	6 weeks	Female Mixed	61.6 to 64.2	39	100	54	Medium

TABLE S3. Characteristics of Included Trials Evaluating Psychological Treatments (cont)

Study	Arm (N)	Duration (Followup)	Population Trauma Type	Baseline PTSD Severity[a]	Mean Age (y)	Mean % F	Mean % Non-white	Risk of Bias
Hinton et al., 2005(Hinton et al., 2005)	CBT-M (20) WL (20)	12 weeks	Male & Female Cambodian refugees	74.9 to 75.9	52	60	100	Medium
Hinton et al., 2009(Hinton, Hofmann, Pollack, & Otto, 2009)	CBT-M (12) CBT-M (12)	12 weeks	Male & Female Cambodian refugees Witnessed genocide	75.4 to 77.3	50	60	100	Medium
Hinton et al., 2011(Hinton, Hofmann, Rivera, Otto, & Pollack, 2011)	CBT-M (12) Relax (12)	14 weeks (12 weeks)	Female Trauma NR	PCL 69.8 to 71.1	50	100	100	Medium
Hogberg et al., 2007(Hogberg et al., 2007)	EMDR (13) WL (11)	2 mths	Swedish public transportation employees	IES 39	43	21	NR	Medium
Hollifield et al., 2007(Hollifield, Sinclair-Lian, Warner, & Hammerschlag, 2007)	Acupuncture (29) CBT-M(28) WL (27)	12 weeks (3 mths)	Male &Female Mixed	PSS-SR 30.8 to 32.5	42	48	24	Medium

TABLE S3. Characteristics of Included Trials Evaluating Psychological Treatments (cont)

Study	Arm (N)	Duration (Followup)	Population Trauma Type	Baseline PTSD Severity[a]	Mean Age (y)	Mean % F	Mean % Non-white	Risk of Bias
Johnson et al., 2011(Johnson, Zlotnick, & Perez, 2011)	CBT-M (35) UC (35)	8 months (1 wk, 3 mths, 6 mths)	Female Interpersonal violence	53.3 to 62.7	33	100	57	Medium
Krakow et al., 2001(Krakow et al., 2001)	IRT (88) WL (80)	3 sessions (2 a wk apart,1 session 3 wks later)[b] (3 mth, 6 mth)	Female Sexual abuse, assault	79.6 to 81.9	38[d]	100	21	Medium
Kruse et al., 2009(Kruse, Joksimovic, Cavka, Woller, & Schmitz, 2009)	CBT-M (35) UC (35)	3 mths wkly; then once every 2 weeks for total of 25 hrs (12 mths)	Male & Female Refugees	NR	45	67	NR	Medium
Kubany et al., 2003(Kubany, Hill, & Owens, 2003)	CBT-M (19) WL (18)	8 to 11 sessions[b] (3 mths)	Female Interpersonal violence	80.1 to 80.2	35	100	51	Medium
Kubany et al., 2004(Kubany et al., 2004)	CBT-M (63) WL (62)	4 to 5.5 weeks (3mths, 6mths)	Female Interpersonal violence	74.1 to 74.4	42	100	47	Medium
Liedl et al., 2011(Liedl et al., 2011)	CBT-M (12) CBT-M (12) WL (12)	10 sessions[b] (mean of 4.8 months) (3 mths)	Male & Female Refugees w/chronic pain	PDS 25.6 to 31.2	42	43	NR	Medium

TABLE S3. Characteristics of Included Trials Evaluating Psychological Treatments (cont)

Study	Arm (N)	Duration (Followup)	Population Trauma Type	Baseline PTSD Severity[a]	Mean Age (y)	Mean % F	Mean % Non-white	Risk of Bias
Lindauer et al., 2005(Lindauer et al., 2005)	BEP (12) WL (12)	16 weeks	Male & Female Mixed	NR	39	54	NR	Medium
Litz et al., 2007(Litz, Engel, Bryant, & Papa, 2007)	CBT-M (24) SC (21)	8 weeks (3 mths, 6 mths)	Male & Female Combat	PSS-I 26.7 to 29.2	39	22	30	Medium
Marks et al., 1998(Marks, Lovell, Noshirvani, Livanou, & Thrasher, 1998) Lovell et al., 2001(Lovell, Marks, Noshirvani, Thrasher, & Livanou, 2001)	PE (23) CR (13) CR+PE (24) Relax (21)	10 sessions (mean of 16 weeks), (1 mth, 3 mths, 6 mths)	Male & female Mixed	CAPS Severity 2.6 to 3.2	38	36	NR	Medium
McDonagh et al., 2005(McDonagh et al., 2005)	CBT-M (29) PCT (22) WL (23)	14 weeks (3 mths, 6 mths)	Female Childhood sexual abuse	67.7 to 72.0	41	100	7	Medium
Mills et al., 2012(Mills et al., 2012)	COPE + UC (55) UC (48)	13 weeks (9 mths)	Male & Female Comorbid SUD Mixed	89 to 91	34	64	15	Medium

