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Does mindfulness have an effect on PTSD-symptoms in veterans?

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Preface and acknowledgements

The purpose of the thesis is to investigate the potential efficacy of a Mindfulness-Based Stress Reduction (MBSR) intervention as a treatment for Post-Traumatic Stress Disorder (PTSD) in veterans. A primary objective of this research was to contribute to the existing knowledge on the topic and to potentially provide patients with a broader range of treatment options.

My first interest in mindfulness began when I was given the chance to participate in a 9-week mindfulness course during the COVID-19 pandemic. Discovering various techniques to regulate emotions and enhance resilience through mindfulness practice made me realise the importance of this as a potential intervention for different mental health disorders. Learning about different psychiatric conditions during my medicine degree has always caught my interest and therefore I chose to learn more about PTSD to explore the potential efficiency of mindfulness as an intervention on this condition.

I am sincerely grateful to my supervisor, Rolf Wynn, for his outstanding guidance throughout the implementation of my master thesis. His expertise, insights and constructive feedback have been invaluable in shaping this project. I would also like to express my gratitude suggestion to focus specifically on veterans as a population for my research. Through this assignment I have gained a deeper understanding of the mental health challenges faced by veterans and I would like to acknowledge the immense respect that I have for the risks they take by signing up for military service. This has been an enlightening journey, and I am honoured to have had the opportunity to undertake this research.

Finally, I want to thank my partner for his support during this time and for dedicating his time to proofread. His support has been a constant source of encouragement for me, and I am truly grateful for his help in ensuring the quality of this thesis.

Date: 20.05.23

Signature: Rikke Johansen

A handwritten signature in black ink that reads "Johansen". The signature is written in a cursive style with a long horizontal line extending from the end of the name.

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Summary

Background: Veterans have an increased risk of being exposed to traumatic events compared to the general population and may develop PTSD. Although there are many established treatments that are evidence based, the prognosis for veterans remains poor, highlighting the demand for optional treatment. Therefore, the primary objective of this thesis is to examine the efficacy of the mindfulness-based stress reduction (MBSR) intervention as a potential treatment for PTSD in veterans.

Material and method: I have conducted a review study by employing a comprehensive search in three central databases: Medline, Embase and PsykInfo. The systematic search encompassed RCTs that compared a MBSR intervention to a control intervention on the effect on PTSD in veterans.

Results: Among 63 articles, only 37 was screened further due to duplicates and the selection process led to nine RCTs that met the inclusion criteria. Overall, MBSR demonstrates a decrease in PTSD-symptoms in veterans post-intervention and the improvements were demonstrated to be persistent about 4 to 12 months follow-up time. Compared to a control intervention it was found to be more effective than psychoeducation, PCGT, and TAU in reducing PTSD symptoms. Mindfulness integrated into cognitive therapy was also found to be superior to SSRI alone. However, results regarding the superiority of MBSR over PCGT are uncertain.

Interpretation: This review study supports the effectiveness of MBSR as a treatment for PTSD in veterans based on nine randomized controlled trials (RCTs). However, more research is needed to confirm its effectiveness and superiority over other treatments.

Introduction

The increased focus on mental health in conjunction with a higher awareness about methods to promote stress reduction, resilience and interpretation of thoughts and feelings, has motivated me to write about mindfulness. Post-traumatic stress disorder (PTSD) is an intrusive mental health condition that affects a large percentage of veterans who have experienced trauma during their service. While there are several treatments established for PTSD, one potentially effective approach that has been gaining increased attention in recent years is mindfulness. I want to use this opportunity to explore the effect of what is known as the mindfulness-based stress reduction (MBSR) intervention, on veterans diagnosed with PTSD. This is an intervention built on the principles of mindfulness, which is described under the subtitle mindfulness.

DSM-5 diagnostic criteria

Different diagnostic tools are available for assessing psychiatric disorders, including PTSD. However, because research has been conducted mostly on American veterans, the relevant studies are primarily American, and the diagnostic criteria are based on the Statistical Manual of Mental Disorders (DSM-5). Consequently, it is essential for this thesis to describe PTSD based on the DSM criteria. Nevertheless, it should be acknowledged that in Norway and other European countries, PTSD is currently diagnosed using the International Classification of Diseases (ICD-10) which has some differences in diagnostic criteria compared to DSM-5.

