Current Psychiatry Reports (2023) 25:19–30
https://doi.org/10.1007/s11920-022-01402-8

ANXIETY DISORDERS (L BROWN, SECTION EDITOR)

Efficacy of Cognitive Behavioral Therapy for Anxiety-Related Disorders: A Meta-Analysis of Recent Literature

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Accepted: 13 November 2022 / Published online: 19 December 2022

Abstract

Purpose of Review Effective treatment of anxiety-related disorders is crucial, considering the prevalence of such disorders and their association with poor psychosocial functioning. To evaluate the most recent evidence on the efficacy of cognitive behavioral therapy (CBT) for anxiety-related disorders in adults, we conducted a meta-analysis of randomized placebo-controlled trials published since 2017.

Recent Findings Ten studies with a total of 1250 participants met the inclusion criteria. Seven of these studies examined PTSD. The findings demonstrated small placebo-controlled effects of CBT on target disorder symptoms (Hedges' $g = 0.24$, $p < 0.05$) and depression (Hedges' $g = 0.15$, $p =$ n.s). When examining only PTSD studies, effects were reduced (Hedges' $g = 0.14$, $p < 0.05$). Heterogeneity in most analyses was very low, and no publication bias was found.

Summary Effect sizes from placebo-controlled trials from the past 5 years appear to be smaller than those in prior meta-analyses. The findings are largely driven by research on PTSD, with few placebo-controlled trials of other anxiety-related disorders published since 2017.

Keywords Anxiety · Anxiety disorders · Cognitive behavioral therapy · Meta-analysis · Posttraumatic stress disorder · Randomized controlled trials

Introduction

Anxiety disorders are highly disabling and have a significant impact on patient's quality of life, relationships, occupational, and social abilities [1–5]. In addition, such disorders contribute to enormous economic and public health costs [6, 7]. A recent report from the Global Burden of Disease Study estimates that more than 301 million people globally are affected by anxiety [8]. A global return on investment analysis report indicates that approximately 12 billion workdays per year are lost due to anxiety and depressive disorders [9]. Among the classifications of anxiety disorders, specific phobia (10.3%), panic disorders (6%), social phobia (2.7%), and generalized anxiety disorders (GAD) (2.2%) are the most common [10]. In the current classification of anxiety disorders under the

This article is part of the Topical Collection on *Anxiety Disorders*

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Diagnostic and Statistical Manual of Mental Disorders (DSM-5), obsessive compulsive disorder (OCD), acute stress disorder (ASD), and posttraumatic disorder (PTSD) are no longer classified as anxiety disorders; however, they are highly comorbid with similar characteristics to anxiety symptoms such as irrational fear, avoidance and hyperarousal [11–14]. Clinical guidelines recommend psychological and pharmacotherapy as a first-line treatment for anxiety-related disorders [15–21]. Despite evidence for the efficacy of such interventions, a substantial proportion of patients receiving treatment still remain symptomatic [22].

The most extensively researched and tested psychotherapy is cognitive–behavioral therapy (CBT) [23]. CBT is considered the gold standard evidence-based intervention for treating anxiety disorders [24••, 25, 26]. The main aim of CBT-based intervention is to alter maladaptive emotional responses by challenging dysfunctional thinking patterns [27]. Several meta-analytic reviews of CBT have found large effects and concluded that CBT effectively treats anxiety disorders [23, 28–30]. However, the magnitude of these effects is influenced by the studies' comparison conditions, such as waitlist (WL) or treatment as usual (TAU) [31, 32]. A limitation of TAU as a control condition is that it tends to be heterogeneous and not structurally equivalent, both within and between studies [33]. A WL control, on the other hand, does not control for nonspecific factors such as patient expectations of the treatment outcomes or therapeutic alliance [34]. Moreover, study samples may be biased by only selecting patients who are willing to be randomized to a waitlist [35, 36]. As a result, TAU and WL comparators are suboptimal, potentially inflating estimates of treatment efficacy [37, 38]. A more systematic approach to address this problem is to compare an active intervention with a psychological or pill placebo [26, 39, 40]. Such comparisons allow for an examination of the specific effects of the intervention beyond factors common across treatments [41]. Pill placebos serve the purpose of controlling for patient expectations of improvement, and control for some level of interaction with a clinician [42].

In general, psychological placebos are intended to mimic the structure of the active interventions, controlling for nonspecific factors including the frequency of therapist interaction, without including active treatment ingredients such as cognitive restructuring and behavioral interventions [43]. Recent evidence on nondirective supportive therapy [NDST] shows positive effects compared to WL and TAU but is less effective compared to psychological treatments [44]. NDST treatment follows unstructured therapy, with the main aim of offering support through active listening [45, 46]. Another form of a psychological placebo is present-centred therapy (PCT), which controls for nonspecific factors in psychotherapy [47]. The main component of PCT includes psychoeducation and strategies to address stressors in a nondirective manner [48]. In recent years, PCT has been effective in reducing PTSD severity as compared to WL [49••].

Two meta-analytic reviews have been published that specifically examined placebo-controlled trials of CBT for adults with anxiety-related disorders. In 2008, Hofmann and Smits [26] compiled data from 27 studies examining anxiety disorders, obsessive compulsive disorder, and PTSD, reporting a large effect size (Hedges' $g = 0.73$) of CBT compared to placebo. In 2018, Carpenter et al. [29] updated this meta-analysis with an additional 16 studies, finding a moderate placebo-controlled effect size (Hedges' $g = 0.56$). Together, these studies highlighted the strong support for CBT as an efficacious intervention for anxiety-related disorders, even when using more rigorous comparison conditions, though they also found more modest effect sizes than meta-analysis comparing CBT against WL controls [50]. The present study aimed to update the prior two meta-analyses on placebo-controlled trials of CBT for adults with anxiety-related disorders conducted by Hofmann and Smits [26] and Carpenter et al. [29] Such an update can provide additional insight into the size of intervention effects specific to CBT for adults based on the most recent literature, further informing treatment recommendations for those living with anxiety. To be consistent with the prior analysis, we included OCD, ASD, and PTSD, although they are no longer classified as anxiety disorders.

Method

Design

This paper was designed as a meta-analysis focusing on recent randomized controlled clinical trials (RCTs) comparing primary outcomes of CBT for anxiety-related disorders in adults with placebo control conditions (psychological or pill). Studies were selected by the first and the second author (SB, CG), and disagreements were resolved through discussion with a third researcher (SH). We followed the same eligibility criteria as Hofmann and Smits [26] and Carpenter et al. [29]. This study protocol was prospectively registered in the Open Science Framework (https://osf.io/t9whj).

Search Strategy

We searched three major bibliographical databases (PubMed, PsycINFO, Web of Science) to identify studies published from January 1, 2017, to January 31, 2022. We used the following search terms indicative of studies with CBT conditions: (((random*)) AND (((cognitive behavior* therap*) OR (cognitive therap*) OR (behavior* therap*))) AND ((GAD) OR (generalized anxiety disorder) OR (OCD) OR (obsessive compulsive disorder) OR

(social phobia) OR (social anxiety disorder) OR (specific phobia) OR (simple phobia) OR (PTSD) OR (posttraumatic stress disorder) OR (panic disorder) OR (acute stress disorder))) NOT (children).

Inclusion and Exclusion Criteria

Studies were included in the present meta-analysis if (1) patients were between ages 18 and 65 and met DSM-III-R, DSM-IV, or DSM-5 diagnostic criteria for acute stress disorder, GAD, OCD, PTSD, SAD, or specific phobia as determined by a psychometrically sound and structured diagnostic instrument; (2) patients had to be randomly assigned to either CBT or placebo (pill or psychological). Psychological placebos are defined as nondirective and nonspecific psychological interventions, including discussion and interaction of patient's problems with the therapist [41]; (3) the severity of anxiety symptoms was assessed through a validated clinical interview or self-report instrument administered pre- and posttreatment; (4) studies provided sufficient data to calculate effect sizes.

