



PTSD *Research Quarterly*

ADVANCING SCIENCE AND PROMOTING UNDERSTANDING OF TRAUMATIC STRESS

Published by:

National Center for PTSD
VA Medical Center (116D)
215 North Main Street
White River Junction
Vermont 05009-0001 USA

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All issues of the PTSD Research Quarterly are available online at: www.ptsd.va.gov

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Meditation-based Approaches in the Treatment of PTSD

Evidence-based psychotherapies (EBPs), such as Prolonged Exposure and Cognitive Processing Therapy, are generally the first-line interventions for PTSD. Unfortunately, many Veterans still have diagnosable PTSD following EBPs (Steenkamp, Litz, Hoge, & Marmar, 2015) or prefer to try other strategies (Markowitz et al., 2016). Thus, there is a strong need for ways to supplement existing treatments, reduce barriers to engagement in EBPs and provide alternatives for individuals who are affected by PTSD. As meditation-based treatments have gained popularity, many practitioners and researchers are incorporating them in the treatment of PTSD (Libby, Pilver, & Desai, 2012). Multiple types of meditation, which differ in philosophy and practice, have been applied clinically. This line of research is in its relative infancy, but initial evidence suggests that meditation-based approaches merit continued investigation to evaluate their efficacy, mechanisms, and implementation within Department of Veterans Affairs (VA) settings.

Recent reviews summarize the impact of meditation as applied to PTSD and other mental health conditions. Hofmann, Grossman and Hinton (2011) reviewed evidence for the broadly beneficial effects of meditation on mental health. They observed that brief instruction and practice are sufficient to produce change in some trials and that improvements may occur via improved positive affect. Hilton and colleagues (2016) recently conducted a meta-analysis of meditation for PTSD. They observed that meditation trials generally led to small to moderate between-group effect sizes (standardized mean differences of -0.41 and -0.34 respectively) for improvements in PTSD and depressive symptoms compared to control conditions. Based on these observed positive effects on PTSD symptoms, they concluded that meditation is a promising adjunct to current PTSD treatments. However, it requires further investigation as much of the current literature base has insufficient methodological rigor. For instance, the authors noted that improving the descriptions of

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treatment as usual (TAU) control conditions could help elucidate the unique effects of meditation; analyzing adherence to protocols could help determine the minimum effective and optimal doses; and more detailed descriptions of the experience of therapists/practitioners could help understand how providers could implement these practices. Finally, Rees (2011) reviewed the role of meditation in resilience programs for military service members. This review found the most support for transcendental meditation (TM), followed by mindfulness and progressive muscle relaxation. Each was associated with a decrease in likelihood of experiencing a range of physical and mental health problems as well as lower health care utilization and overall costs. These reviews suggest meditation is promising as either an intervention or preventative measure for management of stress/PTSD and point to a future research agenda in this area.

Efficacy and Effectiveness

A recent analysis of clinical data collected from multiple VA sites provides information about the effectiveness of meditation-based interventions. This study, which examined programs that have been implemented at six VA clinics, found moderate effect sizes for meditation programs above TAU in measures of post-treatment PTSD symptoms and mindfulness (Heffner, Crean, & Kemp, 2016). On aggregate, between group effect sizes were moderate for PTSD symptoms [-.32 on the Clinician Administered PTSD Scale (CAPS), -.39 on the PTSD Checklist (PCL)] when compared to TAU. Effect sizes were also similar across types of meditation (e.g., mindfulness- or mantram-based). Thus, meditation programs as they are currently implemented appear to be of benefit to Veterans. Of note, two sites allowed participants to choose whether they wanted to participate in the experimental group or a comparison group, so results should be interpreted accordingly.

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One approach for which evidence of efficacy is growing is mantram repetition, which involves silent repetition of a spiritual word or phrase as a coping tool. Bormann, Thorp, Wetherell, Golshan, and Lang (2013) conducted a randomized controlled trial (RCT) comparing mantram repetition plus TAU against TAU alone. Those completing mantram repetition were more likely to make meaningful improvements in PTSD symptoms, and these effects appeared to occur largely through improvements in hyperarousal and spiritual well-being. A two-site RCT comparing mantram repetition to Present Centered Therapy will be published shortly (VA Office of Research and Development, 2015).

Although mindfulness may be better conceptualized as a foundational skill rather than as a meditation practice, mindfulness programs may function similarly to formal meditation in terms of fostering better mental health outcomes. For example, mindfulness was demonstrated to be a significant negative predictor of PTSD symptoms, depressive symptoms, physical symptoms, and problematic alcohol use among firefighters, a population at high risk of trauma exposure (Smith et al., 2011). Polusny and colleagues (2015) completed an RCT comparing mindfulness-based stress reduction (MBSR) against Present Centered Group Therapy (PCGT) among 116 Veterans. MBSR is a commonly used intervention, which aims to teach participants to apply nonjudgmental attention to the present moment as a means of coping with a variety of physical and mental health problems. Those in the MBSR group evidenced modestly greater improvements in PTSD symptoms at post-treatment and 2-month follow-up, although they were no more likely to remit; both the between- and within-group differences were significant such that both groups improved and the MBSR improved to a greater extent. Building on the work of Kearney, McDermott, Malte, Martinez, and Simpson (2012), who found moderate to large within-group effect sizes for PTSD and depression in a naturalistic study of MBSR, the Polusny trial is the only currently published large controlled trial of MBSR with strong methodology (adequate power, follow-up assessments, blinded diagnostic assessors, measurement of treatment fidelity). One limitation of this study was that it did not match the amount of clinician contact, so that those in the MBSR group had more total contact with a therapist (Polusny et al., 2015). These studies generally support the utility of MBSR for PTSD, although more rigorous studies are needed, especially with respect to non-Veterans. Furthermore, future studies need to follow patients over longer periods to determine the durability of effects.

Yoga is similarly not a formal meditation, but this practice has been applied to treat a variety of physical and emotional problems. Its inclusion of mindfulness, controlled breathing, and postures potentially allows it to target mechanisms that may be relevant, such as reducing autonomic arousal (Seppälä et al., 2014). In one RCT testing its efficacy, Veterans diagnosed with PTSD who completed Sudarshan Kriya yoga (a breathing-based practice) demonstrated reductions in PTSD and anxiety symptoms whereas a waitlist control group did not (Seppälä et al., 2014). The yoga group not only improved in startle response, but reductions in startle response predicted reductions in hyperarousal symptoms at post-treatment and 1-year follow-up. Thus, breathing-based meditation practice may be particularly useful for hyperarousal symptoms regardless of actual respiratory changes. Jindani, Turner, and Khalsa (2015) compared Kundalini yoga, a practice including physical movement (asanas) and meditation, to a waitlist control group. They observed small to moderate between-group effect sizes favoring yoga on measures of

PTSD symptoms, insomnia, perceived stress, positive and negative affect, resilience, stress, and anxiety. Finally, in an RCT comparing trauma-informed yoga to a women's health education control condition among women with chronic PTSD secondary to interpersonal violence, those in the yoga group were more likely to remit, demonstrate greater PTSD symptom reduction and maintain their gains over the short-term better than those in the control condition (van der Kolk et al., 2014). The authors posited that the greater improvements observed in the active condition were due to the physical and interoceptive aspects of yoga, suggesting yoga may improve both distress tolerance and bodily awareness. At 18-month follow-up in this RCT, group membership no longer predicted outcome, but rather frequency of yoga practice was negatively related to PTSD and depression; these results suggest that continued practice may be critical for maintenance of effects (Rhodes, Spinazzola, & van der Kolk, 2016). As in these trials, it may be useful to modify yoga practice to fit the needs of trauma survivors. Indeed, trials using "trauma-sensitive" yoga, which involves practice modifications to help trauma survivors feel safer (i.e., invitational language, good lighting, poses that facilitate feeling safe), appear more efficacious than those without such considerations (Wells, Lang, Schmalzl, Groessl, & Strauss, 2016).