PTSD is a mental health condition that occurs after exposure to one or more traumatic event(s). In DSM-5 criteria, trauma is defined as being subjected to real or threatened death, serious harm, or sexual assault (*see appendix 1, criterion A*). The diagnosis consists of a cluster of specific symptoms (*for more detailed description of the criteria, see appendix 1*). One of the main criteria involves persistent reexperiences, typically referred to as “flashbacks”, as well as nightmares or other trauma-associated triggers that lead to emotional distress (*criterion B*). Secondly, PTSD includes avoidance of these stimuli (*criterion C*). Additionally, the trauma must have negatively impacted the cognitive process and mood related to the traumatic incidence, for instance, through an inability to recall a significant portion of the event, social isolation, or excessively and persistently blaming oneself or others for the cause or consequence of the incident (*criterion D*) (1).

A changed physiological activation and reactivity where the body still reacts as if it is in an acute threatening situation, may also result in disturbance like hypervigilance, irritability, anger, concentration issues and sleep problems (*criterion E*), although these symptoms are not required for the diagnosis (1, 2). Furthermore, the disruptions must last for a length of one month or longer, create a significant dysfunction in life, with the symptoms not being attributed to any other diagnosis (*criterion F, G, H*).

The symptoms normally materialise within 6 months after the trauma. Typically, people that are exposed to severe trauma can experience some symptoms, but most do not develop full PTSD. This means that the trauma is a necessary but not sufficient condition for the development of PTSD (3).

Peculiarities of the Population

The American definition of veterans is people who have completed their duty in the armed forces, including the Army, Navy, or Air Force, with an honourable discharge. In Norway, a veteran is a person that has participated in international operations. Since the Second World War, approximately 110 000 Norwegians soldiers have taken part in international operations (4). One of the reasons why I have chosen to explore the use of mindfulness and its effect on PTSD, is because trauma is highly prevalent in this population, with 90% of Norwegian veterans who served in the Afghanistan war reporting exposure to one or more traumatic events (5).

The traumatic experiences behind veterans' PTSD can be distinguished from those in the general population with the same disorder. Veterans are often exposed to life-threatening situations and trained to harm and kill others in combat. Not to mention the moral trauma when they see others, often civilians, suffer without being able to intervene. Soldiers are exposed to these situations because of higher authorities deciding it, rather than natural disasters, criminality, accidents, or personal misfortune (5).

However, veterans are a semi-niche population who are selected through several stages to exclude any who are not eligible for such extraordinary demands as military service often is. The Norwegian military recruits only those with good health, both physically and mentally,

which means the veteran population is healthier than the general population. This is called “the healthy soldier effect”. Consequently, it creates biases when conducting studies comparing veterans to the general population. In addition, intense training before international service also prepares the veterans for difficult and potentially traumatic experiences. The implication of this, is that soldiers are less likely to develop PTSD and have a higher resilience than non-selected and untrained soldiers (5). On the contrary, many soldiers in the American army are from lower socioeconomic classes, which can increase the chance of PTSD in case of trauma exposure (6).

The prevalence of PTSD amongst veterans varies between studies depending on both the study methods, such as sampling strategy and diagnostic assessment, and characteristics of the population in the study. In addition, factors like nationality, type of warfare, enemy, location and politics of the war affect the statistics (7, 8).

A study detecting the long-term psychological consequences of Norwegian soldiers who served in the Afghanistan-war between 2001-2020, revealed that 10.4% had clinical symptoms for psychological health issues, whereas 2.9% had symptoms consistent with PTSD. However, there is a clear correlation between the severity of potential traumatic event(s) and health problems, particularly for PTSD (5). According to recent American research, as summarized by the US Department of Veterans Affairs (VA), the life-time prevalence amongst veterans is close to 7%. About 15% of veterans from Operations Iraqi Freedom (OIF) and Enduring Freedom (OEF) developed the condition (7). The incidence of PTSD in the general population in Norway, is 1.0% for men and 1.7% for women (9).