Studies were excluded if (1) patients had medical comorbidities (e.g., substance abuse or a medical condition); (2) the intervention was delivered in part or fully by a computerized or internet-based program rather than by a therapist, (see [51, 52] for recent meta-analyses on internet-based CBT for anxiety) (3) studies consisted of secondary analyses of previously published datasets; (4) active placebo intervention targeted problems such as self-guided exposures; or (5) the intervention included "third-wave" (acceptance and commitment therapy, mindfulness-based interventions, etc.), given that interventions involved in such treatments such as mindfulness and acceptance exercises go beyond the core strategies of CBT, which focus on cognitive restructuring and exposure [53]. No language restrictions were applied.

Data Extraction

Two researchers independently conducted data extraction for the meta-analysis (SB, CG). The following data were extracted: (1) characteristics of the studies: sample size, type of placebo condition, year of publication, type of analysis (completer or intention to treat (ITT)); (2) characteristics of the intervention: type of CBT (exposure, cognitive or both), format (group and individual, number of sessions); (3) characteristics of the participants (demographics); and (4) postintervention and follow-up outcome data on anxiety symptoms, depression, and quality of life. When a study reported more than one instrument to measure target disorders, we averaged the effect size from the instruments to obtain a more accurate result.

Data Synthesis

All analyses were conducted in R using the "metafor" package (version 3.6.2) [54, 55]. We first calculated the effect size (Hedges' g) indicating the difference between the CBT and placebo groups at posttreatment. Separate meta-analyses were conducted for disorder specific symptoms and other anxiety symptoms such as PTSD and depression. To calculate the effect size for the outcomes, we used the mean, standard deviation, and the number of participants from the CBT and placebo groups [56, 57]. Effect sizes were calculated as the difference in means between the treatment and control groups divided by the pooled standard deviation [58]. If the studies did not report the mean or standard deviation, we used other statistics, such as change scores, binary outcomes, and t test statistics to calculate the effect size. The pooled effect size was calculated by combining effect sizes from the individual studies through random effects models using the Hartung-Knapp-Sidik-Jonkman (HKSJ) adjustment [59, 60]. The indicative effect size for the interpretation of Hedges' g is small effect 0.20, medium effect 0.50, and large effect 0.80 [61].

For meta-analyses based on dichotomous outcomes such as dropout rates, we calculated odds ratios (ORs) and their 95% confidence intervals using the Cox–Hinkley–Miettinen–Nurminen method [62]. An OR of 1 indicates that the event is unlikely to occur in either group. An OR greater than 1 indicates a greater likelihood of dropout in CBT compared to placebo. In our analysis, dropout was defined as the number of participants who started the treatment but did not complete the full treatment protocol [63].

To examine the homogeneity of the effect sizes, we calculated the I^2 statistic and its 95% confidence interval (CI). A value of 0% indicates that the effects are homogenous, 25% indicates low heterogeneity, 50% moderate heterogeneity, and a value over 75% suggests high heterogeneity [64].

We conducted subgroup analyses using mixed effect models [65]. In this method, the studies within the subgroups are pooled with a random effect model, while the test for difference between the groups is conducted with a fixed effects model. We performed five subgroup analyses: (1) treatment format (individual vs. group therapy), (2) analysis type (completer vs. ITT), (3) mode of assessment (self-report vs. clinician report), (4) characteristics of the participants (veteran or active-duty military participants vs. non-military participants), and (5) comparison condition (PCT vs. other psychological placebo). We conducted this latter comparison given accumulating evidence that despite being designed as a placebo control, PCT may be an effective stand-alone treatment, thereby deflating effect sizes of CBT when used as a control [49••].

Sensitivity analyses were conducted by excluding potential outliers and recalculating the effect size. Outliers were

defined as studies for which the 95% CI of the effect sizes did not overlap with the 95% CI of the pooled effect sizes [66].

Meta regression analyses were used to investigate the impact of the number of therapy sessions on treatment outcomes. The regression coefficient indicates the strength of the relationship and along with the *p* value; they can inform whether there was a linear relationship between the two variables [67].

Publication bias was examined by inspecting the funnel plot and Duval and Tweedie's trim and fill procedure [68]. The presence of publication bias was tested through Egger's test for the asymmetry of the funnel plot [69].

Risk of Bias Assessment

The study quality was assessed by two independent researchers using the Cochrane risk of bias assessment tool version 1 (RoB) [70]. The tool involves four criteria: (1) adequate generation of randomization sequence; (2) allocation concealment; (3) blinding of assessors; (4) appropriate methods for handling missing data (rated as positive for intention-to-treat analyses), indicating that all patients at baseline randomizations were included in the analyses; and (5) selective outcome reporting. An individual item was rated as 0 indicating studies with low risk, 1 indicating those with unclear bias risk, and 2 indicating those with high risk. If a study had insufficient information regarding the items, they were classified as having an unclear risk of bias. To determine the overall quality of the study, each individual item score was added, and a study with a score of less than 2 was classified as low risk, while a study with a score more than 2 was considered high risk.

Results

Study Sample Characteristics

Figure 1 presents a flow diagram illustrating the study selection process. The final analysis included 10 studies, and a total of 1250 patients were randomized to the CBT (701 patients) or placebo (549 patients) condition. The characteristics of the 10 included studies are presented in Table 1. The average study sample had a mean age of 39.91 years (SD = 9.49), and 41.95% were female participants (SD = 32.81). Of the studies that reported race, 60% of patients were White or Caucasian ($n = 7$ studies) (SD = 9.87), 23% were Black participants ($n = 7$ studies) (SD = 13.75), and 3.95% were Asian participants ($n = 6$ studies) (SD = 3.19). The majority of studies examined the treatment of PTSD ($n = 7$ studies), while we found one study on ASD, GAD, and SAD, and no studies of panic disorder, OCD, or specific phobia. Of the CBT treatments, 3 studies used exposure techniques, 2 studies focused on cognitive strategies, and 5 included both elements in their interventions. The format of treatment delivery was 4 studies involving individual therapy and 6 conducting group therapy. The mean duration of treatments was 11.4 sessions (SD = 3.69). Seven studies used measures of depression at posttreatment, and three studies reported measures of quality of life. Regarding follow-up measures, 7 of the 10 studies reported treatment effects 6 months after posttreatment. No studies were found that used pill placebo as a control condition. Of the psychological placebo conditions, the most frequent was present-centred therapy ($n = 4$ studies), followed by psychoeducation ($n = 3$ studies) and other psychological placebos ($n = 3$ studies).

Effects of CBT on Anxiety-Related Disorders

The overall effect of CBT compared to placebo control across all studies at posttreatment was small, but significant (Hedges' $g = 0.24$, 95% CI 0.06 to 0.41). Heterogeneity was low and significant ($I^2 = 26\%$, 95% CI 0.0 to 64%, $p < 0.05$). There was no indication of outliers. The results of these studies are summarized in Fig. 2.

Subgroup analyses were then conducted to explain this variance across studies. We found significant group differences between studies comparing CBT to PCT (Hedges' $g = 0.11$, 95% CI − 0.11 to 0.34, $p < 0.05$) and those comparing against other psychological placebos (Hedges' $g = 0.36$, 95% CI 0.09 to 0.62). We found no significant group differences between the following: group versus individual therapy, self-report versus clinician report, and completers versus ITT.

We found that the effects of CBT for anxiety-related disorders were very small and not significant at the 6-month follow-up (Hedges' $g = 0.09$, 95% CI − 0.08 to 0.28, $p =$ n.s.). We also ran the post-treatment analysis including 7 studies that had reported follow-up data to observe if improvements declined at follow-up. The effects for those 7 studies were slightly higher compared to 6-month follow up, albeit not significant (Hedges' $g = 0.20$, 95% CI − 0.04 to 0.45, $p =$ n.s.).