TABLE S3. Characteristics of Included Trials Evaluating Psychological Treatments (cont)

Study	Arm (N)	Duration (Followup)	Population Trauma Type	Baseline PTSD Severity[a]	Mean Age (y)	Mean % F	Mean % Non-white	Risk of Bias
Monson et al., 2006(Monson et al., 2006)	CPT (30) WL (30)	10 weeks (1 mth)	Male & Female Combat	76.7 to 79.1	54	10	4	Medium
Mueser et al., 2008(Mueser et al., 2008)	CBT-M (54) UC (54)	12 to 16 sessions[b]	Male & Female Mixed	74.5 to 76.2	44	79	16	Medium
Nacasch et al., 2011(Nacasch et al., 2011)	PE (15) TAU (15)	9 to 15 weeks (12 mths)	Male & Female Combat or Terror	PSS-I 36.8 to 37.1	34	NR	100	Medium
Neuner et al., 2004(Neuner, Schauer, Klaschik, Karunakara, & Elbert, 2004)	NET (17) Trauma Couns (14) PsychEd (12)	3 to 4 weeks (4 mths,12 mths)	Male & Female Sudanese refugees	PDS 19.5 to 25.2	33	61	100	Medium
Neuner et al., 2008(Neuner et al., 2008)	NET (111) Trauma Couns (111) MG (No Intervention) (55)	3 weeks (6 mths)	Male & Female Rwandan and Somalian refugees	PDS 21.3 to 26.7	35	51	100	Medium
Neuner et al., 2010(Neuner et al., 2010)	NET (16) TAU (16)	Weekly or bi-weekly sessions (median 9)[e]	Male & Female Asylum Seekers	PDS 36.9 to 38.9	31	31	NR	Medium

TABLE S3. Characteristics of Included Trials Evaluating Psychological Treatments (cont)

Study	Arm (N)	Duration (Followup)	Population Trauma Type	Baseline PTSD Severity[a]	Mean Age (y)	Mean % F	Mean % Non-white	Risk of Bias
Nijdam et al., 2012(Nijdam, Gersons, Reitsma, de Jongh, & Olff, 2012)	BEP (70) EMDR (70)	17 weeks	Male & Female Mixed	IES-R 72.8 to 79.9	38	56	100	Medium
Resick et al., 2002(Resick, Nishith, Weaver, Astin, & Feuer, 2002) Resick, et al., 2003(Resick, Nishith, & Griffin, 2003) Resick et al., 2012(Resick, Williams, Suvak, Monson, & Gradus, 2012)	CPT (62) PE (62) MA (47)	6 weeks (3 mths, 9 mths, 5 to 10 years)	Female Adult sexual assault	CAPS-SX 69.9 to 76.6	32	100	29	Medium
Rothbaum et al., 1997(Rothbaum, 1997)	EMDR (11) WL (10)	4 weeks (3 mths)	Female Sexual assault	PSS-I 33.3 to 39.0	35	100	NR	Medium

TABLE S3. Characteristics of Included Trials Evaluating Psychological Treatments (cont)

Study	Arm (N)	Duration (Followup)	Population Trauma Type	Baseline PTSD Severity[a]	Mean Age (y)	Mean % F	Mean % Non-white	Risk of Bias
Rothbaum et al., 2005(Rothbaum, Astin, & Marsteller, 2005)	PE (24) EMDR (26) WL (24)	4.5 weeks (6 mths)	Female Sexual assault	Data Reported in Graphs only	34	100	32	Medium
Rothbaum et al., 2006(Rothbaum et al., 2006)	Sertraline 25 to 200+PE (34) Sertraline 25 to 200 (31)	6 weeks	Male & Female Mixed	SIP 15.3	39	65	20	Medium
Sannibale et al. 2013(Sannibale et al., 2013)	IT (33) Alcohol SC (29)	12 weeks (9 mths)	Male & Female Australian Mixed	68.03	41	53	NR	Medium
Schneier et al., 2012(Schneier et al., 2012)	PE+paroxetine 12.5 to 50 (19) PE+placebo (18)	10 to 22 weeks	Male & Female World Trade Center Attack	65.4 to 72.6	50	54	32	Medium
Schnurr et al., 2003(Schnurr et al., 2003)	Group exp (180) PCT (180)	30 weeks, 5 subsequent monthly boosters (12 months total)	Male Combat	80.4 to 82.1	51	0	34	Low
Schnurr et al., 2007(Schnurr et al., 2007)	PE (141) PCT (143)	10 weeks (3 and 6 months)	Female Mixed	77.6 to 77.9	45	100	46	Medium