Other meditative approaches have been initially evaluated in PTSD. In a convenience sample, both TM and compassion meditation improved psychological wellbeing, but frequency of practice was related to improvements in self-reported well-being; there were no between-group differences (Schoormans & Nyklíček, 2011). In a retrospective chart review, medication and service utilization were measured following a TM program for service members diagnosed with PTSD or anxiety disorder NOS. Those who practiced TM were more likely than demographically matched controls to decrease, cease, or stabilize their psychotropic medication use and to evidence decreases in mental health symptoms at 1- and 3-month follow-up (Barnes, Monto, Williams, & Rigg, 2016). Similarly, TM demonstrated efficacy in a small, uncontrolled pilot study among OEF/OIF Veterans (Rosenthal, Grosswald, Ross, & Rosenthal, 2011). A large randomized trial comparing TM with Prolonged Exposure and wait list was recently completed; findings will be available soon (United States Department of Defense, 2016). In an open pilot trial of loving-kindness meditation (LKM), a practice focused on the wish that others be happy, Kearney and colleagues (2013) found that within-group effect sizes were large for PTSD symptom reduction and moderate for depression improvement from pre-treatment to 3-month follow-up. A study of compassion meditation (an open trial to refine the protocol followed by an RCT comparing compassion meditation to relaxation training) aiming to add to the efficacy literature is also ongoing (Veterans Medical Research Foundation, 2015).

Mechanisms of Meditation-based Intervention

To refine and optimally implement meditation-based approaches, understanding their cognitive, behavioral, and psychophysiological mechanisms is important. Potential mechanisms relate to changes in hyperarousal, intrusive cognitions, and endocrine markers of autonomic arousal (Wahbeh, Goodrich, Goy, & Oken, 2016). Accordingly, individuals completing a pilot of mindfulness-based cognitive therapy demonstrated moderate reductions in PTSD symptoms and moderate-to-large reductions in posttraumatic cognitions (King et al., 2013). Neuropsychological evidence suggests meditation improves the ability to modulate cognition, emotion, and behavior (Hölzel et al., 2011). A trial of mindfulness-based exposure therapy as compared to PCGT examined neural correlates of mindfulness utilizing functional magnetic resonance imaging (fMRI).

Those in the mindfulness group demonstrated increased default mode resting-state functional connectivity to dorsolateral prefrontal cortical regions in the central executive network (King, Block, Sripada, Rauch, Giardino, et al., 2016). These changes may underlie the improvements in attentional switching secondary to mindfulness training. Further, in an examination of neurological correlates of improvements in PTSD following mindfulness-based exposure therapy, symptom reduction was correlated with increased activity in brain areas associated with processing of social and emotional threats (King, Block, Sripada, Rauch, Porter, et al., 2016). Thus, meditation and mindfulness may improve PTSD symptoms by affecting neural circuitry implicated in attentional control and threat perception.

Growing evidence also suggests that these approaches may affect autonomic nervous system activity. For example, meditation and MBSR have been associated with reduction in nonreactivity to inner experience (Heffner, Crean, & Kemp, 2016; Stephenson, Simpson, Martinez, & Kearney, 2017). Increased parasympathetic and decreased sympathetic nervous activity have been observed following meditation (Nesvold et al., 2012). Changes in stress responding are also observable in neurological connectivity, suggesting changes also occur at the neuronal level (Taren et al., 2015). In an RCT comparing a primary care mindfulness program to TAU in Veterans diagnosed with PTSD, those in the mindfulness group demonstrated reductions in cortisol awakening response, a marker of stress responding, but those completing TAU did not, thus suggesting mindfulness may exert its effects by reducing neuroendocrine dysregulation associated with increased sympathetic activity (Bergen-Cico, Possemato, & Pigeon, 2014). Mantram meditation has been linked to reduced hyperarousal in particular (Bormann et al., 2013), suggesting that it may provide a way for individuals to regulate autonomic arousal (Bormann et al., 2013; Lang et al., 2012).

Another potentially important construct related to mindfulness is positive emotional state. Increased positive affect may improve PTSD by building resilience, reducing dysphoria, or reducing stress reactivity (see Lang et al., 2012 for review). Hinton, Ojserkis, Jalal, Peou, and Hofmann (2013) argued for the utility of mindfulness and meditation techniques as an adjunct to CBT in trauma-exposed refugees and minorities. They cite psychological flexibility as a key emotion regulatory process targeted by meditation. Improving psychological flexibility is particularly important for refugees and minorities to navigate between their own cultures and the dominant culture of their current location. Indeed, Dick, Niles, Street, DiMartino, and Mitchell (2014) observed an association between improvements in psychological flexibility and improvements in PTSD symptoms following a yoga intervention. These studies identified a core process of third-wave interventions as an important mechanism in building resilience and improving PTSD symptoms.

Increases in positive affect appear to be implicated in changes following meditation. Kearney and colleagues (2014) observed increases in positive emotions and decreases in negative emotions following 12 weeks of LKM. A related construct is self-compassion. Self-compassion involves self-kindness, or positive emotions towards and wishes for the self. In addition, self-compassion supports holding painful thoughts and feelings in balanced awareness, rather allowing them to determine one's self-appraisal (Neff, 2003). Self-compassion is associated with positive affect and may be a marker of psychological well-being (Neff, Rude, & Kirkpatrick, 2007). Mindfulness may also cultivate self-compassion, potentially acting as an emotion regulation strategy reducing PTSD symptoms by promoting positive emotionality

(Hölzel et al., 2011). Indeed, Kearney and colleagues (2013) found that change in self-compassion significantly mediated changes in PTSD and depression symptoms from pre-to-post treatment and from baseline to 3-month follow-up in their open trial of LKM. Other hypothesized mechanisms include spirituality (Bormann, Liu, Thorp, & Lang, 2012). Although this line of research is still developing, there is evidence meditation improves PTSD via mechanisms potentially distinct from other treatments.

Summary

Although the body of research on meditation-based interventions for PTSD is relatively nascent, this type of intervention offers promise in addressing PTSD. Several types of meditation-based approaches have demonstrated efficacy in open trials, compared to alternative treatments, and as an adjunct to other treatments. Further, the mechanisms of change in meditation appear complementary to EBPs, offering alternatives for those with needs and preferences not met by first line treatments. Ultimately, its most important contribution may be as part of a recovery plan that addresses symptoms and restores functioning through a variety of mechanisms.