The effects of these interventions on depression were very small and non-significant (Hedges' $g = 0.15$, 95% CI − 0.11 to 0.40). Heterogeneity was low ($I^2 = 36\%$) and not significant. We did not have enough studies to conduct any analyses for quality of life ($n = 3$). (Data presented in Table 2 of supplementary material).

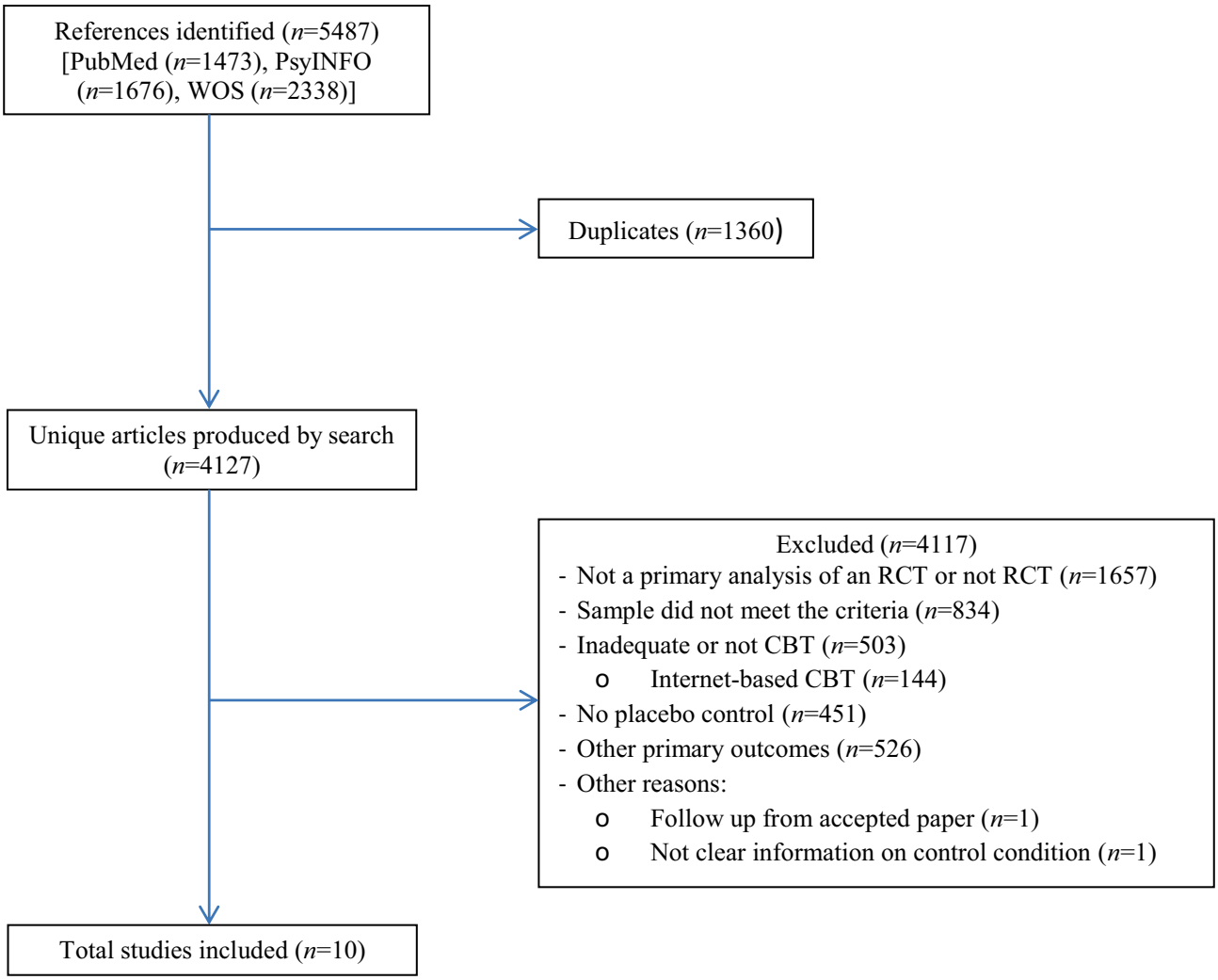

Fig. 1 Flow diagram of study selection process

Effects of CBT on PTSD

When restricting the meta-analysis to the seven studies examining PTSD treatment, the posttreatment effect size was significant but small, Hedges' $g = 0.14$ (95% CI 0.02 to 0.24). Heterogeneity was low and significant ($I^2 = 0\%$, 95% CI 0.0 to 71%, $p < 0.05$). The effect of CBT for PTSD studies on depression was not significant, Hedges' $g = 0.09$ (95% CI − 0.12 to 0.32, $p =$ n.s.). For PTSD studies, we found no significant group differences between PCT and other psychological placebos and for military and non-military participants (see Table 2 in supplementary materials).

Dropout Rates

Examination of dropout rates showed a significantly greater dropout in CBT ($n = 159$ patients) compared to placebo ($n = 98$ patients (OR = 1.35, 95% CI = 1.01 to 1.78, $p < 0.05$)). The weighted mean dropout rate across all studies for CBT was 22% and 17% for placebo. In the PTSD studies ($n = 7$), the difference in dropout between CBT (21%) and placebo (15%) was significant (OR = 1.50, 95% CI = 1.08 to 2.06, $p < 0.05$).

Metaregression

In a meta-regression analysis with the effect size on anxiety-related disorders as the dependent variable and the number of sessions as the predictor, we found no significant association between the two ($p =$ n.s.).

Publication Bias

In Duval and Tweedie's trim and fill procedure, the adjusted effect size was identical to the main analyses, with no studies missing. Egger's test did not indicate the presence of funnel

Table 1 Descriptions and characteristics of studies included in the meta-analysis

Study	Disorder	CBT	PBO	Other comparison conditions	Total N (CBT + PBO)	# Sessions	Symptom measures	Other anxiety measures	Dep. measures	QOL measures	Analysis type	Mean age	% Fem	% White	% Black	% Asian
Fauerbach et al. 2020 [71•]	ASD	Ind C + E	Nondirective supportive psycho-therapy	n/a	28	4	DTS	n/a	PHQ-9	n/a	Completer	39	44.6	52.5	40	2.5
Simon et al. 2021 [72•]	GAD	Grp C + E	Stress education	Kundalini yoga	133	12	CGI-I	n/a	n/a	n/a	ITT	33.35	68.4	74.43	6.01	9.77
Carlsoon et al. 2018 [73•]	PTSD	Grp C + E	Stress management	n/a	126	16	HTQ	HAM-A	HAM-D	WHO-5, GAF, SDS	ITT	43.3	43.6	n/a	n/a	n/a
Foa, et al. 2018* [74•]	PTSD	Ind E only	Present-centered therapy	Minimal-contact control	326	10	PCL-S, PSS-I	n/a	n/a	n/a	ITT	32.69	12.9	60.42	24.23	0.92
Haynes et al. 2020* [75••]	PTSD	Grp C only	Present-centered therapy	n/a	37	12	CAPS, PCL-M	n/a	HAM-D	n/a	Completer	48.42	0	55.81	6.97	2.32
Johnson et al. 2020 [76••]	PTSD	Grp C only	Present-centered therapy	n/a	142	16	CAPS	n/a	CES-D	SF-12	ITT	35.1	100	46.51	44.18	n/a
Nidich et al. 2018* [77•]	PTSD	Ind E only	Psychoeducation	Transcendental meditation	134	12	CAPS, PCL-M	n/a	PHQ-9	n/a	ITT	47.35	16.4	55.97[1]	23.88	6.71
Sloan et al. 2018* [78•]	PTSD	Grp C + E	Present-centered therapy	n/a	198	14	CAPS-5, PCL-5	BAI	BDI-II	SF-36	ITT	55.82	0	74.2	16.7	1.5
Vera et al. 2022 [79••]	PTSD	Ind E only	Applied relaxation	n/a	76	12	CAPS-5, PCL-5	STAI-S	PHQ-9	n/a	Completer	43.62	81.6	n/a	n/a	n/a
Samantaray et al. 2021 [80••]	SAD	Grp C + E	Psychoeducational—supportive therapy	n/a	50	6	LSAS, SPIN	n/a	n/a	n/a	ITT	20.52	52	n/a	n/a	n/a
		Ind = 4 Grp = 6 C + E = 5 C only = 2 E only = 3				*M* = 11.4 SD = 3.69					Completer only = 3 ITT = 7	*M* = 39.91 SD = 9.49	*M* = 41.95% SD = 32.81	M = 59.97% SD = 9.87	M = 23.13% SD = 13.75	M = 3.95% SD = 3.19

