

Meditation for Posttraumatic Stress: Systematic Review and Meta-Analysis

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Objective: We conducted a systematic review and meta-analysis that synthesized evidence from randomized controlled trials of meditation interventions to provide estimates of their efficacy and safety in treating adults diagnosed with posttraumatic stress disorder (PTSD). This review was based on an established protocol (PROSPERO: CRD42015025782) and is reported according to PRISMA guidelines. Outcomes of interest included PTSD symptoms, depression, anxiety, health-related quality of life, functional status, and adverse events. **Method:** Meta-analyses were conducted using the Hartung-Knapp-Sidik-Jonkman method for random-effects models. Quality of evidence was assessed using the Grade of Recommendations Assessment, Development, and Evaluation (GRADE) approach. **Results:** In total, 10 trials on meditation interventions for PTSD with 643 participants met inclusion criteria. Across interventions, adjunctive meditation interventions of mindfulness-based stress reduction, yoga, and the mantram repetition program improve PTSD and depression symptoms compared with control groups, but the findings are based on low and moderate quality of evidence. Effects were positive but not statistically significant for quality of life and anxiety, and no studies addressed functional status. The variety of meditation intervention types, the short follow-up times, and the quality of studies limited analyses. No adverse events were reported in the included studies; only half of the studies reported on safety. **Conclusions:** Meditation appears to be effective for PTSD and depression symptoms, but in order to increase confidence in findings, more high-quality studies are needed on meditation as adjunctive treatment with PTSD-diagnosed participant samples large enough to detect statistical differences in outcomes.

Keywords: PTSD, depression, meditation, systematic review

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Posttraumatic stress disorder (PTSD) is a condition that can develop after exposure to a traumatic event. PTSD is characterized by four hallmark clusters of symptoms: reexperiencing, avoidance, negative cognitions or mood, and hyperarousal (American Psychiatric Association, 2013). In order to meet the diagnostic criteria for PTSD of the *Diagnostic and Statistical Manual of Mental Disorders*, 5th edition (*DSM-5*), symptoms must last for more than a month. Although half of the cases resolve within three months, patients may experience symptoms for extended periods or experience symptoms that resolve and reappear over time (American Psychiatric Association, 2013). These symptoms can be severe, pervasive, and chronic; they can have a devastating impact on those affected by the disorder,

as well as their families. The need for more research on treatment options for PTSD is prompted by the body of evidence showing that patients are increasingly turning to complementary and alternative medicine (CAM) approaches for managing mental health. Among a nationally representative sample of PTSD-diagnosed individuals, 39% reported CAM use in the previous year (Libby, Pilver, & Desai, 2012). In the military context, CAM is being offered for veterans at 89% of Department of Veterans Affairs (VA) facilities. Meditation has been reported to be the most commonly provided CAM modality and a top referral for PTSD treatment (Libby, Pilver, & Desai, 2013; VA HAIG, 2011). Because PTSD can be difficult to treat, and because of the widespread use of CAM for psychological problems, the efficacy of CAM approaches to PTSD is being explored in clinical practices.

Meditation is a mind–body technique that refers to a broad variety of practices with the general goal of training the mind through regulation of attention and/or emotion to affect body functions, symptoms, and state of being (Nash & Newberg, 2013; National Center for Complementary and Alternative Medicine, 2005, 2012). Categories of meditation include focused attention (voluntary focusing of attention on a chosen object), open monitoring (nonreactive monitoring of the content of experience from moment to moment), and automatic self-transcending meditation (absence of focus and individual control or effort; Lutz, Slagter, Dunne, & Davidson, 2008; Travis & Shear, 2010). Movement meditations, such as yoga, tai chi, and qi gong, that consist of

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breathing and physical poses are mindfulness techniques that emphasize attention to emotional and physical stimuli.