TABLE S3. Characteristics of Included Trials Evaluating Psychological Treatments (cont)

Study	Arm (N)	Duration (Followup)	Population Trauma Type	Baseline PTSD Severity[a]	Mean Age (y)	Mean % F	Mean % Non-white	Risk of Bias
Schnyder, 2011(Schnyder, Muller, Maercker, & Wittmann, 2011)	BEP (16) MA (14)	16 weeks (6 mths)[f]	Male & Female Mixed	73.4 to 78.6	40	47	NR	Medium
Spence et al., 2011(Spence et al., 2011)	CBT-M (23) WL (21)	8 weeks (3 mths)	Male & Female Mixed	PCL-C 57.0 to 60.8	43	81	NR	Medium
Tarrier et al., 1999(Tarrier et al., 1999; Tarrier, Sommerfield, Pilgrim, & Humphreys, 1999)	IE (35) CT (37)	16 sessions (112 days) (6 and 12 mths)	Male & Female Mixed	71.1 to 77.6	39	42	NR	Medium
Taylor et al., 2003(Taylor et al., 2003)	Relax (19) PE (22) EMDR (19)	8 weeks (1 mth,3 mths)	Male & Female Mixed	NR	37	75	23	Medium
van der Kolk et al., 2007(van der Kolk et al., 2007)	EMDR (29) Fluoxetine (30) Placebo (29)	8 weeks (6 mths)	Male & Female Mixed	71.2	36	83	33	Medium

TABLE S3. Characteristics of Included Trials Evaluating Psychological Treatments (cont)

Study	Arm (N)	Duration (Followup)	Population Trauma Type	Baseline PTSD Severity[a]	Mean Age (y)	Mean % F	Mean % Non-white	Risk of Bias
van Emmerik et al., 2008(van Emmerik, Kamphuis, & Emmelkamp, 2008)	CBT-M (41) Writing (44) WL (40)	5 sessions[b] (Mean 119.5 days), 91-973 days	Male & Female Mixed	IES 46.4 to 49.1	40	67	NR	Medium
Zlotnick et al., 2009(Zlotnick, Johnson, & Najavits, 2009)	SS (27) RPC (22)	6 to 8 weeks (3 mths, 6 mths)	Female Mixed	64.4 to 69.4	35	100	53	Medium

CAPS-SX= Clinician Administered PTSD Scale for DSM-IV: One-Week Symptom Status Version; CBT Cope= cognitive behavioral therapy-coping skills; CBT-M= cognitive behavioral therapy mixed ; CPT= cognitive processing therapy; CT= cognitive therapy; CR= cognitive restructuring; DTS= Davidson Trauma Scale; EMDR= eye movement desensitization and reprocessing; F= Female; IE= imaginal exposure; IES= Impact of Events Scale; In vivo exp= in vivo exposure; MA= minimal attention (a type of waitlist group); M-PTSD=Mississippi Scale for Combat-related PTSD; MVA= motor vehicle accident; N= total number randomized/assigned to intervention and control groups; NR= not reported; PCL-C= Posttraumatic stress disorder checklist-civilian Version; PCLS= Post-Traumatic Stress Disorder Checklist Scale; PDS= Posttraumatic Stress Diagnostic Scale; PE= prolonged exposure; PSS-I= PTSD Symptom Scale—Interview; PE= prolonged exposure; PSS-I= PTSD Symptom Scale—Interview; PSS-SR= Posttraumatic Symptom Scale-Self Report; PsychEd= Psychosocial education; PTSD=Posttraumatic Stress Disorder; RA= Repeated Assessments (a type of waitlist group); Relax= relaxation; RPC= relapse prevention condition; SHB=Self-help booklet based on principles of CBT; SIT= stress inoculation training; SC= supportive control; SS= seeking safety; TAU= treat as usual; Trauma Couns= Trauma Counseling; UC= usual care; WL= waitlist; Writing=structured writing therapy; y=years.

When mean data for baseline PTSD severity was not reported for the total sample but was presented for each study arm, we provide the range across arms.

[a]Data reported are mean CAPS total or range of mean CAPS total scores across groups unless otherwise specified.

[b]Number of treatment sessions reported when duration of treatment not specified.

[c]Psycho Ed in this study is “Women’s Health Education” (WHE).

[d] Mean age based on the completers in sample.

[e]Treatment was terminated at the discretion of the therapist; range of 5-17 sessions provided.

[f]Only the BEP group had a follow-up assessment; the control group did not.