ASD Acute stress disorder, *GAD* generalized anxiety disorder, *PTSD* posttraumatic stress disorder, *SAD* social anxiety disorder, *CBT* cognitive behavioral therapy, *Ind* individual, *Grp* group, *C* cognitive techniques, *E* exposure techniques, *PBO* placebo, *MCC* minimum control condition, *BAI* Beck anxiety inventory, *BDI-II* Beck depression inventory—II, *CAPS* clinician administered PTSD scale, *CAPS-5* clinician administered PTSD scale for DSM-5, *CES-D* center for epidemiologic studies depression scale, *CGI-I* clinical global impression of improvement, *DTS* Davidson trauma scale, *GAF* global assessment of function, *HAM-A* Hamilton anxiety rating scale, *HAM–D* Hamilton depression rating scale, *HTQ* Harvard trauma questionnaire, *LSAS* Liebowitz social anxiety scale, *PCL-5* PTSD symptom checklist for DSM-5, *PCL-M* PTSD checklist-military version, *PCL-S* PTSD checklist–stressor-specific, *PHQ-9* patient health questionnaire-9, *PSS-I* post-traumatic symptom scale interview, *QOL* quality of life scale; *SDS* Sheehan disability scale, *SF-12* short form health survey, *SF-36 SF* short form 36 social functioning component, *SPIN* social phobia inventory, *STAI-S* state–trait anxiety inventory–state, *WHO-5* World Health Organization Well-Being Index – 5, *ITT* intention-to-treat analyses, *Fem* female

*Study whose participants are military personnel

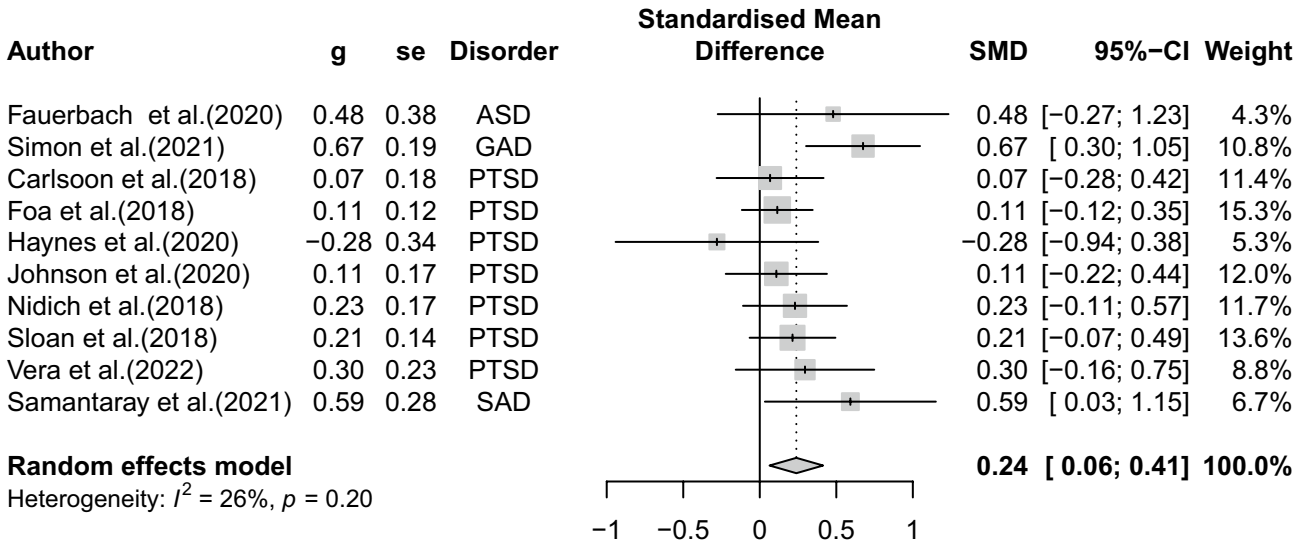

Fig. 2 Studies examining the effects of CBT to placebo for anxiety-related disorders

plot asymmetry and was not significant (p = n.s.). This result indicates that publication bias did not have a significant effect on the summary effect size.

Risk of Bias

Overall, the risk of bias present in the design was relatively low. The number of studies with a low, unclear and high risk of bias in each of the categories was as follows: sequence generation (10 low, 0 unclear, 0 high); allocation concealment (8 low, 1 unclear, 1 high); blinding (8 low, 0 unclear, 2 high); incomplete outcome data (7 low, 0 unclear, 3 high); selective outcome reporting (9 low, 1 unclear, 0 high). Three studies met all five predefined quality criteria, and another six met four of the five criteria [70].

Discussion

This systematic review is the continuation of two previous works of Hofmann and Smits [26] and Carpenter et al. [29], with which it shares the objective of summarizing the state of the evidence of CBT for anxiety and related disorders based on randomized placebo-controlled trials. Our search found 10 placebo-controlled randomized trials published since 2017 and not included in Carpenter et al. [29], seven of which examined PTSD. Accordingly, this updated analysis is most informative with regard to the effects of CBT for PTSD found in the recent literature rather than anxiety-related disorders as a whole. The pooled placebo-controlled effect size for PTSD studies was statistically significant but small (Hedges' $g = 0.14$), and notably smaller than the results reported in Carpenter et al. [29] (Hedges' $g = 0.41$). This pattern of results does not support the notion that CBT is substantially more effective at reducing PTSD symptoms than therapy modalities designed to account for nonspecific factors of psychotherapy, at least when examining literature published since 2017. When including all anxiety-related studies in the analysis, the pooled results presented here similarly reflected a somewhat smaller effect (Hedges' $g = 0.24$) compared to prior literature (Hedges' $g = 0.56$) [29], with the non-PTSD studies demonstrating similar effect sizes individually as the prior meta-analyses [71•, 72•, 80••] (Hedges' $g = 0.48$–0.67). We did not find any significant advantage of CBT over placebo on depression symptoms, either amongst PTSD studies or across all anxiety-related disorders, supporting the specificity of the interventions.

The minimal advantage of CBT over psychological placebo treatments for PTSD is somewhat surprising given that trauma-focused CBTs are recommended as front-line treatments in numerous treatment guidelines [18, 81]. Potential contributors to the reduced between-group effect sizes relative to prior research include (1) more rigorous research designs, as evidenced by low risk of bias ratings across the studies analyzed; (2) inclusion of two studies that did not employ trauma-focused CBT [75••, 76••] (i.e., did not involve processing of traumatic memories); (3) a substantial portion of studies examining military or veteran samples (57%) and/or group CBT (57%), both of which are associated with smaller treatment effects [82, 83], and (4) more active or effective control conditions (e.g., PCT, applied relaxation). However, the present results are in line with a meta-analysis by Belsher et al. [49••], which found that PCT, considered a placebo control in the current analysis, is non-inferior compared to trauma-focused CBT. Thus, there

is a clear need for continued research on how to improve the efficacy of CBT for PTSD.