Future research should continue to examine the effectiveness of meditation-based approaches both as alternative and complementary strategies to help determine their role in comprehensive treatment programs. Although meditation techniques are heterogeneous, examining these techniques in greater detail could help determine commonalities among the approaches as well as ways in which specific techniques may make unique contributions. Greater attention to mechanism of change, such as arousal, positive affect or cognitive control, could highlight distinct benefits associated with meditation and other types of PTSD treatment, raising the possibility of personalizing care. Future research should seek to determine if effective programs can idiosyncratically package effective components or if they should rely on established protocols (Heffner, Crean, & Kemp, 2016) as well as what dose and duration of practice is optimal (Lang et al., 2012). High methodological rigor and common measurement tools will also be important in understanding the commonalities and differences among approaches.

FEATURED ARTICLES

Barnes, V. A., Monto, A., Williams, J. J., & Rigg, J. L. (2016). **Impact of transcendental meditation on psychotropic medication use among active duty military service members with anxiety and PTSD.** *Military Medicine*, 181, 56-63. doi:10.7205/MILMED-D-14-00333

The purpose of the study was to determine whether the regular practice of Transcendental Meditation (TM) decreased the need for psychotropic medications required for anxiety and post-traumatic stress disorder (PTSD) management and increased psychological wellbeing. The sample included 74 military Service Members with documented PTSD or anxiety disorder not otherwise specified (ADNOS), 37 that practiced TM and 37 that did not. At 1 month, 83.7% of the TM group stabilized, decreased, or ceased medications and 10.8% increased medication dosage; compared with 59.4% of controls that showed stabilizations, decreases, or cessations; and 40.5% that increased medications ($p < 0.03$). A similar pattern was observed after 2 ($p < 0.27$), 3 ($p < 0.002$), and 6 months ($p < 0.34$). Notably, there was a 20.5% difference between groups in severity of psychological symptoms after 6 months, that is, the control group

experienced an increase in symptom severity compared with the group practicing TM. These findings provide insight into the benefits of TM as a viable treatment modality in military treatment facilities for reducing PTSD and AD/OS psychological symptoms and associated medication use.

Bergen-Cico, D., Possemato, K., & Pigeon, W. (2014). **Reductions in cortisol associated with primary care brief mindfulness program for veterans with PTSD.** *Medical Care, 52*(12), S25-S31. doi:10.1097/MLR.000000000000224 *Background:* Patients with posttraumatic stress disorder (PTSD) have significant medical morbidity, which may be mediated by hypothalamic pituitary axis (HPA) dysfunction and reflected in cortisol output. Many veterans with PTSD are hesitant to engage in trauma-focused exposure treatments; therefore briefer, non-exposure-based treatments are needed; one such promising approach is an abbreviated Primary Care brief Mindfulness Program (PCbMP). *Objective:* This study investigated the relationship between dose-response to participation in a veterans PCbMP program and diurnal cortisol. Cortisol reflects HPA function and PTSD is associated with HPA dysregulation. *Research Design:* Veterans with PTSD were identified in PC and randomly assigned to treatment as usual (TAU, $n = 21$) or participation in brief 4-week Mindfulness Based Stress Reduction program ($n = 19$). *Subjects:* Veterans ($n = 40$;) (mean age, 48 ± 16 y; 90% men) with PTSD referred through their VA PC provider and randomly assigned to PCbMP or TAU. *Measure:* As an objective indicator of HPA function, salivary diurnal cortisol was measured from samples collected across 2 consecutive days at baseline and follow-up. *Results:* Analyses revealed that significant changes in cortisol were associated with PCbMP treatment engagement and dosing (number of mindfulness program sessions completed). Veterans completing 4 mindfulness-based meditation sessions significantly reduced their cortisol awakening response ($P \leq 0.05$); and had significant changes in cortisol area under the curve increase compared with TAU participants ($P \leq 0.05$). Results indicate that PCbMP has a beneficial physiological impact on veterans with PTSD with a minimum of 4 weeks of practice.

Bormann, J. E., Thorp, S. R., Wetherell, J. L., Golshan, S., & Lang, A. J. (2013). **Meditation-based mantram intervention for veterans with posttraumatic stress disorder: A randomized trial.** *Psychological Trauma: Theory, Research, Practice, and Policy, 5*, 259-267. doi:10.1037/a0027522 Few complementary therapies for posttraumatic stress disorder (PTSD) have been empirically tested. This study explored the efficacy of a portable, private meditation-based mantram (sacred word) intervention for veterans with chronic posttraumatic stress disorder. A prospective, single-blind randomized clinical trial was conducted with 146 outpatient veterans diagnosed with military-related PTSD. Subjects were randomly assigned to either (a) medication and case management alone (i.e., treatment-as-usual [TAU]), or (b) TAU augmented by a 6-week group mantram repetition program (MRP + TAU). A total of 136 veterans (66 in MRP + TAU; 70 in TAU) completed posttreatment assessments. An intent-to-treat analysis indicated significantly greater symptom reductions in self-reported and clinician-rated PTSD symptoms in the MRP + TAU compared with TAU alone. At posttreatment, 24% of MRP + TAU subjects, compared with 12% TAU subjects, had clinically meaningful improvements in PTSD symptom severity. MRP + TAU subjects also reported significant improvements in depression, mental health status, and existential spiritual well-being compared with TAU subjects. There was a 7%

dropout rate in both treatment conditions. A meditation-based mantram repetition intervention shows potential when used as an adjunct to TAU for mitigating chronic PTSD symptoms in veterans. Veterans may seek this type of treatment because it is nonpharmacological and does not focus on trauma. It also has potential as a facilitator of exposure-based therapy or to enhance spiritual well-being. More research is needed using a longitudinal effectiveness design with an active comparison control group.

Heffner, K. L., Crean, H. F., & Kemp, J. E. (2016). **Meditation programs for veterans with posttraumatic stress disorder: Aggregate findings from a multi-site evaluation.** *Psychological Trauma: Theory, Research, Practice, and Policy, 8*, 365-374. doi:10.1037/tra0000106 *Objectives:* Interest in meditation to manage posttraumatic stress disorder (PTSD) symptoms is increasing. Few studies have examined the effectiveness of meditation programs offered to Veterans within Department of Veterans Affairs (VA) mental health services. The current study addresses this gap using data from a multisite VA demonstration project. *Method:* Evaluation data collected at 6 VA sites ($N = 391$ Veterans) before and after a meditation program, and a treatment-as-usual (TAU) program, were examined here using random effects meta-analyses. Site-specific and aggregate between group effect sizes comparing meditation programs to TAU were determined for PTSD severity measured by clinical interview and self-report. Additional outcomes included experiential avoidance and mindfulness. *Results:* In aggregate, analyses showed medium effect sizes for meditation programs compared to TAU for PTSD severity (clinical interview: effect size (ES) = -0.32 ; self-report: $ES = -0.39$). Similarly sized effects of meditation programs were found for overall mindfulness ($ES = 0.41$) and 1 specific aspect of mindfulness, nonreactivity to inner experience ($ES = .37$). Additional findings suggested meditation type and program completion differences each moderated program effects. *Conclusions:* VA-sponsored meditation programs show promise for reducing PTSD severity in Veterans receiving mental health services. Where meditation training fits within mental health services, and for whom programs will be of interest and effective, require further clarification.