REFERENCES

Asukai, N., Saito, A., Tsuruta, N., Kishimoto, J., & Nishikawa, T. (2010). Efficacy of exposure therapy for Japanese patients with posttraumatic stress disorder due to mixed traumatic events: A randomized controlled study. *J Trauma Stress, 23*(6), 744-750. doi: 10.1002/jts.20589

Basoglu, M., Salcioglu, E., & Livanou, M. (2007). A randomized controlled study of single-session behavioural treatment of earthquake-related post-traumatic stress disorder using an earthquake simulator. *Psychol Med, 37*(2), 203-213. doi: 10.1017/s0033291706009123

Blanchard, E. B., Hickling, E. J., Devineni, T., Veazey, C. H., Galovski, T. E., Mundy, E., . . . Buckley, T. C. (2003). A controlled evaluation of cognitive behavioural therapy for posttraumatic stress in motor vehicle accident survivors. *Behav Res Ther, 41*(1), 79-96.

Boden, M. T., Kimerling, R., Jacobs-Lentz, J., Bowman, D., Weaver, C., Carney, D., . . . Trafton, J. A. (2012). Seeking Safety treatment for male veterans with a substance use disorder and post-traumatic stress disorder symptomatology. *Addiction, 107*(3), 578-586. doi: 10.1111/j.1360-0443.2011.03658.x

Bryant, R. A., Moulds, M. L., Guthrie, R. M., Dang, S. T., Mastrodomenico, J., Nixon, R. D., . . . Creamer, M. (2008). A randomized controlled trial of exposure therapy and cognitive restructuring for posttraumatic stress disorder. *J Consult Clin Psychol, 76*(4), 695-703. doi: 10.1037/a0012616

Bryant, R. A., Moulds, M. L., Guthrie, R. M., Dang, S. T., & Nixon, R. D. (2003). Imaginal exposure alone and imaginal exposure with cognitive restructuring in treatment of posttraumatic stress disorder. *J Consult Clin Psychol, 71*(4), 706-712.

Carlson, J. G., Chemtob, C. M., Rusnak, K., Hedlund, N. L., & Muraoka, M. Y. (1998). Eye movement desensitization and reprocessing (EDMR) treatment for combat-related posttraumatic stress disorder. *J Trauma Stress, 11*(1), 3-24. doi: 10.1023/a:1024448814268

Chard, K. M. (2005). An evaluation of cognitive processing therapy for the treatment of posttraumatic stress disorder related to childhood sexual abuse. *J Consult Clin Psychol, 73*(5), 965-971. doi: 10.1037/0022-006x.73.5.965

Cloitre, M., Koenen, K. C., Cohen, L. R., & Han, H. (2002). Skills training in affective and interpersonal regulation followed by exposure: a phase-based treatment for PTSD related to childhood abuse. *J Consult Clin Psychol, 70*(5), 1067-1074.

Cloitre, M., Petkova, E., Wang, J., & Lu, L. F. (2012). An examination of the influence of a sequential treatment on the course and impact of dissociation among women with PTSD related to childhood abuse. *Depression and anxiety*(Journal Article). doi: 10.1002/da.21920

Cloitre, M., Stovall-McClough, K. C., Nooner, K., Zorbas, P., Cherry, S., Jackson, C. L., . . . Petkova, E. (2010). Treatment for PTSD related to childhood abuse: a randomized controlled trial. *Am J Psychiatry, 167*(8), 915-924. doi: 10.1176/appi.ajp.2010.09081247

Cook, J. M., Harb, G. C., Gehrman, P. R., Cary, M. S., Gamble, G. M., Forbes, D., & Ross, R. J. (2010). Imagery rehearsal for posttraumatic nightmares: a randomized controlled trial. *J Trauma Stress, 23*(5), 553-563. doi: 10.1002/jts.20569

Cottraux, J., Note, I., Yao, S. N., de Mey-Guillard, C., Bonasse, F., Djamoussian, D., . . . Chen, Y. (2008). Randomized controlled comparison of cognitive behavior therapy with Rogerian supportive therapy in chronic post-traumatic stress disorder: a 2-year follow-up. *Psychother Psychosom, 77*(2), 101-110. doi: 10.1159/000112887

Dias, S., Welton, N. J., Sutton, A. J., & Ades, A. E. (2011, August 2011). NICE DSU Technical Support Document 2: A Generalised Linear Modelling Framework for Pairwise and Network Meta-Analysis of Randomised Controlled Trials Retrieved April 24, 2012, from http://www.nicedsu.org.uk

Dunne, R. L., Kenardy, J., & Sterling, M. (2012). A randomized controlled trial of cognitive-behavioral therapy for the treatment of PTSD in the context of chronic whiplash. *Clin J Pain, 28*(9), 755-765. doi: 10.1097/AJP.0b013e318243e16b

Ehlers, A., Clark, D. M., Hackmann, A., McManus, F., & Fennell, M. (2005). Cognitive therapy for post-traumatic stress disorder: development and evaluation. *Behav Res Ther, 43*(4), 413-431. doi: 10.1016/j.brat.2004.03.006

Ehlers, A., Clark, D. M., Hackmann, A., McManus, F., Fennell, M., Herbert, C., & Mayou, R. (2003). A randomized controlled trial of cognitive therapy, a self-help booklet, and repeated assessments as early interventions for posttraumatic stress disorder. *Archives of General Psychiatry, 60*(10), 1024-1032.