PTSD became a diagnosis in the DSM in 1980 and in the ICD in 1992. Prior to this, the condition was known under different terms, including “shell shock”, which was reported amongst veterans in the US Civil War, World War I and II. However, the increased awareness of mental health has led to better diagnostic definitions and tools, which is important for accurate diagnosis and essential for effective treatment (10).

First-line treatment

There are many different approaches to PTSD-treatment. Not all treatments have been proven to be effective, therefore, guidelines recommend various forms of evidence-based treatment as first-line treatment.

The US Department of Veterans Affairs and the US Department of Defense (VA/DoD) Guidelines for PTSD, recommend **trauma-focused psychotherapies** (TF) as primary treatment (11). There are many types of TF. To mention some, the following treatments have a strong recommendation; **trauma-focused cognitive-behavioural therapy (CBT)**, and particularly **cognitive processing therapy (CPT)**, which focuses on helping the patient to identify negative thought patterns and challenges their interpretation of the thoughts. Secondly, **exposure-based therapy**, such as **prolonged exposure (PE)**, which involves safely recalling traumatic memories and controlled exposure to the patient's avoidance-pattern, which allows the trauma to be processed and eventually become easier to manage. Lastly, **eye movement desensitization reprocessing therapy (EMDR)**, which combines aspects of exposure therapy and CBT in addition to implementing a bilateral stimulation, typically involving a saccadic eye movement pattern (8, 11-13). Many patients with PTSD are treated with medication, either as a main type of treatment or as a supplement to psychological treatment. The main type of medication used in the treatment for PTSD is **selective serotonin reuptake inhibitors (SSRIs)**, that have an effect on many of the symptoms typically experienced by patients with PTSD (12).

Norwegian guidelines for PTSD do not exist, but the Norwegian centre for violence and traumatic stress studies (NKVTS) build their recommendation on international guidelines from National Institute for Health and Care Excellence (NICE, 2018) and International Society for Traumatic Stress Studies (ISTSS, 2018). **Cognitive therapy for PTSD (CT-PTSD)** and EMDR are the two main interventions that are recommended as they have the best evidence (14). CT-PTSD is a form for CBT and has much in common with CPT (15). Most guidelines are directed towards adults in a general population and do not have specific recommendations directed to veterans, apart from the NICE guidance, which recommend EMDR for combat-related PTSD (16).

The provider and the patient must decide together which type of TF to use, depending on the patient's symptoms and preferences. The duration for these treatments is roughly 8-12 weeks and consist of sessions of 50-90 minutes weekly (8, 12, 13). All good PTSD-treatment should also include **psychoeducation**, where the patient receives knowledge about their mental illness and how different interventions can be helpful (14).

Despite the excessive research on the interventions listed above, **psychosocial-** and **non-trauma-focused therapies** are alternatives to conventional treatment, which can also be used as complementary or integrative therapy (13). Even though these forms of therapy currently have a weak recommendation due to limited research, mindfulness is a **psychosocial** intervention that can be relevant and that is gaining increased attention and use among patients suffering from PTSD (11). New interventions, such as MBSR, are currently under development and there is an increased focus on documenting the effects.

As discussed, there are various ways to treat PTSD and many studies prove that treatment helps. But amongst veterans, one study shows that as many as 58% have persisting symptoms after being treated and that remarkably only 9% recover completely (of the US military). Other research finds that 2/3 of veterans (and personnel in the military) who receive psychotherapeutic treatment, maintain their diagnosis. In regard of this, it is essential to mention that 77% of veterans are interested in trying an alternative form of non-medication treatment (17).

Mindfulness

Mindfulness is a form of meditation that focuses on full awareness of the present moment, or, the mental and emotional state one is experiencing, without analysing or judging it. The practise teaches to observe thoughts, emotions and surroundings with an open mind and accept what is, rather than trying to control or avoid the unpleasantness that may occur. It involves breathing techniques, visualizing instructions, body scans and other methods of stress reduction practice (18, 19). The technique has roots in Buddhism, but secular research shows several advantages in mental health, such as reducing stress, improving anxiety- and depression symptoms, reducing avoidances behaviour, improving cognition, and enhancing overall well-being (20).