Two recent narrative reviews that examined meditation interventions reported that research indicates promise but does not clearly establish efficacy of meditation for PTSD (Lang et al., 2012; Vujanovic, Niles, Pietrefesa, Schmertz, & Potter, 2013); one review (Lang et al., 2012) noted the need to examine meditation that is used adjunctively with existing evidence-based therapies. In the most recent major review of the effect of meditation on PTSD, 11 of the 12 included studies reported a significant effect of meditation on PTSD symptoms, but the authors noted that the strength of evidence was weak due to poor methodological quality and small sample sizes of most of the included studies (Banks, Newman, & Saleem, 2015). In another recent review, 12 of the 16 included studies of mixed design showed a positive effect of meditation on PTSD symptoms, but the strength of evidence was limited by the variation in study design and quality (Kim, Schneider, Kravitz, Mermier, & Burge, 2013). A smaller review that included nine studies found meditation improved PTSD symptoms in most studies, but again methodological quality varied among studies (Wahbeh, Senders, Neuendorf, & Cayton, 2014).

This review aims to synthesize randomized controlled trials (RCTs) in a comprehensive systematic review in order to provide reliable estimates of the efficacy and safety of meditation interventions for the treatment of PTSD. Specifically, this systematic review aimed to answer the following key question: What are the effects of meditation interventions on PTSD symptoms, depression, anxiety, health-related quality of life, functional status, and adverse events compared with treatment as usual (TAU), waitlists, no treatment, or other active treatments, in adults diagnosed with PTSD?

Method

This systematic review was conducted on the basis of an established protocol (PROSPERO: CRD42015025782) and is reported according the PRIMSA guidelines (Supplemental Appendix A).

Search Strategy

We searched the databases PubMed, PsycINFO, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Allied and Complementary Medicine (AMED), Cochrane Database of Systematic Reviews (CDSR), Cochrane Central Register of Controlled Trials (CENTRAL), Database of Abstracts of Reviews of Effect (DARE), and Published International Literature on Traumatic Stress (PILOTS) for English-language RCTs, from database inception to November 2015. Search strings included terms related to PTSD (e.g., “posttraumatic stress”) using both free text and controlled language of indexing databases (e.g., MeSH headings). Given the broad range of eligible meditation approaches and the difficult nomenclature, we searched PubMed without any search filters for meditation interventions. All PTSD-related RCTs indexed in the database were screened to avoid missing relevant studies. The search output informed the search strategy for other databases. The search strings for meditation are a combination of general meditation terms (“meditat*”) and specific approaches (e.g., mindfulness-based stress reduction [MBSR]). In addition, we screened the bibliographies of relevant reviews and included studies. Finally, we contacted topic experts to identify pertinent RCTs.

Eligibility Criteria

Parallel group, individual or cluster RCTs of adults diagnosed with PTSD were eligible for inclusion. PTSD diagnosis was defined as a reported clinical diagnosis (e.g., *DSM-5* criteria) or a clinically meaningful score on an established PTSD symptom assessment scale (e.g., Clinician Administered PTSD Scale [CAPS]; PTSD Checklist [PCL]) consistent with a PTSD diagnosis. Studies measuring PTSD symptoms in other patient groups were not eligible. Studies that evaluated the effect of a meditation intervention (e.g., MBSR, mindfulness-based cognitive therapy, mindfulness meditation, yoga, tai chi, mantram meditation, qigong, or self-compassion), either as an adjunctive or monotherapy, were eligible. Mind–body interventions that alone did not include a meditative component (e.g., diaphragmatic breathing), or where meditation was not a central component, were excluded. Inclusion was not limited by treatment duration, follow-up period, or setting. RCTs were eligible regardless of the comparator (e.g., TAU, waitlist, attention control, no treatment, or other active treatments). Studies had to report on PTSD symptoms, depression, anxiety, quality of life, or functional status to be included. Dissertations or conference abstracts were excluded.

Study Selection and Data Abstraction

Two independent reviewers screened titles and abstracts of retrieved citations using systematic review software after an initial session piloting the screening form. Citations judged as potentially relevant by at least one reviewer were obtained as full text. The two independent reviewers screened full-text publications against the specified inclusion and exclusion criteria; any disagreements were resolved through discussion within the review team. The flow of citations throughout this process was documented in an electronic database, and reasons for exclusion of full-text publications were recorded. Data abstraction was also conducted in dual review. The risk of bias of included RCTs was assessed using the Cochrane Risk of Bias tool (Higgins et al., 2011), and other biases related to the U.S. Preventive Services Task Force’s criteria for internal validity of included studies were also assessed (U.S. Preventive Services Task Force, 2008).