Ehlers, A., Hackmann, A., Grey, N., Wild, J., Liness, S., Albert, I., . . . Clark, D. M. (2014). A randomized controlled trial of 7-day intensive and standard weekly cognitive therapy for PTSD and emotion-focused supportive therapy. *Am J Psychiatry, 171*(3), 294-304. doi: 10.1176/appi.ajp.2013.13040552

Fecteau, G., & Nicki, R. (1999). Cognitive behavioural treatment of post traumatic stress disorder after motor vehicle accident. *Behavioural and Cognitive Psychotherapy, 27*(3), 201-214.

Foa, E. B., Dancu, C. V., Hembree, E. A., Jaycox, L. H., Meadows, E. A., & Street, G. P. (1999). A comparison of exposure therapy, stress inoculation training, and their combination for reducing posttraumatic stress disorder in female assault victims. *J Consult Clin Psychol, 67*(2), 194-200.

Foa, E. B., Hembree, E. A., Cahill, S. P., Rauch, S. A., Riggs, D. S., Feeny, N. C., & Yadin, E. (2005). Randomized trial of prolonged exposure for posttraumatic stress disorder with and without cognitive restructuring: outcome at academic and community clinics. *J Consult Clin Psychol, 73*(5), 953-964. doi: 10.1037/0022-006x.73.5.953

Foa, E. B., Yusko, D. A., McLean, C. P., Suvak, M. K., Bux, D. A., Jr., Oslin, D., . . . Volpicelli, J. (2013). Concurrent naltrexone and prolonged exposure therapy for patients with comorbid alcohol dependence and PTSD: a randomized clinical trial. *Jama, 310*(5), 488-495. doi: 10.1001/jama.2013.8268

Forbes, D., Lloyd, D., Nixon, R. D. V., Elliott, P., Varker, T., Perry, D., . . . Creamer, M. (2012). A multisite randomized controlled effectiveness trial of cognitive processing therapy for military-related posttraumatic stress disorder. *Journal of Anxiety Disorders, 26*(3), 442-452.

Ford, J. D., Steinberg, K. L., & Zhang, W. (2011). A randomized clinical trial comparing affect regulation and social problem-solving psychotherapies for mothers with victimization-related PTSD. *Behavior therapy, 42*(4), 560-578. doi: 10.1016/j.beth.2010.12.005

Gamito, P., Oliveira, J., Rosa, P., Morais, D., Duarte, N., Oliveira, S., & Saraiva, T. (2010). PTSD elderly war veterans: a clinical controlled pilot study. *Cyberpsychol Behav Soc Netw, 13*(1), 43-48.

Gersons, B. P., Carlier, I. V., Lamberts, R. D., & van der Kolk, B. A. (2000). Randomized clinical trial of brief eclectic psychotherapy for police officers with posttraumatic stress disorder. *J Trauma Stress, 13*(2), 333-347. doi: 10.1023/a:1007793803627

Hien, D. A., Cohen, L. R., Miele, G. M., Litt, L. C., & Capstick, C. (2004). Promising treatments for women with comorbid PTSD and substance use disorders. *Am J Psychiatry, 161*(8), 1426-1432. doi: 10.1176/appi.ajp.161.8.1426

Hien, D. A., Morgan-Lopez, A. A., Campbell, A. N. C., Saavedra, L. M., Wu, E., Cohen, L. R., . . . Nunes, E. V. (2012). Attendance and substance use outcomes for the Seeking Safety program: sometimes less is more. *Journal of consulting and clinical psychology, 80*(1), 29-42. doi: 10.1037/a0026361

Hien, D. A., Wells, E. A., Jiang, H., Suarez-Morales, L., Campbell, A. N., Cohen, L. R., . . . Nunes, E. V. (2009). Multisite randomized trial of behavioral interventions for women with co-occurring PTSD and substance use disorders. *J Consult Clin Psychol, 77*(4), 607-619. doi: 10.1037/a0016227

Hinton, D. E., Chhean, D., Pich, V., Safren, S. A., Hofmann, S. G., & Pollack, M. H. (2005). A randomized controlled trial of cognitive-behavior therapy for Cambodian refugees with treatment-resistant PTSD and panic attacks: a cross-over design. *J Trauma Stress, 18*(6), 617-629. doi: 10.1002/jts.20070