Hilton, L., Maher, A. R., Colaiaco, B., Apaydin, E., Sorbero, M. E., Booth, M., . . . Hempel, S. (2016). **Meditation for posttraumatic stress: Systematic review and meta-analysis.** *Psychological Trauma: Theory, Research, Practice, and Policy.* Advance Online Publication. doi:10.1037/tra0000180 *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.

Hinton, D. E., Ojserkis, R. A., Jalal, B., Peou, S., & Hofmann, S. G. (2013). **Loving-kindness in the treatment of traumatized refugees and minority groups: A typology of mindfulness and the nodal network model of affect and affect regulation.** *Journal of Clinical Psychology, 69*, 817-828. doi:10.1002/jclp.22017 This article discusses how loving-kindness can be used to treat traumatized refugees and minority groups, focusing on examples from our treatment, culturally adapted cognitive-behavioral therapy (CA-CBT). To show how we integrate loving-kindness with other mindfulness interventions and why loving-kindness should be an effective therapeutic technique, we present a typology of mindfulness states and the Nodal Network Model (NNM) of Affect and Affect Regulation. We argue that mindfulness techniques such as loving-kindness are therapeutic for refugees and minority populations because of their potential for increasing emotional flexibility, decreasing rumination, serving as emotional regulation techniques, and forming part of a new adaptive processing mode centered on psychological flexibility. We present a case to illustrate the clinical use of loving-kindness within the context of CA-CBT.

Hofmann, S. G., Grossman, P., & Hinton, D. E. (2011). **Loving-kindness and compassion meditation: Potential for psychological interventions.** *Clinical Psychology Review, 31*, 1126-1132. doi:10.1016/j.cpr.2011.07.003 Mindfulness-based meditation interventions have become increasingly popular in contemporary psychology. Other closely related meditation practices include loving-kindness meditation (LKM) and compassion meditation (CM), exercises oriented toward enhancing unconditional, positive emotional states of kindness and compassion. This article provides a review of the background, the techniques, and the empirical contemporary literature of LKM and CM. The literature suggests that LKM and CM are associated with an increase in positive affect and a decrease in negative affect. Preliminary findings from neuroendocrine studies indicate that CM may reduce stress-induced subjective distress and immune response. Neuroimaging studies suggest that LKM and CM may enhance activation of brain areas that are involved in emotional processing and empathy. Finally, preliminary intervention studies support application of these strategies in clinical populations. It is concluded that, when combined with empirically supported treatments, such as cognitive behavioral therapy, LKM and CM may provide potentially useful strategies for targeting a variety of different psychological problems that involve interpersonal processes, such as social anxiety, marital conflict, anger, and coping with the strains of long-term caregiving.

Hölzel, B. K., Lazar, S. W., Gard, T., Schuman-Olivier, Z., Vago, D. R., & Ott, U. (2011). **How does mindfulness meditation work? Proposing mechanisms of action from a conceptual and neural perspective.** *Perspectives on Psychological Science, 6*, 537-559.

doi:10.1177/1745691611419671 Cultivation of mindfulness, the nonjudgmental awareness of experiences in the present moment, produces beneficial effects on well-being and ameliorates psychiatric and stress-related symptoms. Mindfulness meditation has therefore increasingly been incorporated into psychotherapeutic interventions. Although the number of publications in the field has sharply increased over the last two decades, there is a paucity of theoretical reviews that integrate the existing literature into a comprehensive theoretical framework. In this article, we explore several components through which mindfulness meditation exerts its effects: (a) attention regulation, (b) body awareness, (c) emotion regulation (including reappraisal and exposure, extinction, and reconsolidation), and (d) change in perspective on the self. Recent empirical research, including practitioners' self-reports and experimental data, provides evidence supporting these mechanisms. Functional and structural neuroimaging studies have begun to explore the neuroscientific processes underlying these components. Evidence suggests that mindfulness practice is associated with neuroplastic changes in the anterior cingulate cortex, insula, temporo-parietal junction, fronto-limbic network, and default mode network structures. The authors suggest that the mechanisms described here work synergistically, establishing a process of enhanced self-regulation. Differentiating between these components seems useful to guide future basic research and to specifically target areas of development in the treatment of psychological disorders.

Jindani, F., Turner, N., & Khalsa, S. B. S. (2015). **A yoga intervention for posttraumatic stress: A preliminary randomized control trial.** *Evidence-Based Complementary and Alternative Medicine, 2015*, Article ID 351746. doi:10.1155/2015/351746 Yoga may be effective in the reduction of PTSD symptomology. The purpose of this study was to evaluate the impact of a Kundalini Yoga (KY) treatment on PTSD symptoms and overall wellbeing. To supplement the current field of inquiry, a pilot randomized control trial (RCT) was conducted comparing an 8-session KY intervention with a waitlist control group. 80 individuals with current PTSD symptoms participated. Both groups demonstrated changes in PTSD symptomology but yoga participants showed greater changes in measures of sleep, positive affect, perceived stress, anxiety, stress, and resilience. Between-groups effect sizes were small to moderate (0.09-0.25). KY may be an adjunctive or alternative intervention for PTSD. Findings indicate the need for further yoga research to better understand the mechanism of yoga in relation to mental and physical health, gender and ethnic comparisons, and short- and long-term yoga practice for psychiatric conditions.

Kearney, D. J., McManus, C., Malte, C. A., Martinez, M. E., Felleman, B., & Simpson, T. L. (2014). **Loving-kindness meditation and the broaden-and-build theory of positive emotions among veterans with posttraumatic stress disorder.** *Medical Care, 52*(12), S32-S38. doi:10.1097/MLR.0000000000000221 **Background:** Loving-kindness meditation (LKM) is a practice intended to enhance feelings of kindness and compassion for self and others. **Objectives:** To assess whether participation in a 12-week course of LKM for veterans with posttraumatic stress disorder (PTSD) is associated with improved positive emotions, decentering, and personal resources. **Research Design:** In an open-pilot trial, veterans were assessed at baseline, after the course, and 3 months later. Effect sizes were calculated from baseline to each follow-up point for each construct of interest. Measures were chosen as an initial investigation of the broaden-and-

build theory of positive emotions. *Subjects*: A total of 42 veterans with active PTSD (40% female) participated. *Measures*: Emotions, decentering, psychological wellbeing including autonomy, environmental mastery, personal growth, positive relations, purpose in life, self-acceptance, and sense of social support were measured at each time point. *Results*: Significant increases in unactivated pleasant ($d = 0.73$), but not activated pleasant, emotions were found over time. Activated and unactivated unpleasant emotions decreased over time ($d = -0.69$ and -0.53 , respectively). There were also increases in environmental mastery ($d = 0.61$), personal growth ($d = 0.54$), purpose in life ($d = 0.71$), self-acceptance ($d = 0.68$), and decentering ($d = 0.96$) at 3-month follow-up. *Conclusions*: Overall, positive emotions increased, and enhancement of personal resources occurred over time. Further investigation of LKM for PTSD is warranted.