Meta-Analytic Techniques and Quality of Evidence Assessment

When sufficient data were available and clinical heterogeneity was acceptable, we conducted meta-analyses to pool results across included studies using random-effects meta-analysis and calculated the standard error using the Hartung-Knapp-Sidik-Jonkman method (Hartung, 1999; Hartung & Knapp, 2001; Sidik & Jonkman, 2006); this approach may be preferred when the number of studies pooled is small (IntHout, Ioannidis, & Borm, 2014; Sánchez-Meca & Marín-Martínez, 2008). Continuous data are presented as standardized mean differences (SMDs) together with the 95-percent confidence intervals (CIs). Metaregressions examined the impact of moderator variables on study effect size. We explored sources of detected heterogeneity and conducted sensitivity analyses, such as omitting the lower quality studies, where indicated. The quality of evidence was assessed for major outcomes using the GRADE approach (Brożek et al., 2009; Canfield

& Dahm, 2011; Guyatt et al., 2008). We assessed study limitations, directness, consistency, precision, and reporting bias (Egger, Smith, Schneider, & Minder, 1997; Green, 2013). The quality of evidence was graded with a determination of high, moderate, low, or very low.

Results

We identified 1,365 citations through the electronic database search and reference-mining. The literature flowchart is shown in Figure 1. Full texts were obtained for 70 citations identified as potentially relevant. Sixty citations were excluded because of the type of publication (e.g., abstract only, dissertations), because they did not report primary data (Background or Review), because participants were not diagnosed with PTSD, because the study was not an RCT (Exclude-Design), because the intervention was not meditation, or because the study did not report on an eligible outcome. Ten RCTs met inclusion criteria.

Description of Included Studies

All included studies were individually randomized controlled trials and provided data on the efficacy of meditation interventions on PTSD symptoms, depression, anxiety, or quality of life. Five RCTs addressed the presence or absence of adverse events. No studies were identified that reported on functional status. Study settings were single sites; eight were conducted in the U.S. and two were conducted in the Middle East.

Of the 10 included studies, five RCTs assessed MBSR, including a brief MBSR intervention (Azad Marzabadi & Hashemi Zadeh, 2014; Kearney, McDermott, Malte, Martinez, & Simpson, 2013; Niles et al., 2012; Omid, Mohammadi, Zargar, & Akbari, 2013; Polusny et al., 2015). MBSR is a manualized protocol that

includes didactic training and formal practice in three meditation techniques: body scan, sitting meditation, and mindful yoga. Three RCTs assessed yoga interventions (Jindani, Turner, & Khalsa, 2015; Mitchell et al., 2014; van der Kolk et al., 2014). Yoga programs included Kundalini yoga with trauma focus, which is a comprehensive yoga style incorporating the traditional elements of yoga practice (postures and physical exercises, breathing techniques, meditation, cultivation of mind-body awareness, and deep relaxation); Kripalu hatha yoga with trauma-sensitive focus combining breathing and physical postures; and a protocolized trauma-informed hatha yoga program consisting of breathing, postures, and meditation. Two RCTs assessed a mantram repetition program (Bormann, Thorp, Wetherell, & Golshan, 2008; Bormann, Thorp, Wetherell, Golshan, & Lang, 2013). Mantram repetition programs consisted of education on PTSD symptoms and skills on how to choose and silently repeat a mantram throughout the day, as often as possible, to train attention; concepts of slowing down and one-pointed attention mindfulness practice were also taught.

Intervention durations ranged from 4 to 12 weeks in length, with the average program running 8 weeks. Nine interventions included weekly sessions, and one intervention met twice weekly. One program also included a day-long retreat in addition to weekly meetings. The average number of intervention minutes per week was 108, and the range was 26 min to 199 min. The mode was 90 min of intervention per week. The detailed description of included studies is displayed in Table 1.

There were a total of 643 participants across all included studies, and the range of sample sizes within studies was 28 to 146 participants. All participants were diagnosed with PTSD. There were four studies with mixed gender, four studies focused on males only, and two studies focused on females only.