An important part of PTSD treatment is to learn regulating strategies for symptoms and all evidence-based PTSD treatment emphasizes work on emotions to some degree (14). Mindfulness techniques may have the potential to be used as a tool to increase the ability to cope with trauma-related emotions, such as guilt, shame, loss, anger and to deal with flashbacks, hypervigilance, avoidance, distress, and other central symptoms in PTSD, in order to learn to feel safe in the world again. Interventions that are based on these techniques are often referred to as mindfulness-based stress reduction (MBSR) intervention.

Assessment of response

Different diagnostic tools and self-report measures are used to evaluate the effect size of treatment, by assessing symptoms at baseline and post-intervention. Commonly used are both the PTSD checklist (PCL) and the Clinician Administered PTSD Scale (CAPS), which consists of 17-30 questions corresponding to either DSM-4 or DSM-5 (21, 22). Considering the newest version of DSM was introduced in 2013, relevant literature may include prior editions matching DSM-4-criteria. PCL is a self-report measure which is often used to screen patients for PTSD and can give a tentative PTSD diagnosis (21). In cases of uncertainty, CAPS, a semi-structured interview with more detailed questions, can be used. CAPS is the gold standard in diagnostic tools for assessing and diagnosing PTSD (22). Both measures can be administered by clinicians, clinical researchers, or other trained paraprofessionals (21, 22).

Summary of introduction

Although mindfulness has been found to have positive effects on reducing symptoms in PTSD in a general population with PTSD (23), veterans is a unique population with a different background, and research targeting the effects of mindfulness-based approaches on veterans specifically, is lacking. Due to the poor PTSD-prognosis amongst veterans, and the increasing interest in trying other interventions than first-line treatment, it is highly relevant to look at the effect of MBSR in this population.

Material and method

In my master thesis I have chosen to do a review study. To increase the chances of finding all the relevant articles, I used three different databases: Medline, Embase and PsycInfo. My method is based on building a structured and systematic search based on three main categories of words; PTSD, veterans, and mindfulness, as well as all the relevant synonyms I could find in each database. I used “and” between the main categories, and “or” between the synonyms in each category.

I had to make small adjustments to the words I used in the different databases (*see Table 1*). I found all the keywords in each database and marked them with “explode” to get all the potential words in the hierarchy below. In addition, I wanted to find all the articles that had not been hash-tagged into the hierarchy, therefore I searched each synonym (truncated), in title, abstract and keywords. The articles were required to be from the last 10 years (2013-2023), in English language, and only randomised controlled studies (RCTs) were included.

Medline	Embase	PsycInfo
Post-traumatic stress disorder*, Post traumatic stress disorder*, Posttraumatic stress disorder*, PTSD* Exp: Post-Traumatic Stress Disorders	Post-traumatic stress disorder*, PTSD* Exp: Posttraumatic Stress Disorder	Post-traumatic stress disorder*, Posttraumatic stress disorder*, PTSD* Exp: Posttraumatic Stress Disorder
Mindfulness* Exp: Mindfulness	Mindfulness* Exp: Mindfulness, Mindfulness-based stress reduction, mindfulness meditation	Mindfulness* Exp: Mindfulness Mindfulness-based interventions
Veteran* Exp: Veterans, Veterans health	Veteran* Exp: Veterans, Veterans health	Veteran* Exp: Military Veterans

Table 1 is an overview of the search procedure in the three different databases. Within each row, I combined the words using “or”. Then I combined each column using “and”.

“Exp” = explode.

* = truncated word.

The further selection was done in EndNote based on inclusion and exclusion criteria. Duplicate records were removed before screening.

Inclusion criteria were as follows: Articles from the last 10 years, written in English language. Only RCTs that compared a mindfulness-based intervention to a control intervention on the effect on PTSD in veterans.

Exclusion criteria were as follows: The article did not examine the effect of a mindfulness-based intervention on PTSD-symptoms in veterans. The population studied was not veterans, or veterans not diagnosed with PTSD. The intervention was not based on mindfulness, or it was combined with physical exercise. Lastly, articles were excluded if they did not report findings from a RCT.