King, A. P., Block, S. R., Sripada, R. K., Rauch, S., Giardino, N., Favorite, T., . . . Liberzon, I. (2016). **Altered default mode network (DMN) resting state functional connectivity following a mindfulness-based exposure therapy for posttraumatic stress disorder (PTSD) in combat veterans of Afghanistan and Iraq.** *Depression and Anxiety*, *33*, 289-299. doi:10.1002/da.22481

Background: Recent studies suggest that mindfulness may be an effective component for posttraumatic stress disorder (PTSD) treatment. Mindfulness involves practice in volitional shifting of attention from “mind wandering” to present-moment attention to sensations, and cultivating acceptance. We examined potential neural correlates of mindfulness training using a novel group therapy (mindfulness-based exposure therapy (MBET)) in combat veterans with PTSD deployed to Afghanistan (OEF) and/or Iraq (OIF). *Methods*: Twenty-three male OEF/OIF combat veterans with PTSD were treated with a mindfulness-based intervention ($N = 14$) or an active control group therapy (present-centered group therapy (PCGT), $N = 9$). Pre-post therapy functional magnetic resonance imaging (fMRI, 3 T) examined resting-state functional connectivity (rsFC) in default mode network (DMN) using posterior cingulate cortex (PCC) and ventral medial prefrontal cortex (vmPFC) seeds, and salience network (SN) with anatomical amygdala seeds. PTSD symptoms were assessed at pre- and posttherapy with Clinician Administered PTSD Scale (CAPS). *Results*: Patients treated with MBET had reduced PTSD symptoms (effect size $d = 0.92$) but effect was not significantly different from PCGT ($d = 0.46$). Increased DMN rsFC (PCC seed) with dorsolateral dorsolateral prefrontal cortex (DLPFC) regions and dorsal anterior cingulate cortex (ACC) regions associated with executive control was seen following MBET. A group \times time interaction found MBET showed increased connectivity with DLPFC and dorsal ACC following therapy; PCC–DLPFC connectivity was correlated with improvement in PTSD avoidant and hyperarousal symptoms. *Conclusions*: Increased connectivity between DMN and executive control regions following mindfulness training could underlie increased capacity for volitional shifting of attention. The increased PCC–DLPFC rsFC following MBET was related to PTSD symptom improvement, pointing to a potential therapeutic mechanism of mindfulness-based therapies.

King, A. P., Block, S. R., Sripada, R. K., Rauch, S. A. M., Porter, K. E., Favorite, T. K., . . . Liberzon, I. (2016). **A pilot study of mindfulness-based exposure therapy in OEF/OIF combat veterans with PTSD: Altered medial frontal cortex and amygdala responses in social–emotional processing.** *Frontiers in Psychiatry*, *7*, Article 154.

doi:10.3389/fpsy.2016.00154 Combat-related posttraumatic stress disorder (PTSD) is common among returning veterans, and is a serious and debilitating disorder. While highly effective treatments involving trauma exposure exist, difficulties with engagement and early drop may lead to sub-optimal outcomes. Mindfulness training may provide a method for increasing emotional regulation skills that may improve engagement in trauma-focused therapy. Here, we examine potential neural correlates of mindfulness training and in vivo exposure (non-trauma focused) using a novel group therapy [mindfulness-based exposure therapy (MBET)] in Afghanistan (OEF) or Iraq (OIF) combat veterans with PTSD. OEF/OIF combat veterans with PTSD ($N = 23$) were treated with MBET ($N = 14$) or a comparison group therapy [Present-centered group therapy (PCGT), $N = 9$]. PTSD symptoms were assessed at pre- and post-therapy with Clinician Administered PTSD scale. Functional neuroimaging (3-T fMRI) before and after therapy examined responses to emotional faces (angry, fearful, and neutral faces). Patients treated with MBET had reduced PTSD symptoms (effect size $d = 0.92$) but effect was not significantly different from PCGT ($d = 0.43$). Improvement in PTSD symptoms from pre- to post-treatment in both treatment groups was correlated with increased activity in rostral anterior cingulate cortex, dorsal medial prefrontal cortex (mPFC), and left amygdala. The MBET group showed greater increases in amygdala and fusiform gyrus responses to Angry faces, as well as increased response in left mPFC to Fearful faces. These preliminary findings provide intriguing evidence that MBET group therapy for PTSD may lead to changes in neural processing of social–emotional threat related to symptom reduction.

King, A. P., Erickson, T. M., Giardino, N. D., Favorite, T., Rauch, S. A. M., Robinson, E., . . . Liberzon, I. (2013). **A pilot study of group mindfulness-based cognitive therapy (MBCT) for combat veterans with posttraumatic stress disorder (PTSD).** *Depression and Anxiety*, *30*, 638-645. doi:10.1002/da.22104 *Background*: “Mindfulness-based” interventions show promise for stress reduction in general medical conditions, and initial evidence suggests that they are accepted in trauma-exposed individuals. Mindfulness-based cognitive therapy (MBCT) shows substantial efficacy for prevention of depression relapse, but it has been less studied in anxiety disorders. This study investigated the feasibility, acceptability, and clinical outcomes of an MBCT group intervention adapted for combat posttraumatic stress disorder (PTSD). *Methods*: Consecutive patients seeking treatment for chronic PTSD at a VA outpatient clinic were enrolled in 8-week MBCT groups, modified for PTSD (four groups, $n = 20$) or brief treatment-as-usual (TAU) comparison group interventions (three groups, $n = 17$). Pre and posttherapy psychological assessments with clinician administered PTSD scale (CAPS) were performed with all patients, and self-report measures (PTSD diagnostic scale, PDS, and posttraumatic cognitions inventory, PTCI) were administered in the MBCT group. *Results*: Intent to treat analyses showed significant improvement in PTSD (CAPS ($t(19) = 4.8$, $P < .001$)) in the MBCT condition but not the TAU conditions, and a significant Condition \times Time interaction ($F[1,35] = 16.4$, $P < .005$). MBCT completers ($n = 15$, 75%) showed good compliance with assigned homework exercises, and significant and clinically meaningful improvement in PTSD symptom severity on posttreatment assessment in CAPS and PDS (particularly in avoidance/numbing symptoms), and reduced PTSD-relevant cognitions in PTCI (self blame). *Conclusions*: These data suggest group MBCT as an acceptable brief intervention/adjunctive therapy for combat PTSD, with potential for reducing avoidance symptom

cluster and PTSD cognitions. Further studies are needed to examine efficacy in a randomized controlled design and to identify factors influencing acceptability and efficacy.

Lang, A. J., Strauss, J. L., Bomyea, J., Bormann, J. E., Hickman, S. D., Good, R. C., & Essex, M. (2012). **The theoretical and empirical basis for meditation as an intervention for PTSD.** *Behavior Modification, 36*, 759-786. doi:10.1177/0145445512441200 In spite of the existence of good empirically supported treatments for posttraumatic stress disorder (PTSD), consumers and providers continue to ask for more options for managing this common and often chronic condition. Meditation-based approaches are being widely implemented, but there is minimal research rigorously assessing their effectiveness. This article reviews meditation as an intervention for PTSD, considering three major types of meditative practices: mindfulness, mantra, and compassion meditation. The mechanisms by which these approaches may effectively reduce PTSD symptoms and improve quality of life are presented. Empirical evidence of the efficacy of meditation for PTSD is very limited but holds some promise. Additional evaluation of meditation-based treatment appears to be warranted.