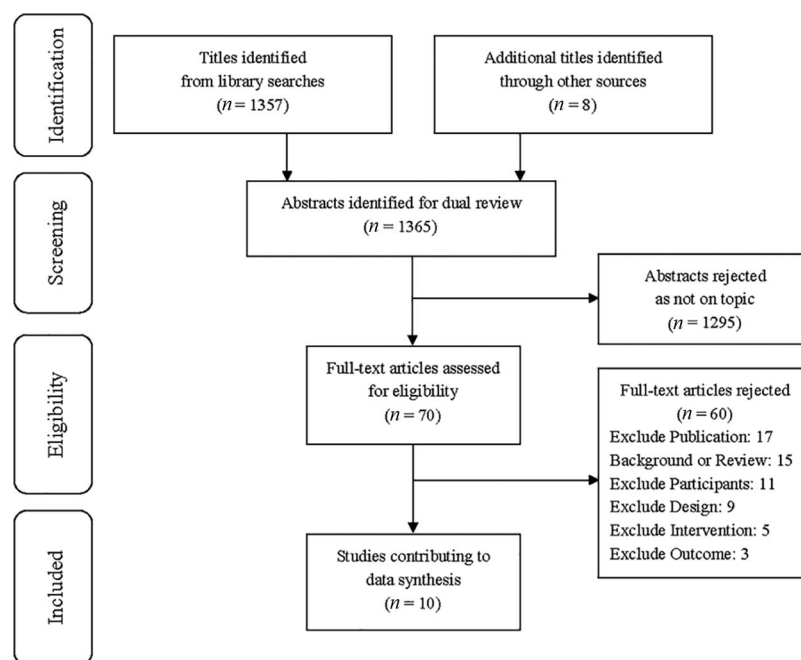


Figure 1. Literature flowchart.

Table 1
Study Descriptions

Study	Meditation, duration	Comparator	Sample size	Trauma type	% Male	Age M (SD)
Bormann et al. (2008)	Mantram repetition program and TAU for 6 weekly 90-min sessions.	TAU, waitlist	29	Combat-associated trauma	100	56 (6.57)
Bormann et al. (2013)	Mantram repetition program plus TAU for 6 weekly 90-min sessions.	TAU	146	Combat-associated trauma	97	57 (10.10)
Jindani, Turner, and Khalsa (2015)	Kundalini Yoga with trauma focus plus TAU for 8 weekly 90-min sessions.	TAU, waitlist	80	Sexual trauma, violence, other trauma	11.3	Median 41 (range 18–64)
Kearney et al. (2013)	MBSR plus TAU for 8 weekly 150-min sessions plus day-long retreat.	TAU	47	Combat-associated trauma	79	MBSR: 52 (13.4); TAU: 52 (11.7)
Azad Marzabadi and Hashemi Zadeh (2014)	MBSR with quality of life focus for 2 90-min sessions per week for 4 weeks.	TAU, waitlist	28	Combat-associated trauma	100	35–45 years: 46%; 46–55 years: 50%; 56–60 years: 4%
Mitchell et al. (2014)	Kripalu hatha yoga with trauma-sensitive focus plus TAU for 12 weekly 75-min sessions.	TAU, waitlist	38	Combat-associated trauma, sexual trauma, violence, childhood abuse, other trauma	0	44.37 (12.37)
Niles et al. (2012)	Brief MBSR plus TAU for 8 weekly 26-min sessions.	TAU, psycho-education telehealth program	33	Combat-associated trauma	100	52 (13.0)
Omidi et al. (2013)	MBSR for 8 weekly 120-min sessions.	TAU	62	Combat-associated trauma	100	35–39 years: 24%; 40–44 years: 69%; 45–49 years: 6%
Polusny et al. (2015)	MBSR plus TAU for 8 weekly 150-min sessions plus day-long retreat.	TAU, group present-centered therapy	116	Combat-associated trauma, sexual trauma, physical assault, other trauma	84	58.5 (9.8)
van der Kolk et al. (2014)	Protocolized trauma-informed hatha yoga program plus TAU for 10 weekly 60-min sessions.	TAU, waitlist, women's health education	64	Interpersonal violence	0	42.9 (12.0)

Note. M (SD) = Mean (Standard deviation); MBSR = Mindfulness-based stress reduction; TAU = Treatment as usual/standard care.