Hinton, D. E., Hofmann, S. G., Pollack, M. H., & Otto, M. W. (2009). Mechanisms of efficacy of CBT for Cambodian refugees with PTSD: improvement in emotion regulation and orthostatic blood pressure response. *CNS Neurosci Ther, 15*(3), 255-263. doi: 10.1111/j.1755-5949.2009.00100.x

Hinton, D. E., Hofmann, S. G., Rivera, E., Otto, M. W., & Pollack, M. H. (2011). Culturally adapted CBT (CA-CBT) for Latino women with treatment-resistant PTSD: a pilot study comparing CA-CBT to applied muscle relaxation. *Behav Res Ther, 49*(4), 275-280. doi: 10.1016/j.brat.2011.01.005

Hogberg, G., Pagani, M., Sundin, O., Soares, J., Aberg-Wistedt, A., Tarnell, B., & Hallstrom, T. (2007). On treatment with eye movement desensitization and reprocessing of chronic post-traumatic stress disorder in public transportation workers - A randomized controlled trial. [Article]. *Nordic Journal of Psychiatry, 61*(1), 54-61.

Hollifield, M., Sinclair-Lian, N., Warner, T. D., & Hammerschlag, R. (2007). Acupuncture for posttraumatic stress disorder: a randomized controlled pilot trial. *J Nerv Ment Dis, 195*(6), 504-513. doi: 10.1097/NMD.0b013e31803044f8

Johnson, D. M., Zlotnick, C., & Perez, S. (2011). Cognitive behavioral treatment of ptsd in residents of battered women's shelters: Results of a randomized clinical trial. *Journal of Consulting and Clinical Psychology, 79*(4), 542-551.

Krakow, B., Hollifield, M., Johnston, L., Koss, M., Schrader, R., Warner, T. D., . . . Prince, H. (2001). Imagery rehearsal therapy for chronic nightmares in sexual assault survivors with posttraumatic stress disorder: a randomized controlled trial. *JAMA, 286*(5), 537-545.

Kruse, J., Joksimovic, L., Cavka, M., Woller, W., & Schmitz, N. (2009). Effects of trauma-focused psychotherapy upon war refugees. *J Trauma Stress, 22*(6), 585-592. doi: 10.1002/jts.20477

Kubany, E. S., Hill, E. E., & Owens, J. A. (2003). Cognitive trauma therapy for battered women with PTSD: preliminary findings. *J Trauma Stress, 16*(1), 81-91. doi: 10.1023/a:1022019629803

Kubany, E. S., Hill, E. E., Owens, J. A., Iannce-Spencer, C., McCaig, M. A., Tremayne, K. J., & Williams, P. L. (2004). Cognitive trauma therapy for battered women with PTSD (CTT-BW). *J Consult Clin Psychol, 72*(1), 3-18. doi: 10.1037/0022-006x.72.1.3

Liedl, A., Muller, J., Morina, N., Karl, A., Denke, C., & Knaevelsrud, C. (2011). Physical activity within a CBT intervention improves coping with pain in traumatized refugees: results of a randomized controlled design. *Pain Med, 12*(2), 234-245. doi: 10.1111/j.1526-4637.2010.01040.x

Lindauer, R. J., Gersons, B. P., van Meijel, E. P., Blom, K., Carlier, I. V., Vrijlandt, I., & Olff, M. (2005). Effects of brief eclectic psychotherapy in patients with posttraumatic stress disorder: randomized clinical trial. *J Trauma Stress, 18*(3), 205-212. doi: 10.1002/jts.20029

Litz, B. T., Engel, C. C., Bryant, R. A., & Papa, A. (2007). A randomized, controlled proof-of-concept trial of an Internet-based, therapist-assisted self-management treatment for posttraumatic stress disorder. *Am J Psychiatry, 164*(11), 1676-1683. doi: 10.1176/appi.ajp.2007.06122057

Lovell, K., Marks, I. M., Noshirvani, H., Thrasher, S., & Livanou, M. (2001). Do cognitive and exposure treatments improve various PTSD symptoms differently?: a randomized controlled trial. *Behavioural and Cognitive Psychotherapy, 29*(1), 107-112. doi: 10.1017/s1352465801001126

Marks, I., Lovell, K., Noshirvani, H., Livanou, M., & Thrasher, S. (1998). Treatment of posttraumatic stress disorder by exposure and/or cognitive restructuring: a controlled study. *Arch Gen Psychiatry, 55*(4), 317-325.