Polusny, M. A., Erbes, C. R., Thuras, P., Moran, A., Lambert, G. J., Collins, R. C., . . . Lim, K. O. (2015). **Mindfulness-based stress reduction for posttraumatic stress disorder among veterans: A randomized clinical trial.** *JAMA, 314*, 456-465. doi:10.1001/jama.2015.8361 *Importance:* Mindfulness-based interventions may be acceptable to veterans who have poor adherence to existing evidence-based treatments for posttraumatic stress disorder (PTSD). *Objective:* To compare mindfulness-based stress reduction with present-centered group therapy for treatment of PTSD. *Design, Setting, and Participants:* Randomized clinical trial of 116 veterans with PTSD recruited at the Minneapolis Veterans Affairs Medical Center from March 2012 to December 2013. Outcomes were assessed before, during, and after treatment and at 2-month follow-up. Data collection was completed on April 22, 2014. *Interventions:* Participants were randomly assigned to receive mindfulness-based stress reduction therapy ($n = 58$), consisting of 9 sessions (8 weekly 2.5-hour group sessions and a daylong retreat) focused on teaching patients to attend to the present moment in a nonjudgmental, accepting manner; or present-centered group therapy ($n = 58$), an active-control condition consisting of 9 weekly 1.5-hour group sessions focused on current life problems. *Main Outcomes And Measures:* The primary outcome, change in PTSD symptom severity over time, was assessed using the PTSD Checklist (range, 17-85; higher scores indicate greater severity; reduction of 10 or more considered a minimal clinically important difference) at baseline and weeks 3, 6, 9, and 17. Secondary outcomes included PTSD diagnosis and symptom severity assessed by independent evaluators using the Clinician-Administered PTSD Scale along with improvements in depressive symptoms, quality of life, and mindfulness. *Results:* Participants in the mindfulness-based stress reduction group demonstrated greater improvement in self-reported PTSD symptom severity during treatment (change in mean PTSD Checklist scores from 63.6 to 55.7 vs 58.8 to 55.8 with present-centered group therapy; between-group difference, 4.95; 95% CI, 1.92-7.99; $P = .002$) and at 2-month follow-up (change in mean scores from 63.6 to 54.4 vs 58.8 to 56.0, respectively; difference, 6.44; 95% CI, 3.34-9.53, $P < .001$). Although participants in the mindfulness-based stress reduction group were more likely to show

clinically significant improvement in self-reported PTSD symptom severity (48.9% vs 28.1% with present-centered group therapy; difference, 20.9%; 95% CI, 2.2%-39.5%; $P = .03$) at 2-month follow-up, they were no more likely to have loss of PTSD diagnosis (53.3% vs 47.3%, respectively; difference, 6.0%; 95% CI, -14.1% to 26.2%; $P = .55$). *Conclusions and Relevance:* Among veterans with PTSD, mindfulness-based stress reduction therapy, compared with present-centered group therapy, resulted in a greater decrease in PTSD symptom severity. However, the magnitude of the average improvement suggests a modest effect.

Rees, B. (2011). **Overview of outcome data of potential meditation training for soldier resilience.** *Military Medicine, 176*, 1232-1242. doi:10.7205/MILMED-D-11-00067 In order to identify potential training to enhance comprehensive soldier fitness, this analysis searched MEDLINE via PubMed and elsewhere for 33 reasonably significant modalities, screening over 11,500 articles for relevance regarding soldier resilience. Evaluation of modalities that are exclusively educational or cognitive/behavioral in nature is deferred. Using the volume and quality of research over 40 parameters distributed among the five domains of resilience (physical, emotional, spiritual, social, and family life), these data allow culling of most of the meditative modalities and discrimination among the remaining techniques. The resulting order of merit is Transcendental Meditation, mindfulness, and progressive muscle relaxation. Transcendental Meditation, mindfulness, and progressive muscle relaxation, in that order, have the most supporting data. Fortuitously, they also represent a cross section of the domain of techniques regarded as meditation, stress management, or relaxation, with three very different mechanisms of action. They are suitable potential options for improving soldier resilience.

Seppälä, E. M., Nitschke, J. B., Tudorascu, D. L., Hayes, A., Goldstein, M. R., Nguyen, D. T. H., . . . Davidson, R. J. (2014). **Breathing-based meditation decreases posttraumatic stress disorder symptoms in U.S. military veterans: A randomized controlled longitudinal study.** *Journal of Traumatic Stress, 27*, 397-405. doi:10.1002/jts.21936 Given the limited success of conventional treatments for veterans with posttraumatic stress disorder (PTSD), investigations of alternative approaches are warranted. We examined the effects of a breathing-based meditation intervention, Sudarshan Kriya yoga, on PTSD outcome variables in U.S. male veterans of the Iraq or Afghanistan war. We randomly assigned 21 veterans to an active ($n = 11$) or waitlist control ($n = 10$) group. Laboratory measures of eye-blink startle and respiration rate were obtained before and after the intervention, as were self-report symptom measures; the latter were also obtained 1 month and 1 year later. The active group showed reductions in PTSD scores, $d = 1.16$, 95% CI [0.20, 2.04], anxiety symptoms, and respiration rate, but the control group did not. Reductions in startle correlated with reductions in hyperarousal symptoms immediately post-intervention ($r = .93$, $p < .001$) and at 1-year follow-up ($r = .77$, $p = .025$). This longitudinal intervention study suggests there may be clinical utility for Sudarshan Kriya yoga for PTSD.

Smith, B. W., Ortiz, J. A., Steffen, L. E., Tooley, E. M., Wiggins, K. T., Yeater, E. A., . . . Bernard, M. L. (2011). **Mindfulness is associated with fewer PTSD symptoms, depressive symptoms, physical symptoms, and alcohol problems in urban firefighters.** *Journal of Consulting and Clinical Psychology, 79*, 613-617. doi:10.1037/a0025189

Objective: This study investigated the association between mindfulness, other resilience resources, and several measures of health in 124 urban firefighters. **Method:** Participants completed health measures of posttraumatic stress disorder (PTSD) symptoms, depressive symptoms, physical symptoms, and alcohol problems and measures of resilience resources including mindfulness, optimism, personal mastery, and social support. The Mindful Awareness and Attention Scale (MAAS; Brown & Ryan, 2003) was used to assess mindfulness. Participants also completed measures of firefighter stress, number of calls, and years as a firefighter as control variables. Hierarchical multiple regressions were conducted with the health measures as the dependent variables with 3 levels of independent variables: (a) demographic characteristics, (b) firefighter variables, and (c) resilience resources. **Results:** The results showed that mindfulness was associated with fewer PTSD symptoms, depressive symptoms, physical symptoms, and alcohol problems when controlling for the other study variables. Personal mastery and social support were also related to fewer depressive symptoms, firefighter stress was related to more PTSD symptoms and alcohol problems, and years as a firefighter were related to fewer alcohol problems. **Conclusions:** Mindfulness may be important to consider and include in models of stress, coping, and resilience in firefighters. Future studies should examine the prospective relationship between mindfulness and health in firefighters and others in high-stress occupations.