The mean age of participants ranged from 41 to 59 years. Meditation offered as adjunctive to TAU was compared to TAU plus waitlist controls in four studies (Azad Marzabadi & Hashemi Zadeh, 2014; Bormann et al., 2008; Jindani et al., 2015; Mitchell et al., 2014) and TAU alone in two studies (Bormann et al., 2013; Kearney et al., 2013); one study used attention-match control of psycho-education plus TAU (Niles et al., 2012), one study used attention-match control of women's health education plus TAU and waitlist (van der Kolk et al., 2014), and one had an active treatment comparator of present-centered group therapy plus TAU (Polusny et al., 2015). One study compared meditation to TAU alone but it was unclear whether the meditation intervention was given as adjunctive or monotherapy (Omidi et al., 2013).

Critical Appraisal of Individual Studies

Three studies (30%) were assigned a “good” quality rating, two (20%) were rated “fair” quality, and five (50%) were rated “poor” quality across critical appraisal criteria. All five studies with poor ratings failed to utilize intention-to-treat (ITT) analyses. In addition, four of these studies had statistically significant differences among potential confounders at baseline. The study quality summary for each included study is displayed in Table 2 along with study level results. Detailed critical appraisal ratings are displayed in supplemental materials in Appendix B.

Quality of Evidence Assessment Across Studies

The results of the quality of evidence assessments for each major outcome are presented in the supplemental materials in Appendix C.

PTSD Symptoms

Eight studies reported on treatment response with respect to PTSD symptoms (Bormann et al., 2008, 2013; Jindani et al., 2015; Kearney et al., 2013; Mitchell et al., 2014; Niles et al., 2012; Polusny et al., 2015; van der Kolk et al., 2014), whereas the remaining two focused on symptoms of depression (Omidi et al., 2013) or quality of life (Azad Marzabadi & Hashemi Zadeh, 2014). Four studies utilized the clinician-administered CAPS and the self-reported PCL measure (Bormann et al., 2008, 2013; Niles et al., 2012; Polusny et al., 2015), three used only the PCL (Jindani et al., 2015; Kearney et al., 2013; Mitchell et al., 2014), and one used only the CAPS (van der Kolk et al., 2014) to assess symptoms. Eight RCTs assessed PTSD symptoms at posttreatment. Figure 2 provides an overview of results showing the meditation type and comparator assessed at the time-point closest to end of treatment. In the pooled analysis, PTSD symptoms for adjunctive meditation interventions were statistically significantly different compared with all comparators (SMD -0.41 ; CI $[-0.81, -0.01]$; 8 RCTs; I^2 67%) in favor of meditation. However, substantial

Table 2
Effects for Individual Studies Included in the Sample

Study	Quality rating	Outcome	Measure (effect)	SMD (95% CI)	Follow-up (weeks)
Bormann et al. (2008)	Poor	PTSD	CAPS (↑)	-.32 (-1.06, .41)	6
			PCL (↑)	-.70 (-1.46, .04)	6
Bormann et al. (2013)	Good	Depression	BSI-18 (↑)	-.72 (-1.47, .04)	6
		PTSD	CAPS (↑)	-.26 (-.59, .06)	6
			PCL (+)	-.33 (-.66, -.01)	6
		Anxiety	BSI-18 Anxiety (↑)	-.10 (-.42, .23)	6
		Depression	BSI-18 Depression (↑)	-.27 (-.59, .06)	6
Jindani, et al. (2015)	Poor	Quality of life	SF-12: Mental Component (+)	.38 (.05, .71)	6
		PTSD	PCL-17 (+)	-1.06 (-1.66, -.46)	8
		Anxiety	DASS-21 (anxiety) (↑)	-.43 (-1.00, .14)	8
		Depression	DASS-21 (depression) (↑)	-.25 (-.82, .31)	8
Kearney et al. (2013)	Fair	PTSD	PCL (↑)	-.49 (-1.07, .09)	8
		Depression	PHQ-9 (+)	-.61 (-1.20, -.02)	8
			PHQ-9 (↑)	-.57 (-1.16, .02)	32
		Quality of life	SF-8 Mental Component (+)	.68 (.09, 1.27)	8
		SF-8 Physical Component (↑)	.38 (-.20, .96)	8	
Azad Marzabadi and Hashemi Zadeh (2014)	Poor	Quality of life	WHOQoL-Bref (+)	1.39 (.57, 2.22)	4
Mitchell et al. (2014)	Good	PTSD	PCL (∅)	-.00 (-.64, .64)	6
		Anxiety	STAI-State (↓)	.08 (-.55, .72)	6
		Depression	CES-D (↑)	-.08 (-.71, .56)	4
			CES-D (↓)	.06 (-.58, .70)	6
Niles et al. (2012)	Poor	PTSD	CAPS (-)	-1.23 (-2.07, -.40)	8
			PCL-M (-)	-1.90 (-2.83, -.96)	8
Omidi et al. (2013)	Poor	Depression	BMS (-)	-.97 (-1.69, -.24)	8
Polusny et al. (2015)	Fair	PTSD	CAPS (↓)	.23 (-.14, .59)	9
			PCL (↑)	-.01 (-.37, .36)	9
		Depression	PHQ-9 (↑)	-.05 (-.42, .31)	9
			PHQ-9 (↑)	-.08 (-.44, .29)	17
		Quality of life	WHOQoL-Bref (↑)	.14 (-.23, .50)	9
van der Kolk et al. (2014)	Good	PTSD	CAPS (+)	-.55 (-1.05, -.05)	10
		Depression	BDI-II (+)	-.50 (-1.00, -.00)	10