Effect size measures: To make the effect size measures between the studies as comparable as possible, I have chosen to calculate the change from baseline to post-treatment, and from baseline to the given follow-up weeks. The calculations are based on the result tables given in each article.

Results

The searching was done between 2nd of January and 6th of February. In total, from the three different databases, the search identified 63 articles. However, 26 of these were duplicates, and 37 articles were screened further. The selection process is summarized in *Figure 1*.

Which articles that were excluded and the specific exclusion criteria applied in each case, are summarized in *Appendix 2*. After the selection process, only nine articles met all the inclusion criteria. These articles are summarized in *Table 2*.

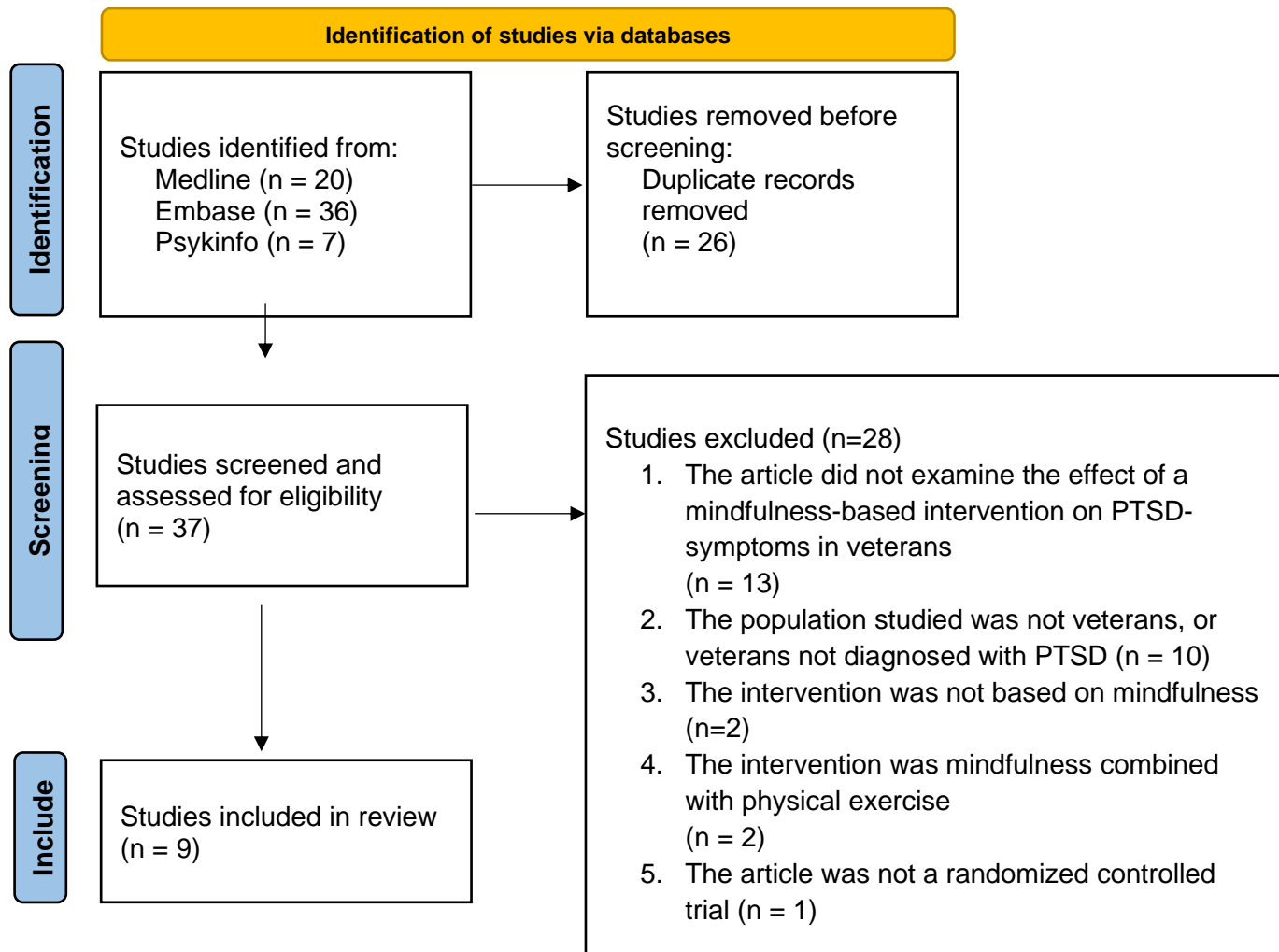


Figure 1: PRISMA flowchart of the selection process.

All nine articles compared **an intervention group** given a form of MBSR-intervention, to a **control group** (CG) receiving a comparable intervention. Control conditions were: psychoeducation (1), present-centered group therapy (PCGT) (4), cognitive processing therapy (CPT) (1), citalopram (SSRI) with weekly groups sessions (1) and “treatment as usual (TAU)” (2), which referred to participants receiving different types of usual care for PTSD (*see table 2, article 1-9 for more details of the interventions given*). Duration of the intervention in each study averaged 8 weeks and most studies had weekly sessions lasting between 1.5-2.5 hours. The numbers of participants in the studies varied between 10 and 90.

The articles shared the same goal, which was to assess the effect of mindfulness on PTSD in a veteran population. The population included in the studies were either screened for PTSD with a self-report measure, PCL, or the gold standard diagnostic tool, CAPS. The most recent articles, mainly from 2021 and 2022, were based on DSM-5 criteria, while studies older than 2019 (except one) used DSM-4 criteria. Furthermore, these measures were used to evaluate the effect size of the treatment by assessing symptoms at baseline and post-intervention. Some studies also examined if the changes persisted weeks after ended treatment at a given follow-up week. *Table 2* contains information on which effect size measures each study included and the reported mean changes for each intervention.