van der Kolk, B. A., Stone, L., West, J., Rhodes, A., Emerson, D., Suvak, M., & Spinazzola, J. (2014). **Yoga as an adjunctive treatment for posttraumatic stress disorder: A randomized controlled trial.** *Journal of Clinical Psychiatry, 75*, e559-e565. doi:10.4088/JCP.13m08561

Background: More than a third of the approximately 10 million women with histories of interpersonal violence in the United States develop posttraumatic stress disorder (PTSD). Currently available treatments for this population have a high rate of incomplete response, in part because problems in affect and impulse regulation are major obstacles to resolving PTSD. This study explored the efficacy of yoga to increase affect tolerance and to decrease PTSD symptomatology. **Method:** Sixty-four women with chronic, treatment-resistant PTSD were randomly assigned to either trauma-informed yoga or supportive women's health education, each as a weekly 1-hour class for 10 weeks. Assessments were conducted at pretreatment, midtreatment, and posttreatment and included measures of *DSM-IV* PTSD, affect regulation, and depression. The study ran from 2008 through 2011. **Results:** The primary outcome measure was the Clinician-Administered PTSD Scale (CAPS). At the end of the study, 16 of 31 participants (52%) in the yoga group no longer met criteria for PTSD compared to 6 of 29 (21%) in the control group ($n = 60$, $\chi^2_1 = 6.17$, $P = .013$). Both groups exhibited significant decreases on the CAPS, with the decrease falling in the large effect size range for the yoga group ($d = 1.07$) and the medium to large effect size decrease for the control group ($d = 0.66$). Both the yoga ($b = -9.21$, $t = -2.34$, $P = .02$, $d = -0.37$) and control ($b = -22.12$, $t = -3.39$, $P = .001$, $d = -0.54$) groups exhibited significant decreases from pretreatment to the midtreatment assessment. However, a significant group \times quadratic trend interaction ($d = -0.34$) showed that the pattern of change in Davidson Trauma Scale significantly differed across groups. The yoga group exhibited a significant medium effect size linear ($d = -0.52$) trend. In contrast, the control group exhibited only a significant medium effect size quadratic trend ($d = 0.46$) but did not exhibit a significant linear trend ($d = -0.29$). Thus, both groups exhibited significant decreases in PTSD

symptoms during the first half of treatment, but these improvements were maintained in the yoga group, while the control group relapsed after its initial improvement. **Discussion:** Yoga significantly reduced PTSD symptomatology, with effect sizes comparable to well-researched psychotherapeutic and psychopharmacologic approaches. Yoga may improve the functioning of traumatized individuals by helping them to tolerate physical and sensory experiences associated with fear and helplessness and to increase emotional awareness and affect tolerance.

ADDITIONAL CITATIONS

- Bormann, J. E., Liu, L., Thorp, S. R., & Lang, A. J. (2012). **Spiritual wellbeing mediates PTSD change in veterans with military-related PTSD.** *International Journal of Behavioral Medicine, 19*, 496-502. doi:10.1007/s12529-011-9186-1 Following a group mantram repetition intervention for Veterans with service-related PTSD, spiritual wellbeing mediated the improvement in self-reported PTSD symptoms. Thus, mantram repetition may improve PTSD symptoms by connecting individuals to a higher power or inner resources.
- Dick, A. M., Niles, B. L., Street, A. E., DiMartino, D. M., & Mitchell, K. S. (2014). **Examining mechanisms of change in a yoga intervention for women: The influence of mindfulness, psychological flexibility, and emotion regulation on PTSD symptoms.** *Journal of Clinical Psychology, 70*, 1170-1182. doi:10.1002/jclp.22104 Following an RCT comparing yoga to an assessment control, the yoga group evidenced greater decreases in expressive suppression (regulation of emotions by inhibiting emotional expression) and unique improvement in psychological flexibility. Further, increases in psychological flexibility were associated with improvement in PTSD symptoms in the yoga group and not the control group. Yoga may reduce PTSD symptoms by improving expressive suppression and psychological flexibility.
- Kearney, D. J., Malte, C. A., McManus, C., Martinez, M. E., Felleman, B., & Simpson, T. L. (2013). **Loving-kindness meditation for posttraumatic stress disorder: A pilot study.** *Journal of Traumatic Stress, 26*, 426-434. doi:10.1002/jts.21832 In this open trial of LKM, the authors observed large effect sizes for improvements in PTSD symptoms and mindfulness and moderate effect size for depression reduction at 3-month follow-up. There was evidence that gains in self-compassion mediated changes in PTSD and depression symptoms. This trial provided early evidence for the utility of LKM in PTSD symptom reduction.
- Kearney, D. J., McDermott, K., Malte, C., Martinez, M., & Simpson, T. L. (2012). **Association of participation in a mindfulness program with measures of PTSD, depression, and quality of life in a veteran sample.** *Journal of Clinical Psychology, 68*, 101-116. doi:10.1002/jclp.20853 Veterans who completed MBSR demonstrated improvements in PTSD symptoms, depression symptoms, experiential avoidance, behavioral activation, and quality of life at 2-month and 6-month follow-ups. Gains in mindfulness skills mediated the relationship between completion of MBSR and improvements in PTSD, depression, and quality of life. This study established MBSR as a promising intervention for PTSD and depression.

Libby, D. J., Pilver, C. E., & Desai, R. (2012). **Complementary and alternative medicine in VA specialized PTSD treatment programs.** *Psychiatric Services, 63*, 1134-1136. doi:10.1176/appi.ps.201100456

In a survey of staff from over 100 VA PTSD treatment programs between September 2010 and March 2011, 96% of programs reported using at least one complementary or alternative modality. More than 20% of them reported using tai chi, spiritual practices, meditation, or yoga, and 96% reported using mindfulness. Use of complementary and alternative treatments is increasing across VA PTSD treatment programs and more research is needed to determine their optimal applications.

Markowitz, J. C., Meehan, K. B., Petkova, E., Zhao, Y., Van Meter, P. E., Neria, Y., . . . Nazia, Y. (2016). **Treatment preferences of psychotherapy patients with chronic PTSD.** *Journal of Clinical Psychiatry, 77*, 363-370. doi:10.4088/JCP.14m09640 In a pre-treatment evaluation of the treatment attitudes of treatment-seekers, patients expressed preference for interpersonal psychotherapy above Prolonged Exposure and relaxation therapy with an equal number expressing a preference for Prolonged Exposure and relaxation therapy. Patients receiving an undesired treatment did worse in therapy than those receiving their preferred treatment or those with no preferences. These data suggest offering alternative options beyond evidence-based psychotherapies can improve clinic outcomes.

Neff, K. (2003). **Self-compassion: An alternative conceptualization of a healthy attitude toward oneself.** *Self and Identity, 2*, 85-101. doi:10.1080/15298860309032 This article defines and elaborates upon the concept of self-compassion. It presents self-compassion as a positive attitude toward self, particularly related to constructs such as adaptive emotion regulation, approach behaviors, and accurate self-appraisal.