Note. ∅ = no effect; + = improved and statistically significant; ↑ = favors meditation (but nonsignificant); ↓ = favors control (but nonsignificant); - = worsened and statistically significant; BDI-II = Beck Depression Inventory-II; BMS = Brunel Mood Scales (inventory of mood status); BSI = Brief Symptom Inventory; CAPS = Clinician-Administered PTSD Scale; CES-D = Center for Epidemiologic Studies Depression Scale; DASS-21 = Depression Anxiety Stress Scale-21; PCL = PTSD Checklist; PCL-M = PTSD Checklist, Military Version; PHQ = Patient Health Questionnaire; PTSD = Posttraumatic Stress Disorder; SF-8 = Short Form Health Survey-8; SF-12 = Short Form Health Survey-12; STAI-State = State-Trait Anxiety Inventory-State; WHOQoL-bref = Abbreviated World Health Organization Quality of Life.

heterogeneity was detected and study quality was mixed, reducing the confidence in the result. The quality of evidence for this finding was determined to be low.

Depression Symptoms

Eight studies assessed depressive symptoms at the end of treatment using the following self-reported measures: Beck Depression Inventory, CES-D, PHQ-9, Behavioral Activation for Depression Scale, BSI-18, Brunel Mood Scales, and Depression Anxiety Stress Scale-21 (Bormann et al., 2008, 2013; Jindani et al., 2015; Kearney et al., 2013; Mitchell et al., 2014; Omidi et al., 2013; Polusny et al., 2015; van der Kolk et al., 2014). Figure 3 shows the results of the included studies by meditation intervention type and comparator assessed at the time point closest to the end of treatment. In the pooled analysis, differences in depression for meditation interventions compared to all controls were statistically significant (SMD -0.34; CI [-0.59, -0.08]; 8 RCTs; I² 24%). However, due to the mixed quality of included studies we downgraded the quality of evidence to moderate for this finding.

Anxiety

Three studies assessed self-reported anxiety symptoms at the end of treatment using the State-Trait Anxiety Inventory – State and BSI-18 (Bormann et al., 2013; Jindani et al., 2015; Mitchell et al., 2014). Two studies compared yoga with TAU (Jindani et al., 2015; Mitchell et al., 2014), and one study compared a mantram repetition program to TAU (Bormann et al., 2013). In the pooled analysis, between-groups differences in anxiety for meditation interventions were not statistically significantly (SMD -0.14; CI [-0.63, 0.36]; 3 RCTs; I² 0%). No statistical heterogeneity was detected but results varied by study, and the quality of evidence for the summary effect is moderate because of inconsistency.