Another important finding was related to patient dropout. Participants receiving CBT for anxiety and PTSD showed a significantly higher chance of dropping out from the study than those receiving the psychological placebo. This finding is consistent with that of Carpenter et al. [29], who found higher dropout rates in the CBT condition than in the placebo condition (OR = 1.82, $p < 0.01$). A potential explanation could be that patients receiving the intervention, such as exposure-based treatment, are required to revisit the traumatic memory, which could confer the risk of early dropout [84–86]. We observed that the dropout rate for PTSD across clinical trials had a high degree of variability, which could be due to sampling error or characteristics of the study or due to distinct characteristics of the patient population, including other comorbidities [63, 86].

Limitations

The most significant limitation to this meta-analysis is the small number of studies examining CBT for disorders other than PTSD, which precludes our ability to make conclusions about effects on anxiety-related disorders as a whole or to compare the efficacy of CBT for the various anxiety disorders, including PD, GAD, OCD, and SAD outcomes. Moreover, although heterogeneity and the risk of bias were low, the meta-analysis as a whole was based on a relatively small number of studies.

Future Directions

Previous research suggested that skills acquired during the treatment do not improve beyond 12 months of follow-up [24••]. In our meta-analysis, only 2 studies reported a follow up of 12 months. Therefore, to substantiate the treatment effect, future trials should report a follow-up of more than 12 months for both anxiety and depression. Second, it is important that CBT continue to be tested in more diverse populations to maximize the generalizability of results. Although the studies in this analysis that reported race data demonstrated some degree of racial diversity ($M = 40\%$ non-White), certain racial groups (e.g., Asian participants) were not well-represented, and most [$n = 9$ studies] were set in the USA or Europe. Therefore, future trials should include more diverse samples to understand the effectiveness of the intervention in a more inclusive way. Third, regarding the control condition in RCTs, there is increasing evidence that TAU are suboptimal control conditions, as they are associated with a type 1 error resulting in an overestimation of effect size [32, 35]. Although we identified an additional 10 placebo controlled RCTs published since Carpenter et al. [29] (a 25% increase) more work is needed to establish the feasibility of including psychological placebo in RCTs as one of the most robust tests of treatment effectiveness.

Conclusion

Randomized controlled trials published in the last 5 years show relatively minimal advantage in CBT over psychological placebos in the treatment of PTSD, though this effect may depend on the specific comparison condition. The stagnation (and even deterioration) of effect sizes over the years is an issue that is worth exploring further. Although CBT is significantly better than placebo, more efficacious treatments are needed. Anxiety disorders are highly comorbid warranting a transdiagnostic approach to identify underlying psychological processes rather than targeting the symptom constellations. Additionally, a latent disease model that drives interventions such as CBT relies on methodological factors that create limitations in finding the best treatments:(1) focusing on groups (as opposed to individuals) as the level of analysis, and (2) overlooking dynamic changes. For example, the latent disease model used in the studies examined in the current meta-analysis neglects the ergodic error [87] by clustering people based on symptoms identified at the level of the collective. This approach also overlooks the potential non-linear trajectory of change. Using analytical assessments that are limited in identifying feedback loops and non-linear changes in processes restricts our understanding of the structure of a system and how it behaves as a result of clinical inputs. When perturbations are caused in a system as a result of a clinical intervention, the system may not change linearly; in fact, change can happen in dynamic ways with complex processes that include outputs circling back into the system as inputs turning into feedback loops that we may fail to examine. A process-based approach [88••], on the other hand, takes an idiographic stance towards treatments such that each individual is examined based on contextualized and dynamic psychological processes of change. This approach allows for identifying individual moderators that work best for the given client instead of relying on treatments assigned to problem types. Taking a process-based approach may in fact be a solution to the limitations and the low effect sizes of CBT found in the current meta-analysis. We believe that the process-based approach may assist the clinician in detecting the key processes relevant to the specific needs of the client and respectively implementing the appropriate interventions targeted at those needs. Future research is warranted in further examining such a process-based approach for anxiety-related disorders.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s11920-022-01402-8.

Author contribution Study concept and design: SB, CG, SH, SGH, JC. Data extraction: SB, CG. Risk of bias assessment: SH, SB. Statistical analyses and interpretation: SB. Drafting of the manuscript: SB. Critical revision of the manuscript for important intellectual content: CG, SH, JC, SGH.

Funding Open Access funding enabled and organized by Projekt DEAL. SGH receives financial support from the Alexander von Humboldt Foundation, NIH/NCCIH (R01AT007257), NIH/NIMH (R01MH099021, U01MH108168), and the James S. McDonnell Foundation 21st Century Science Initiative in Understanding Human Cognition — Special Initiative. He receives compensation for his work as editor from SpringerNature and the Association for Psychological Science, and as an advisor from the Palo Alto Health Sciences, Otsuka Pharmaceuticals, Jazz Pharmaceuticals and for his work as a Subject Matter Expert from John Wiley & Sons, Inc. and SilverCloud Health, Inc. He also receives royalties and payments for his editorial work from various publishers.

Data Availability The data that support the findings of this study are available from the author upon reasonable request.

Declarations

Conflict of Interest The authors declare no competing interests.

References

Papers of particular interest, published recently, have been highlighted as:
- • Of importance
- •• Of major importance

1. Kessler RC, Chiu WT, Demler O, Walters EE. Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. Arch Gen Psychiatry. 2005;62(6):617. https://doi.org/10.1001/archpsyc.62.6.617.
2. Baxter AJ, Scott KM, Vos T, Whiteford HA. Global prevalence of anxiety disorders: a systematic review and meta-regression. Psychol Med. 2013;43(5):897–910. https://doi.org/10.1017/S003329171200147X.
3. Sareen J, Jacobi F, Cox BJ, Belik SL, Clara I, Stein MB. Disability and poor quality of life associated with comorbid anxiety disorders and physical conditions. Arch Intern Med. 2006;166(19):2109–16. https://doi.org/10.1001/archinte.166.19.2109 (PMID: 17060541).
4. Olatunji BO, Cisler JM, Tolin DF. Quality of life in the anxiety disorders: a meta-analytic review. Clin Psychol Rev. 2007;27(5):572–81. https://doi.org/10.1016/j.cpr.2007.01.015 (Epub 2007 Feb 7 PMID: 17343963).
5. Priest JB. Anxiety disorders and the quality of relationships with friends, relatives, and romantic partners. J Clin Psychol. 2012;69(1):78–88. https://doi.org/10.1002/jclp.21925.
6. Kessler RC, Greenberg PE. The economic burden of anxiety and stress disorders. Neuropsychopharmacology: The fifth generation of progress. 2002;67:982–2.
7. Greenberg PE, Sisitsky T, Kessler RC, Finkelstein SN, Berndt ER, Davidson JR, Ballenger JC, Fyer AJ. The economic burden of anxiety disorders in the 1990s. J Clin Psychiatry. 1999;60(7):427–35.
8. Yang X, Fang Y, Chen H, Zhang T, Yin X, Man J, Yang L, Lu M. Global, regional and national burden of anxiety disorders from 1990 to 2019: results from the Global Burden of Disease Study 2019. Epidemiol Psychiatr Sci. 2021;6(30):e36. https://doi.org/10.1017/S2045796021000275.PMID:33955350;PMCID:PMC8157816.
9. Chisholm D, Sweeny K, Sheehan P, Rasmussen B, Smit F, Cuijpers P, Saxena S. Scaling-up treatment of depression and anxiety: a global return on investment analysis. The Lancet Psychiatry. 2016;3(5):415–24. https://doi.org/10.1016/s2215-0366(16)30024-4.
10. Thibaut, F. Anxiety disorders: a review of current literature. Dialogs in Clinical Neuroscience, 2017;19(2):87–88. https://doi.org/10.31887/dcns.2017.19.2/fthibaut.
11. Price M, Legrand AC, Brier ZMF, Hébert-Dufresne L. The symptoms at the center: examining the comorbidity of posttraumatic stress disorder, generalized anxiety disorder, and depression with network analysis. J Psychiatr Res. 2019;109:52–8. Available from: https://doi.org/10.1016/j.jpsychires.2018.11.016.
12. Cheng B, Huang X, Li S, Hu X, Luo Y, Wang X, et al. Gray matter alterations in post-traumatic stress disorder, obsessive-compulsive disorder, and social anxiety disorder. Front Behav Neurosci. 2015;9:219. Available from: https://doi.org/10.3389/fnbeh.2015.00219.
13. Storch EA, Abramowitz J, Goodman WK. Where does obsessive-compulsive disorder belong in DSM-V? Depress Anxiety. 2008;25(4):336–47. Available from: https://doi.org/10.1002/da.20488.
14. Knowles KA, Sripada RK, Defever M, Rauch SAM. Comorbid mood and anxiety disorders and severity of posttraumatic stress disorder symptoms in treatment-seeking veterans. Psychol Trauma. 2019;11(4):451–8. Available from: https://doi.org/10.1037/tra0000383.
15. Stein MB, Goin MK, Pollack MH, et al. *Practice guideline for the treatment of patients with panic disorder*. 2nd ed Washington, DC: American Psychiatric Press; 2009. https://doi.org/10.1136/bmj.1.4496.313-d.
16. Benedek DM, Friedman MJ, Zatzick D, Ursano RJ. Guideline watch*:* practice guideline for the treatment of patients with acute stress disorder and postttraumatic stress disorder. Arlington, VA: American Psychiatric Association; 2009. https://doi.org/10.1176/appi.books.9780890423363.149073.
17. Koran LM, Simpson HB Guideline Watch (March 2013). Practice guideline for the treatment of patients with obsessive-compulsive disorder. Arlington, VA: American Psychiatric Association. 2013. https://www.psychiatry.org/psychiatrists/practice/clinical-practice-guidelines. Accessed 12 Nov 2019.
18. National Institute for Health and Care Excellence Posttraumatic stress disorder. Clinical guideline NG116. Published 2018. https://www.nice.org.uk/guidance/ng116/. Accessed 8 Aug 2022.
19. National Institute for Health and Care Excellence Generalized anxiety disorder and panic disorder in adults: management. Clinical guideline CG113. Published 2011. https://www.nice.org.uk/guidance/cg113. Accessed 8 Aug 2022.