Compared to **PCGT**, the predominant findings were that mindfulness-participants showed a larger reduction in PTSD-symptoms (*article 3, 5, 6 in Table 2*). A significant better PCL-improvement was observed in the MBSR-group at week 8 amongst the studies, with a mean decrease of 7.8, 9.3 and 9.2 points vs 1.7, 6.1 and 3.0 in the PCGT (*a. 3, 4, 6, respectively*). Moreover, a significant larger decrease in CAPS for participants randomized to MBSR was measured to be 14.7 and 28.0 vs 9.2 and 8.0 for the CG (*a. 3, 5*). Although the studies found a decrease in PCL that reached significance at week 8, the decrease in CAPS showed no significance difference between the groups post-treatment (*a. 4, 6*). Additionally, effect sizes measured at week 3, 6, and 16 showed no significant difference, and the PCL improvement was not maintained post-treatment (*a. 4*). Most of the studies found a persistent decrease in effect sizes during the follow-ups; MBSR was found to be superior to PCGT at week 17-follow-up, measured by both CAPS (20.0 vs 11.9 points) and PCL (9.2 vs 2.8 points) (*a. 6*).

Additionally, the largest improvement in effect size, with 28 points (by CAPS) in MBSR, compared to no significant reduction in the CG, was retained at the 6 months follow-up (*a. 5*).

A clinically meaningful change was defined as an improvement in effect size ≥ 10 points, whereas MBSR-receivers reported a significant higher proportion of improvement (in PCL) at week 17 follow-up (48.9% vs 28.1%), but no significant difference between the groups was measured at week 9 or by CAPS at any point. The percentage of veterans randomized to MBSR who reported loss of diagnosis, by no longer meeting the DSM-requirements, was 42.3% at week 9 and 53.3% at week 17. However, there was no significant difference from the CG (*a. 6*). Moreover, with an intervention-efficiency defined as a 30% decrease in CAPS-score or more, 45.2% of MBSR-participants showed improvement in PTSD-symptom severity, but with no significant difference from PCGT (*a. 4*).