Quality of Life

Four studies assessed self-reported quality of life at the end of treatment using the Abbreviated World Health Organization Quality of Life, Quality of Life Enjoyment and Satisfaction Questionnaire, Short Form Health Survey-8 physical and mental components, and

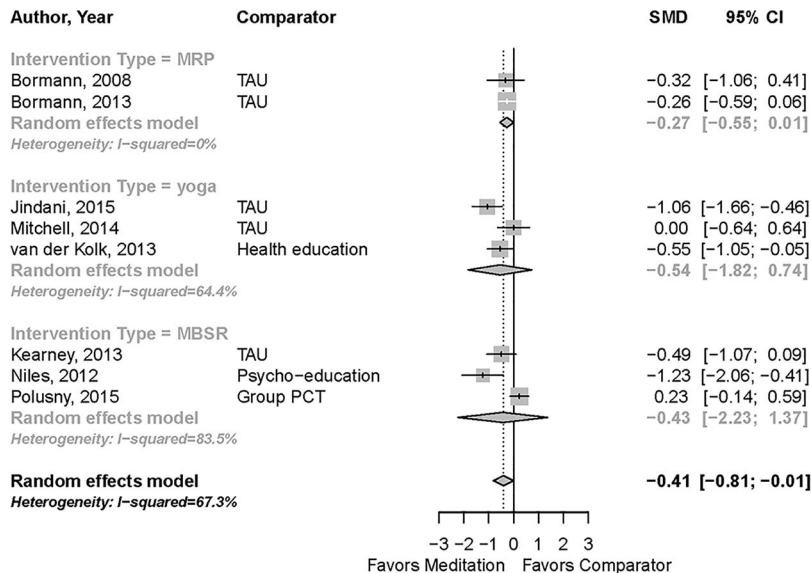


Figure 2. Meditation effects on PTSD symptoms.

Short Form Health Survey–12 mental component (Azad Marzabadi & Hashemi Zadeh, 2014; Bormann et al., 2013; Kearney et al., 2013; Polusny et al., 2015). Two studies compared MBSR to TAU (Azad Marzabadi & Hashemi Zadeh, 2014; Kearney et al., 2013), one study compared MBSR to present-centered group therapy (Polusny et al., 2015), and one study compared a mantram repetition program to TAU (Bormann et al., 2013). In the pooled analysis, effects on quality of life scores between meditation and control groups among the studies measuring total quality of life or only a mental health component were positive but not statistically significant (SMD 0.52; CI [-0.24, 1.28]; 4 RCTs; I² 64%). Similarly, among studies measuring total quality of life or only a physical health component, differences in quality of life

scores between meditation and control groups were also not statistically significant (SMD 0.54; CI [-1.02, 2.11]; 3 RCTs; I² 73%). Substantial heterogeneity, inconsistency, and imprecision were detected in both pooled analyses, and the quality of evidence for the summary estimate was determined to be very low.

Adverse Events

Five of the 10 studies addressed adverse events (Bormann et al., 2013; Kearney et al., 2013; Mitchell et al., 2014; Niles et al., 2012; Polusny et al., 2015). None of these five identified any adverse events occurring among participants randomized to the intervention group. A

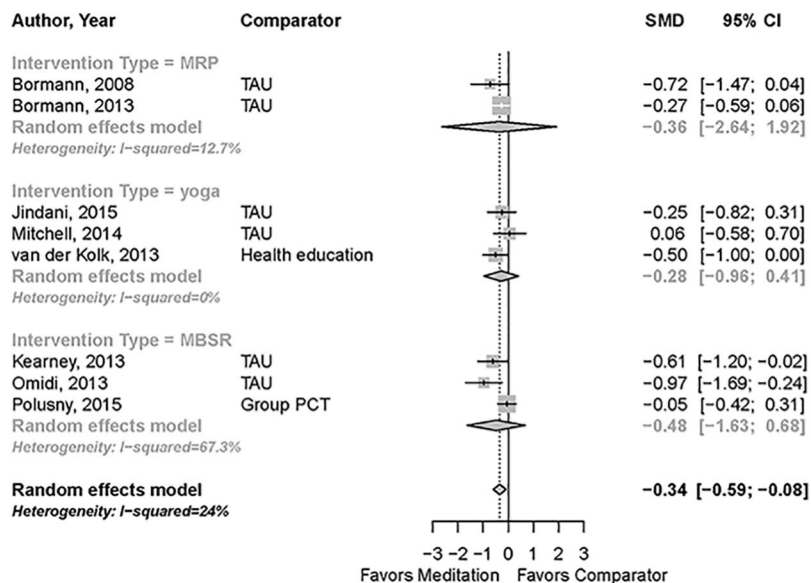


Figure 3. Meditation effects on depression symptoms.

single adverse event, attempted suicide, was reported in the present-centered group therapy control group (Polusny et al., 2015).