20. National Institute for Health and Care Excellence Social anxiety disorder: recognition, assessment and treatment. Clinical guideline CG159. Published 2013. https://www.nice.org.uk/guidance/cg159. Accessed 8 Aug 2022.
21. National Institute for Health and Care Excellence Obsessive-compulsive disorder and body dysmorphic disorder: treatment. Clinical guideline CG31. Published 2005. https://www.nice.org.uk/guidance/cg31. Accessed 8 Aug 2022.
22. Lanouette NM, Stein MB. Advances in the management of treatment-resistant anxiety disorders. Focus (Am Psychiatr Publ) . 2010;8(4):501–24. Available from: https://doi.org/10.1176/foc.8.4.foc501.
23. Cuijpers P, Cristea IA, Karyotaki E, Reijnders M, Huibers MJH. How effective are cognitive behavior therapies for major depression and anxiety disorders? A meta-analytic update of the evidence. World Psychiatry . 2016;15(3):245–58. Available from: https://doi.org/10.1002/wps.20346.
24.•• van Dis EAM, van Veen SC, Hagenaars MA, Batelaan NM, Bockting CLH, van den Heuvel RM, Cuijpers P, Engelhard IM. Long-term outcomes of cognitive behavioral therapy for anxiety-related disorders. JAMA Psychiatry. 2020;77(3):265. https://doi.org/10.1001/jamapsychiatry.2019.3986. **This is recent meta-analysis examining the impact of long-term outcomes of CBT. The authors outline some fundamental points concerning the long-term outcomes after 12 months. According to the review, the effects were unstable after 12 months of treatment. As suggested by the authors, the natural progression of this work is to examine the variable associated with treatment response as this would help to optimize the treatment.**
25. Kaczkurkin AN, Foa EB. Cognitive-behavioral therapy for anxiety disorders: an update on the empirical evidence. Dialogues Clin Neurosci. 2015;17(3):337–46. Available from: https://doi.org/10.31887/dcns.2015.17.3/akaczkurkin.
26. Hofmann SG, Smits JA. Cognitive–behavioral therapy for adult anxiety disorders: a meta-analysis of randomized placebo-controlled trials. J Clin Psychiatry. 2008;69(4):621–32. https://doi.org/10.4088/JCP.v69n0415.
27. Hofmann SG, Asmundson GJ, Beck AT. The science of cognitive therapy. Behav Ther. 2013;44(2):199–212. https://doi.org/10.1016/j.beth.2009.01.007 (Epub 2011 May 25 PMID: 23611069).
28. Olatunji BO, Cisler JM, Deacon BJ. Efficacy of cognitive behavioral therapy for anxiety disorders: a review of meta-analytic findings. Psychiatr Clin North Am . 2010;33(3):557–77. Available from: https://doi.org/10.1016/j.psc.2010.04.002.
29. Carpenter JK, Andrews LA, Witcraft SM, Powers MB, Smits JAJ, Hofmann SG. Cognitive behavioral therapy for anxiety and related disorders: a meta-analysis of randomized placebo-controlled trials. Depress Anxiety. 2018;35(6):502–14. Available from: https://doi.org/10.1002/da.22728.
30. Otte C. Cognitive behavioral therapy in anxiety disorders: current state of the evidence. Dialogues Clin Neurosci . 2011;13(4):413–21. Available from: https://doi.org/10.31887/dcns.2011.13.4/cotte.
31. Greenberg RP, Constantino MJ, Bruce N. Are patient expectations still relevant for psychotherapy process and outcome? Clin Psychol Rev . 2006;26(6):657–78. Available from: https://doi.org/10.1016/j.cpr.2005.03.002.
32. Watts SE, Turnell A, Kladnitski N, Newby JM, Andrews G. Treatment-as-usual (TAU) is anything but usual: a meta-analysis of CBT versus TAU for anxiety and depression. J Affect Disord. 2015;1(175):152–67. https://doi.org/10.1016/j.jad.2014.12.025 (Epub 2014 Dec 15 PMID: 25618002).
33. Munder T, Geisshüsler A, Krieger T, Zimmermann J, Wolf M, Berger T, et al. Intensity of treatment as usual and its impact on the effects of face-to-face and internet-based psychotherapy for depression: a preregistered meta-analysis of randomized controlled trials. Psychother Psychosom . 2022;91(3):200–9. Available from: https://doi.org/10.1159/000521951.
34. Cristea IA. The waiting list is an inadequate benchmark for estimating the effectiveness of psychotherapy for depression. Epidemiol Psychiatr Sci . 2019;28(3):278–9. Available from: https://doi.org/10.1017/S2045796018000665.
35. Patterson B, Boyle MH, Kivlenieks M, Van Ameringen M. The use of waitlists as control conditions in anxiety disorders research. J Psychiatr Res . 2016;83:112–20. Available from: https://doi.org/10.1016/j.jpsychires.2016.08.015.
36. Cunningham JA, Kypri K, McCambridge J. Exploratory randomized controlled trial evaluating the impact of a waiting list control design. BMC Med Res Methodol . 2013;13(1):150. Available from: https://doi.org/10.1186/1471-2288-13-150.
37. Mohr DC, Ho J, Hart TL, Baron KG, Berendsen M, Beckner V, et al. Control condition design and implementation features in controlled trials: a meta-analysis of trials evaluating psychotherapy for depression. Transl Behav Med. 2014;4(4):407–23. Available from: https://doi.org/10.1007/s13142-014-0262-3.
38. Karlsson P, Bergmark A. Compared with what? An analysis of control-group types in Cochrane and Campbell reviews of psychosocial treatment efficacy with substance use disorders: Compared with what? Addiction. 2015;110(3):420–8. Available from: https://doi.org/10.1111/add.12799.
39. Quitkin FM. Placebos, drug effects, and study design: a clinician's guide. Am J Psychiatry . 1999;156(6):829–36. Available from: https://doi.org/10.1176/ajp.156.6.829.
40. Quitkin FM, Rabkin JG, Gerald J, Davis JM, Klein DF. Validity of clinical trials of antidepressants. Am J Psychiatry . 2000;157(3):327–37. Available from: https://doi.org/10.1176/appi.ajp.157.3.327.
41. Gaab J, Kossowsky J, Ehlert U, Locher C. Effects and components of placebos with a psychological treatment rationale - three randomized-controlled studies. Sci Rep . 2019;9(1):1421. Available from: https://doi.org/10.1038/s41598-018-37945.
42. Sliwinski J, Elkins GR. Enhancing placebo effects: insights from social psychology. Am J Clin Hypn. 2013;55(3):236–48. Available from: https://doi.org/10.1080/00029157.2012.740434.
43. Geers AL, Miller FG. Understanding and translating the knowledge about placebo effects: the contribution of psychology: the contribution of psychology. Curr Opin Psychiatry . 2014;27(5):326–31. Available from: https://doi.org/10.1097/YCO.0000000000000082.
44. Cuijpers P, Driessen E, Hollon SD, van Oppen P, Barth J, Andersson G. The efficacy of nondirective supportive therapy for adult depression: a meta-analysis. Clin Psychol Rev. 2012;32(4):280–91. https://doi.org/10.1016/j.cpr.2012.01.003.
45. Winston A, Rosenthal RN, Pinsker H. Introduction to supportive psychotherapy. Inc.: American Psychiatric Publishing; 2004.
46. Grover S, Avasthi A, Jagiwala M. Clinical practice guidelines for practice of supportive psychotherapy. Indian Journal of Psychiatry. 2020;62(8):173. https://doi.org/10.4103/psychiatry.indianjpsychiatry_768_1.
47. Schnurr P, Friedman M, Foy D, Shea T, Hsieh F, Lavori P, et al. A randomized trial of trauma-focused group therapy for posttraumatic stress disorder. Archives of General Psychiatry. 2003;60:481–9. Available from: https://doi.org/10.1001/archpsyc.60.5.48.
48. McDonagh A, Friedman M, McHugo G, Ford J, Sengupta A, Mueser K, Demment CC, Fournier D, Schnurr PP, Descamps M. Randomized trial of cognitive–behavioral therapy for chronic posttraumatic stress disorder in adult female survivors of childhood sexual abuse. J Consult Clin Psychol. 2005;73(3):515.
49.•• Belsher BE, Beech E, Evatt D, Smolenski DJ, Shea MT, Otto JL, et al. Present-centered therapy (PCT) for posttraumatic stress disorder (PTSD) in adults. Cochrane Libr . 2019;2019(11). Available from: https://doi.org/10.1002/14651858.cd012898.pub2. **This**