McDonagh, A., Friedman, M., McHugo, G., Ford, J., Sengupta, A., Mueser, K., . . . Descamps, M. (2005). Randomized trial of cognitive-behavioral therapy for chronic posttraumatic stress disorder in

adult female survivors of childhood sexual abuse. *J Consult Clin Psychol, 73*(3), 515-524. doi: 10.1037/0022-006x.73.3.515

Mills, K. L., Teesson, M., Back, S. E., Brady, K. T., Baker, A. L., Hopwood, S., . . . Ewer, P. L. (2012). Integrated exposure-based therapy for co-occurring posttraumatic stress disorder and substance dependence: a randomized controlled trial. *JAMA, 308*(7), 690-699. doi: 10.1001/jama.2012.9071

Monson, C. M., Schnurr, P. P., Resick, P. A., Friedman, M. J., Young-Xu, Y., & Stevens, S. P. (2006). Cognitive processing therapy for veterans with military-related posttraumatic stress disorder. *J Consult Clin Psychol, 74*(5), 898-907. doi: 10.1037/0022-006x.74.5.898

Mueser, K. T., Rosenberg, S. D., Xie, H., Jankowski, M. K., Bolton, E. E., Lu, W., . . . Wolfe, R. (2008). A randomized controlled trial of cognitive-behavioral treatment for posttraumatic stress disorder in severe mental illness. *J Consult Clin Psychol, 76*(2), 259-271. doi: 10.1037/0022-006x.76.2.259

Nacasch, N., Foa, E. B., Huppert, J. D., Tzur, D., Fostick, L., Dinstein, Y., . . . Zohar, J. (2011). Prolonged exposure therapy for combat- and terror-related posttraumatic stress disorder: a randomized control comparison with treatment as usual. *J Clin Psychiatry, 72*(9), 1174-1180. doi: 10.4088/JCP.09m05682blu

Neuner, F., Kurreck, S., Ruf, M., Odenwald, M., Elbert, T., & Schauer, M. (2010). Can asylum-seekers with posttraumatic stress disorder be successfully treated? A randomized controlled pilot study. *Cogn Behav Ther, 39*(2), 81-91. doi: 10.1080/16506070903121042

Neuner, F., Onyut, P. L., Ertl, V., Odenwald, M., Schauer, E., & Elbert, T. (2008). Treatment of posttraumatic stress disorder by trained lay counselors in an African refugee settlement: a randomized controlled trial. *J Consult Clin Psychol, 76*(4), 686-694. doi: 10.1037/0022-006x.76.4.686

Neuner, F., Schauer, M., Klaschik, C., Karunakara, U., & Elbert, T. (2004). A comparison of narrative exposure therapy, supportive counseling, and psychoeducation for treating posttraumatic stress disorder in an african refugee settlement. *J Consult Clin Psychol, 72*(4), 579-587. doi: 10.1037/0022-006x.72.4.579

Nijdam, M. J., Gersons, B. P. R., Reitsma, J. B., de Jongh, A., & Olff, M. (2012). Brief eclectic psychotherapy v. eye movement desensitisation and reprocessing therapy for post-traumatic stress disorder: randomised controlled trial. *British Journal of Psychiatry, 200*(3), 224-231. doi: 10.1192/bjp.bp.111.099234

Resick, P. A., Nishith, P., & Griffin, M. G. (2003). How well does cognitive-behavioral therapy treat symptoms of complex PTSD? An examination of child sexual abuse survivors within a clinical trial. *CNS Spectr, 8*(5), 340-355.

Resick, P. A., Nishith, P., Weaver, T. L., Astin, M. C., & Feuer, C. A. (2002). A comparison of cognitive-processing therapy with prolonged exposure and a waiting condition for the treatment of chronic posttraumatic stress disorder in female rape victims. *J Consult Clin Psychol, 70*(4), 867-879.

Resick, P. A., Williams, L. F., Suvak, M. K., Monson, C. M., & Gradus, J. L. (2012). Long-term outcomes of cognitive-behavioral treatments for posttraumatic stress disorder among female rape survivors. *Journal of consulting and clinical psychology, 80*(2), 201-210. doi: 10.1037/a0026602

Rothbaum, B. O. (1997). A controlled study of eye movement desensitization and reprocessing in the treatment of posttraumatic stress disordered sexual assault victims. *Bull Menninger Clin, 61*(3), 317-334.