Neff, K. D., Rude, S. S., & Kirkpatrick, K. L. (2007). **An examination of self-compassion in relation to positive psychological functioning and personality traits.** *Journal of Research in Personality, 41*, 908-916. doi:10.1016/j.jrp.2006.08.002 In an examination of self-compassion's relation to personality and psychological functioning, self-compassion had a positive relationship with several measures of psychological wellbeing including positive affect and happiness. It had a negative relationship with negative affect and neuroticism. Self-compassion predicted markers of psychological functioning beyond measures of personality.

Nesvold, A., Fagerland, M. W., Davanger, S., Ellingsen, Ø., Solberg, E. E., Holen, A., . . . Atar, D. (2012). **Increased heart rate variability during nondirective meditation.** *European Journal of Preventive Cardiology, 19*, 773-780. doi:10.1177/1741826711414625 Heart rate variability increases in low-frequency and high-frequency bands during Acem meditation compared to at-rest baseline levels. Thus, increased parasympathetic and reduced sympathetic activity were observed. Meditation may downregulate arousal of the autonomic nervous system related to posttraumatic stress.

Rhodes, A., Spinazzola, J., & van der Kolk, B. (2016). **Yoga for adult women with chronic PTSD: A long-term follow-up study.** *Journal of Alternative and Complementary Medicine, 22*, 189-196. doi:10.1089/acm.2014.0407 In a follow-up to the van der Kolk et al. (2014) RCT, frequency of yoga practice predicted decreases in PTSD and depression symptom severity, and PTSD diagnostic status

although group status did not. Yoga was an efficacious treatment modality at 18-month follow-up among those who continued their practice. This demonstrates that yoga may be useful as a lifestyle modification rather than a time-limited intervention.

Rosenthal, J. Z., Grosswald, S., Ross, R., & Rosenthal, N. (2011). **Effects of transcendental meditation in veterans of Operation Enduring Freedom and Operation Iraqi Freedom with posttraumatic stress disorder: A pilot study.** *Military Medicine, 176*, 626-630. doi:10.7205/MILMED-D-10-00254 In a small uncontrolled pilot study testing the effects of transcendental meditation in OEF/OIF Veterans diagnosed with PTSD, participants made significant improvements in PTSD symptoms and self-reported quality of life. These results add to the support for transcendental meditation as a treatment for PTSD.

Schoormans, D., & Nyklíček, I. (2011). **Mindfulness and psychological well-being: Are they related to type of meditation technique practiced?** *Journal of Alternative and Complementary Medicine, 17*, 629-634. doi:10.1089/acm.2010.0332 Using convenience samples, transcendental and mindfulness meditation were compared to determine if they differed in their effects on psychological wellbeing and mindfulness. The authors did not observe differences between groups on these measures, but rather found that the frequency of practice in days per week was associated with mindful acceptance and lower perceived stress. Results provided preliminary support for the frequency of practice more so than the type of meditation in improving psychological wellbeing.

Steenkamp, M. M., Litz, B. T., Hoge, C. W., & Marmar, C. R. (2015). **Psychotherapy for military-related PTSD: A review of randomized clinical trials.** *JAMA, 314*, 489-500. doi:10.1001/jama.2015.8370 This article reviewed RCTs of evidence-based psychotherapies for PTSD. They found that many treatment-seekers make meaningful gains but nonresponse rates are high and the effect sizes of these treatments against active control conditions suggest marginal incremental utility. There is a need to improve existing PTSD treatments and develop novel modalities to fill these gaps.

Stephenson, K. R., Simpson, T. L., Martinez, M. E., & Kearney, D. J. (2017). **Changes in mindfulness and posttraumatic stress disorder symptoms among veterans enrolled in mindfulness-based stress reduction.** *Journal of Clinical Psychology, 73*, 201-217. doi:10.1002/jclp.22323 Among Veterans completing 8 weeks of MCSR, increases in the facets of nonreactivity and acting with awareness were most strongly associated with decreases in PTSD symptoms. The cluster of PTSD symptoms most strongly associated was hyperarousal followed by emotional numbing. This study highlighted specific associations between mindfulness and PTSD treatment and expanded knowledge of potential mechanisms of change.

Taren, A. A., Gianaros, P. J., Greco, C. M., Lindsay, E. K., Fairgrieve, A., Brown, K. W., . . . Creswell, J. D. (2015). **Mindfulness meditation training alters stress-related amygdala resting state functional connectivity: A randomized controlled trial.** *Social Cognitive and Affective Neuroscience, 10*, 1758-1768. doi:10.1093/scan/nsv066 A brief meditation program was associated with decreased amygdala-subgenual anterior cingulate cortex resting state frontal connectivity compared to a relaxation control condition. Meditation was implicated in neuroplastic changes and these specific changes may link meditation to reduced stress responding.

ADDITIONAL CITATIONS *continued*

United States Department of Defense. (2016). ***A RCT of meditation compared to exposure therapy and education control on PTSD in veterans*** (Clinicaltrials.gov Identifier NCT01865123). Retrieved from <https://clinicaltrials.gov/ct2/show/NCT01865123> An RCT comparing Transcendental Meditation to Prolonged Exposure (active comparator) and health education (placebo comparator) in the treatment of Veterans with PTSD was recently completed. Results will be available soon.

VA Office of Research and Development. (2015). ***Mantram repetition meditation for veterans with PTSD*** (Clinicaltrials.gov Identifier NCT01506323). Retrieved from <https://clinicaltrials.gov/ct2/show/NCT01506323> This clinical trial aimed to determine the utility of a mantram repetition program for Veterans with military-related PTSD compared to present-centered therapy at two VA sites. Data collection is complete and findings will be published soon.

Veterans Medical Research Foundation. (2015). ***Compassion meditation for PTSD*** (Clinicaltrials.gov Identifier NCT02372396). Retrieved from <https://clinicaltrials.gov/ct2/show/NCT02372396> This trial of compassion meditation will refine the meditation protocol and test its safety and feasibility in an open trial in the first wave. In the second wave, it will test the efficacy of compassion meditation against present-centered therapy in a RCT.

Wahbeh, H., Goodrich, E., Goy, E., & Oken, B. S. (2016). ***Mechanistic pathways of mindfulness meditation in combat veterans with posttraumatic stress disorder***. *Journal of Clinical Psychology, 72*, 365-383. doi:10.1002/jclp.22255 Veterans completing a mindfulness meditation intervention improved in subjective physiological arousal symptoms, intrusive thoughts, and waking cortisol levels. Only the observed changes in intrusive thoughts differed from other experimental conditions, including the control group, a mindfulness meditation with slowed breathing group, and a slow breathing with biofeedback group. Although these results suggest mechanisms of change in mindfulness meditation, more research is needed in how to enhance its incremental contributions above other treatments.

Wells, S. Y., Lang, A. J., Schmalzl, L., Groessler, E. J., & Strauss, J. L. (2016). ***Yoga as an intervention for PTSD: A theoretical rationale and review of the literature***. *Current Treatment Options in Psychiatry, 3*, 60-72. doi:10.1007/s40501-016-0068-7 This manuscript synthesizes literature on yoga as an intervention for PTSD and relevant research on potential mechanisms of action. The authors cited evidence for yoga as an effective intervention but not necessarily a first-line treatment. They discuss potential future directions for this line of research.