Study Moderators

Metaregression did not suggest systematic differences among intervention types: Neither mantram repetition program ($p = .84$) nor yoga ($p = .76$) significantly affected PTSD outcomes more than MBSR. In addition, no systematic effect differences were found by comparators ($p = .09$), trauma type ($p = .20$), or dosage (e.g., a combination of duration and frequency; $p = .53$). Systematic differences were also not found in treatment effects of poor quality studies ($p = .14$) compared with good quality studies, nor fair quality studies compared with good quality studies ($p = .51$); however, the number of studies was small, limiting all metaregressions. Given the lack of monotherapy studies, it was not possible to determine differential effects of offering meditation as adjunctive or monotherapy.

Discussion

Meditation interventions offered adjunctive to TAU—including three yoga, three MBSR, and two mantram repetition programs—reduced PTSD symptoms statistically significantly compared with all comparators (TAU alone, education, or present-centered therapy) across all sources of trauma. Adjunctive meditation interventions were also efficacious in reducing depression symptoms. However, the evidence base for the effect estimates in this review was rated low for PTSD symptoms and moderate for depression symptoms given the identified limitations. Treatment effects were positive but not statistically significantly different for quality of life or anxiety symptoms, and no study addressed functional status. None of the studies identified any adverse events as a result of the meditation intervention, but only five RCTs assessed safety. No head-to-head trials compared different meditation approaches. Indirect comparisons did not systematically favor one type of meditation over another, but only a small number of studies were available per approach. It was not possible to determine the differential effect of offering meditation as adjunctive or monotherapy, and metaregressions did not identify a systematic effect of the intervention intensity or trauma type.

Strengths and Limitations

This review has several methodological strengths: an a priori research design, duplicate study selection and data abstraction of study information, a comprehensive search of electronic databases, risk of bias assessments, comprehensive quality of evidence assessments used to formulate review conclusions, and the availability of studies that focused exclusively on PTSD-diagnosed participants. One limitation is that we did not contact individual study authors; results reported in the review are based on published data. We excluded conference abstracts and dissertations because abstracts do not contain enough data to evaluate study quality, and our search criteria required articles to be peer-reviewed. In addition, we included only studies published in English because of the cost of reviewing and abstracting data in a foreign language.

The included studies had limitations. There were clinician-administered measures used for PTSD severity in most studies, but for depression, anxiety, and quality of life, only self-reported measures

were utilized. This is relevant for studies that may have potential bias due to lack of participant blinding. Because participants in meditation studies can rarely (if ever) be blinded to the intervention, utilizing blinded assessors minimizes at least detection bias, even when performance bias cannot be addressed. In the case of this review, the CAPS measure with blinded assessors is one such workaround. Five of the 10 studies were rated as poor quality, primarily because of lack of ITT analysis and differences at baseline. Seven studies did not report on an a priori power calculation with a targeted sample size. Therefore, the quality of the evidence base on which these findings rest is moderate at best.

Implications for Future Research and Practice

Similar to previous reviews in this area, across intervention type, meditation improved PTSD symptoms and depression symptoms compared to TAU, attention-matched controls, and active controls. This difference translates to an improvement of eight points on the CAPS measure and five points on the PCL measure, which approaches clinical significance.

Meditation interventions, intensity, and study quality varied considerably, and the analytic pool of studies was very small. The review necessarily included studies that focused solely on the PTSD-diagnosed population, which limited the number of included studies. Reporting on and analysis of TAU in adjunctive studies would provide an opportunity to understand the unique effects of meditation. Data on the experience and training of the therapists/practitioners were limited but are needed to understand the potential effect of that experience and training as a modifier of study outcomes. Further research examining the effect of meditation on PTSD symptoms may focus on analyzing treatment adherence to identify the minimum frequency or duration of meditation practice required for maximum effectiveness. Reporting on adherence may also help compare the acceptability of CAM treatments with that of current first-line treatments. This review is consistent with recent reviews (Banks et al., 2015; Lang et al., 2012; Vujanovic et al., 2013), concluding that more well-designed, rigorous, and large RCTs are needed to develop an evidence base that can more decisively provide estimates of the efficacy of the many types of meditation interventions for PTSD, depression, anxiety, quality of life, functional status, as well as associated adverse events.

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