is a recent meta-analysis compares present-centered therapy (PCT) with trauma-focused CBT(TCBT) and other control conditions. This is an important review as PCT is considered as non-directive psychotherapy for PTSD and was designed as a placebo treatment. The intervention focuses on developing hope, optimism and positive regard. Though PCT is distinct from other forms of psychotherapy, it is interesting to note that PCT has been shown to be effective in improving PTSD symptoms. Additionally, this review provides important insight on dropout rates as the authors found that dropout were significantly lower as compared to TCBT.

50. Bandelow B, Reitt M, Röver C, Michaelis S, Görlich Y, Wedekind D. Efficacy of treatments for anxiety disorders: a meta-analysis: a meta-analysis. Int Clin Psychopharmacol . 2015;30(4):183–92. Available from: https://doi.org/10.1097/YIC.0000000000000078.
51. Domhardt M, Nowak H, Engler S, Baumel A, Grund S, Mayer A, Terhorst Y, Baumeister H. Therapeutic processes in digital interventions for anxiety: a systematic review and meta-analytic structural equation modeling of randomized controlled trials. Clin Psychol Rev. 2021. https://doi.org/10.1016/j.cpr.2021.102084.
52. Pauley D, Cuijpers P, Papola D, Miguel C, Karyotaki E. Two decades of digital interventions for anxiety disorders: a systematic review and meta-analysis of treatment effectiveness. Psychol Med. 2021. https://doi.org/10.1017/S0033291721001999.
53. Hofmann SG, Asmundson GJG. Acceptance and mindfulness-based therapy: new wave or old hat?. Clin Psychol Rev. 2008;28(1):1–16. https://doi.org/10.1016/j.cpr.2007.09.003.
54. Balduzzi S, Rücker G, Schwarzer G. How to perform a meta-analysis with R: a practical tutorial. Evid Based Ment Health. 2019;22(4):153–60. Available from: https://doi.org/10.1136/ebmental-2019-300117.
55. Harrer M, Cuijpers P, Furukawa T, Ebert D. dmetar: Companion R package for the guide 'doing meta-analysis in R. 2019.
56. Higgins J, Li T, Deeks J;., Higgins J, Thomas J, Chandler J, et al. Chapter 6: choosing effect measures and computing estimates of effect. 2022;6(3). Available from: https://www.training.cochrane.org/handbook.
57. Lakens D. Calculating and reporting effect sizes to facilitate cumulative science: a practical primer for t tests and ANOVAs. Front Psychol. 2013;4. Available from: https://doi.org/10.3389/fpsyg.2013.00863.
58. Hedges LV. Distribution theory for glass's estimator of effect size and related estimators. J Educ Stat. 1981;6(2):107. Available from: https://doi.org/10.2307/1164588.
59. IntHout J, Ioannidis JPA, Borm GF. The Hartung-Knapp-Sidik-Jonkman method for random effects meta-analysis is straightforward and considerably outperforms the standard DerSimonian–Laird method. BMC Med Res Methodol. 2014;14(1). Available from: https://doi.org/10.1186/1471-2288-14-25.
60. Sidik K, Jonkman JN. Simple heterogeneity variance estimation for meta-analysis. J R Stat Soc Ser C Appl Stat. 2005;54(2):367–84. Available from: https://doi.org/10.1111/j.1467-9876.2005.00489.
61. Cohen J. Statistical power analysis for the behavioral sciences. 2nd ed. London, England: Routledge; 2013. Available from: https://doi.org/10.4324/9780203771587.
62. Miettinen O, Nurminen M. Comparative analysis of two rates. Stat Med . 1985;4(2):213–26. Available from: https://doi.org/10.1002/sim.4780040211.
63. Lewis C, Roberts NP, Gibson S, Bisson JI. Dropout from psychological therapies for posttraumatic stress disorder (PTSD) in adults: systematic review and meta-analysis. Eur J Psychotraumatol. 2020;11(1):1709709. Available from: https://doi.org/10.1080/20008198.2019.1709709.
64. Higgins JPT. Measuring inconsistency in meta-analyses. BMJ. 2003;327(7414):557–60. Available from: https://doi.org/10.1136/bmj.327.7414.557.
65. Borenstein M, Hedges LV, Higgins JPT, Rothstein HR. Introduction to meta-analysis. Chichester, UK: John Wiley & Sons, Ltd; 2009.
66. van Lissa1 C. 7.3 Detecting outliers & influential cases Github. io. [cited 2022 Aug 4]. Available from: https://cjvanlissa.github.io/Doing-Meta-Analysis-in-R/detecting-outliers-influential-cases.html.
67. Shuster JJ. Review: Cochrane handbook for systematic reviews for interventions, Version 5.1.0, published 3/2011. Julian P.T. Higgins and Sally Green, Editors. Res Synth Methods. 2011;2(2):126–30. Available from: https://doi.org/10.1002/jrsm.38.
68. Duval S, Tweedie R. Trim and fill: a simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. Biometrics. 2000;56(2):455–63. Available from: https://doi.org/10.1111/j.0006-341x.2000.00455.x.
69. Egger M, Smith GD, Schneider M, Minder C. Bias in meta-analysis detected by a simple, graphical test. BMJ. 1997;315(7109):629–34. Available from: https://doi.org/10.1136/bmj.315.7109.629.
70. Higgins JPT, Altman DG, Gotzsche PC, Juni P, Moher D, Oxman AD, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomized trials. BMJ. 2011;343(oct18 2):d5928–d5928. Available from: https://doi.org/10.1136/bmj.d5928.
71.• Fauerbach JA, Gehrke AK, Mason ST, Gould NF, Milner SM, Caffrey J. Cognitive behavioral treatment for acute posttrauma distress: a randomized, controlled proof-of-concept study among hospitalized adults with burns. Arch Phys Med Rehabil .2020;101(1S):S16–25. Available from: https://doi.org/10.1016/j.apmr.2018.11.027.
72.• Simon NM, Hofmann SG, Rosenfield D, Hoeppner SS, Hoge EA, Bui E, et al. Efficacy of yoga vs cognitive behavioral therapy vs stress education for the treatment of generalized anxiety disorder: a randomized clinical trial: A randomized clinical trial. JAMA Psychiatry. 2021;78(1):13–20. Available from: https://doi.org/10.1001/jamapsychiatry.2020.2496.
73.• Carlsson J, Sonne C, Vindbjerg E, Mortensen EL. Stress management versus cognitive restructuring in trauma-affected refugees—a pragmatic randomized study. Psychiatry Res. 2018;266:116–23. Available from: https://doi.org/10.1016/j.psychres.2018.05.015.
74.• Foa EB, McLean CP, Zang Y, Rosenfield D, Yadin E, Yarvis JS, et al. Effect of prolonged exposure therapy delivered over 2 weeks vs 8 weeks vs present-centered therapy on PTSD symptom severity in military personnel: a randomized clinical trial. JAMA. 2018;319(4):354. Available from: https://doi.org/10.1001/jama.2017.21242.
75.•• Haynes PL, Burger SB, Kelly M, Emert S, Perkins S, Shea MT. Cognitive behavioral social rhythm group therapy versus present centered group therapy for veterans with posttraumatic stress disorder and major depressive disorder: A randomized controlled pilot trial. J Affect Disord. 2020;277:800–9. Available from: https://doi.org/10.1016/j.jad.2020.09.009. **This paper is important because it is the first randomized controlled pilot trial to examine the feasibility and efficacy of a promising new social rhythm-based cognitive behavioral therapy (CBSRT) in combat veterans with PTSD. According to social rhythm hypothesis of mood disorders, dysregulated mood are a resulted of poor circadian rhythm. Veteran with PTSD have major sleep disturbances. Therefore, to address the need CBSRT was designed to improve the sleep disturbances. The authors did find that individuals assigned to the CBSRT group have significant reductions in the frequency of nightmares as compared to individuals randomized to PCT, but not overall PTSD symptoms.**
76.•• Johnson DM, Palmieri PA, Zlotnick C, Johnson NL, Hoffman L, Holmes SC, et al. A randomized controlled trial comparing