Rothbaum, B. O., Astin, M. C., & Marsteller, F. (2005). Prolonged Exposure versus Eye Movement Desensitization and Reprocessing (EMDR) for PTSD rape victims. *J Trauma Stress, 18*(6), 607-616. doi: 10.1002/jts.20069

Rothbaum, B. O., Cahill, S. P., Foa, E. B., Davidson, J. R., Compton, J., Connor, K. M., . . . Hahn, C. G. (2006). Augmentation of sertraline with prolonged exposure in the treatment of posttraumatic stress disorder. *J Trauma Stress, 19*(5), 625-638. doi: 10.1002/jts.20170

Sannibale, C., Teesson, M., Creamer, M. C., Sitharthan, T., Bryant, R. A., Sutherland, K., . . . Peek-O'Leary, M. (2013). Randomized controlled trial of cognitive behaviour therapy for comorbid post-traumatic stress disorder and alcohol use disorders. *Addiction, 108*(8), 1397-1410. doi: http://dx.doi.org/10.1111/add.12167

Schneier, F. R., Neria, Y., Pavlicova, M., Hembree, E., Suh, E. J., Amsel, L., & Marshall, R. D. (2012). Combined prolonged exposure therapy and paroxetine for PTSD related to the World Trade Center attack: a randomized controlled trial. *Am J Psychiatry, 169*(1), 80-88. doi: 10.1176/appi.ajp.2011.11020321

appi.ajp.2011.11020321 [pii]

Schnurr, P. P., Friedman, M. J., Engel, C. C., Foa, E. B., Shea, M. T., Chow, B. K., . . . Bernardy, N. (2007). Cognitive behavioral therapy for posttraumatic stress disorder in women - A randomized controlled trial. [Article]. *Journal of the American Medical Association, 297*(8), 820-830.

Schnurr, P. P., Friedman, M. J., Foy, D. W., Shea, M. T., Hsieh, F. Y., Lavori, P. W., . . . Bernardy, N. C. (2003). Randomized trial of trauma-focused group therapy for posttraumatic stress disorder - Results from a Department of Veterans Affairs Cooperative Study. [Article; Proceedings Paper]. *Archives of General Psychiatry, 60*(5), 481-489.

Schnyder, U., Muller, J., Maercker, A., & Wittmann, L. (2011). Brief eclectic psychotherapy for PTSD: a randomized controlled trial. *J Clin Psychiatry, 72*(4), 564-566. doi: 10.4088/JCP.10l06247blu

Spence, J., Titov, N., Dear, B. F., Johnston, L., Solley, K., Lorian, C., . . . Schwenke, G. (2011). Randomized controlled trial of Internet-delivered cognitive behavioral therapy for posttraumatic stress disorder. *Depress Anxiety, 28*(7), 541-550. doi: 10.1002/da.20835

Tarrier, N., Pilgrim, H., Sommerfield, C., Faragher, B., Reynolds, M., Graham, E., & Barrowclough, C. (1999). A randomized trial of cognitive therapy and imaginal exposure in the treatment of chronic posttraumatic stress disorder. *J Consult Clin Psychol, 67*(1), 13-18.

Tarrier, N., Sommerfield, C., Pilgrim, H., & Humphreys, L. (1999). Cognitive therapy or imaginal exposure in the treatment of post-traumatic stress disorder. Twelve-month follow-up. *Br J Psychiatry, 175*, 571-575.

Taylor, S., Thordarson, D. S., Maxfield, L., Fedoroff, I. C., Lovell, K., & Ogrodniczuk, J. (2003). Comparative efficacy, speed, and adverse effects of three PTSD treatments: exposure therapy, EMDR, and relaxation training. *J Consult Clin Psychol, 71*(2), 330-338.

van der Kolk, B. A., Spinazzola, J., Blaustein, M. E., Hopper, J. W., Hopper, E. K., Korn, D. L., & Simpson, W. B. (2007). A randomized clinical trial of eye movement desensitization and reprocessing (EMDR), fluoxetine, and pill placebo in the treatment of posttraumatic stress disorder: treatment effects and long-term maintenance. *J Clin Psychiatry, 68*(1), 37-46.

van Emmerik, A. A., Kamphuis, J. H., & Emmelkamp, P. M. (2008). Treating acute stress disorder and posttraumatic stress disorder with cognitive behavioral therapy or structured writing therapy: a randomized controlled trial. *Psychother Psychosom, 77*(2), 93-100. doi: 10.1159/000112886

West, S. L., Gartlehner, G., Mansfield, A. J., Poole, C., Tant, E., Lenfestey, N., . . . Lohr, K. N. (2010). Comparative Effectiveness Review Methods: Clinical Heterogeneity (2011/03/25 ed.). Rockville, MD: Methods Research Report (Prepared by RTI International -- University of North Carolina Evidence-based Practice Center under Contract No. 290-2007-10056-I).

Zlotnick, C., Johnson, J., & Najavits, L. M. (2009). Randomized controlled pilot study of cognitive-behavioral therapy in a sample of incarcerated women with substance use disorder and PTSD. *Behav Ther, 40*(4), 325-336. doi: 10.1016/j.beth.2008.09.004

Zoellner, L. A., Feeny, N. C., Fitzgibbons, L. A., & Foa, E. B. (1999). Response of African American and Caucasian women to cognitive behavioral therapy for PTSD. *Behavior Therapy, 30*(4), 581-595.