HOPE treatment and present-centered therapy in women residing in shelter with PTSD from intimate partner violence. Psychol Women Q. 2020;44(4):539–53. Available from: https://doi.org/10.1177/0361684320953120. **This is the first RCT addressing intimate partner violence (IPV) among women with a higher rate of PTSD. The authors investigate a unique treatment to address such needs for the sample. The treatment focuses on empowering women living in the shelters by teaching CBT based skills including cognitive restructuring, managing triggers improving relationships, assertiveness, anger management goal setting and safety planning. The finding from the papers indicates that such training are effective for IPV survivors residing in shelter.**

77.• Nidich S, Mills PJ, Rainforth M, Heppner P, Schneider RH, Rosenthal NE, et al. Nontrauma-focused meditation versus exposure therapy in veterans with posttraumatic stress disorder: a randomized controlled trial. Lancet Psychiatry . 2018;5(12):975–86. Available from: https://doi.org/10.1016/S2215-0366(18)30384-5.

78.• Sloan DM, Unger W, Lee DJ, Beck JG. A randomized controlled trial of group cognitive behavioral treatment for veterans diagnosed with chronic posttraumatic stress disorder: group cognitive behavioral treatment for PTSD. J Trauma Stress . 2018;31(6):886–98. Available from: https://doi.org/10.1002/jts.22338.

79.•• Vera M, Obén A, Juarbe D, Hernández N, Kichic R, Hembree EA. A randomized clinical trial of prolonged exposure and applied relaxation for the treatment of Latinos with posttraumatic stress disorder. J Trauma Stress. 2022;35(2):593–604. Available from: https://doi.org/10.1002/jts.22773. **This article is important because it is the first study to examine the efficacy of prolonged exposure therapy in a population of Spanish-speaking Latinos with PTSD, addressing disparities experienced by racial and ethnic minorities and providing information relevant to their treatment.**

80.•• Samantaray NN, Nath B, Behera N, Mishra A, Singh P, Sudhir P. Brief cognitive behavior group therapy for social anxiety among medical students: a randomized placebo-controlled trial. Asian J Psychiatr. 2021;55(102526):102526. Available from: https://doi.org/10.1016/j.ajp.2020.102526. **This article is important mainly for two reasons: it examines the efficacy of a brief CBT for targeting SAD amongst medical students and it is the only RCT of those included in this meta-analysis that was conducted in an Asian country. Although various studies have examined the prevalence of SAD among different populations, data regarding SAD amongst medical students are scarce. Therefore, this study is an important addition contributing to the extant literature.**

81. U.S. Department of Veterans Affairs, Department of defense. VA/DOD clinical practice guideline for the management of posttraumatic stress disorder and acute stress disorder 2017. Available at https://www.healthquality.va.gov/guidelines/MH/ptsd/VADoDPTSDCPGFinal012418.pdf. Accessed 8 Aug 2022.

82. Haagen JFG, Smid GE, Knipscheer JW, Kleber RJ. The efficacy of recommended treatments for veterans with PTSD: a metaregression analysis. Clin Psychol Rev. 2015;40:184–94. Available from: https://doi.org/10.1016/j.cpr.2015.06.008.

83. Straud CL, Siev J, Messer S, Zalta AK. Examining military population and trauma type as moderators of treatment outcome for first-line psychotherapies for PTSD: A meta-analysis. J Anxiety Disord. 2019;67(102133):102133. Available from: https://doi.org/10.1016/j.janxdis.2019.102133.

84. Foa EB, Zoellner LA, Feeny NC, Hembree EA, Alvarez-Conrad J. Does imaginal exposure exacerbate PTSD symptoms? J Consult Clin Psychol. 2002;70(4):1022–8. https://doi.org/10.1037/0022-006X.70.4.1022.

85. Speckens AEM, Ehlers A, Hackmann A, Clark DM. Changes in intrusive memories associated with imaginal reliving in posttraumatic stress disorder. J Anxiety Disord [Internet]. 2006;20(3):328–41. Available from: https://doi.org/10.1016/j.janxdis.2005.02.004.

86. Imel ZE, Laska K, Jakupcak M, Simpson TL. Meta-analysis of dropout in treatments for posttraumatic stress disorder. J Consult Clin Psychol . 2013;81(3):394–404. Available from: https://doi.org/10.1037/a0031474.

87. Molenaar PCM. A manifesto on psychology as idiographic science: bringing the person back into scientific psychology, this time forever. Measurement (Mahwah NJ). 2004;2(4):201–18. Available from: https://doi.org/10.1207/s15366359mea0204_1.

88.•• Hofmann SG, Hayes SC. The future of intervention science: process-based therapy. Clin Psychol Sci . 2019;7(1):37–50. Available from: https://doi.org/10.1177/2167702618772296. **This article gives an overview of process-based therapy and alternative way to understand and treat psychological problems rather than relying on the disease model.**