Compared to a control group receiving **psychoeducation**, MBSR experienced a significant greater reduction in PTSD-symptoms after an 8-week intervention, with a mean decrease in PCL of 9.9 vs 3.3. This improvement was still observed at week 16- and 24-week follow-up, but there was no significant difference between the groups. Veterans in the MBSR-group reported a significantly higher number of participants who had a PCL-score lower than the clinical cut-off (>31) with a number of 11 vs 3 (*a. 1*).

Compared to **CPT**, MBSR did not show a greater improvement in the CAPS-score after a 12-week intervention, or at 6- and 12- month follow up time. However, both interventions had a reduction around 6 points post-treatment that also persisted at both follow-up times. Moreover, 19% of MBSR-participants experienced a clinically meaningful improvement post-treatment defined as a decrease ≥ 10 points. Lastly, 7% of MBSR-completers had a remission of their diagnosis, defined as CAPS < 12 points, and 22% was reported to no longer meet the DSM-criteria for PTSD (*a. 2*).

A couple of studies examined the effect of MBSR given in addition to their treatment as usual (TAU), which meant they kept receiving standard intervention, such as medication, psychotherapy, addiction treatment and other mental health treatment (24, 25). The CG continued to receive usual care for PTSD.

One of these studies examined veterans in primary care, claiming a hypothesis that veterans will easier receive treatment at this level of health care, in comparison to seeking help from specialists (25) (a. 7). The participants randomized to MBSR who completed the full length of the intervention (MBSR-completers), had significantly larger decreases in PTSD severity after 4 and 8 weeks, compared to those who received TAU, measured as mean decrease in CAPS of 16.3 vs 6.3 at week 4. MBSR-completers also had a significant improvement in both CAPS and PCL, compared to those who did not receive any treatment (did not attend either of the interventions they were randomized to). With a 15-point or greater reduction on CAPS, or ≥ 10 -point decrease on PCL, a clinically significant improvement in PTSD-severity was observed in 75% of the MBSR-completers.

Moreover, MBSR have been found to have a significant better improvement than TAU measured by PCL at week 8 post-treatment (7.43 vs 4.41) and at 4 months follow-up (5.45 vs 2.75). 8% of MBSR-participants reported a clinical change given a cut-point ≥ 10 points in PCL-score, but there was no clinically significant difference observed from TAU (a. 8).

Lastly, one study had MBSR integrated with cognitive therapy as the intervention (a. 9). All participants in both the control- and intervention group received citalopram (30–50 mg/day at therapeutic dosages). The group receiving mindfulness-based cognitive therapy, in addition to medication, showed a significant greater reduction in PTSD symptoms compared to the CG. The total PCL-score was not measured, but a reduction in the main four groups of symptoms (defined in the PCL-measurement) were significantly bigger for the MBSR-group.

To summarize, MBSR-participants reported a significantly greater reduction in the PCL-score post-treatment, in comparison to PCGT (in all four studies), psychoeducation and TAU (in both studies). Mindfulness-based cognitive therapy was also shown to be better than just receiving SSRI. For the CAPS-score, MBSR was significantly better than TAU and in half of the studies for PCGT. However, MBSR was found to be non-inferior to CPT measured by CAPS. Nevertheless, all the studies measuring effect size at a given follow up time, found that the improvements were persistent about 4 to 12 months post-intervention. No significant difference was observed compared to psychoeducation or CPT. With PCGT as the control group, only two of the studies had a follow-up time, whereas only one found a significant difference.

Discussion

This review study provides support for the effectiveness of MBSR as a treatment for PTSD in veterans. The results of all nine RCTs demonstrate a decrease in PTSD-symptoms in this population. However, some studies do not indicate that MBSR is more effective than the control intervention. Nevertheless, it has been demonstrated that MBSR is more effective than psychoeducation, PCGT, and TAU in reducing PTSD symptoms as measured by PCL. Mindfulness integrated into cognitive therapy was found to be superior to SSRI alone. Additionally, MBSR is more effective than TAU, as measured by CAPS, but not CPT. It is also uncertain whether MBSR is superior to PCGT, as results from various studies differ.

The maintenance of the reduction in effect size was observed between follow-up periods of 4 to 12 months, but it should be noted that not all studies conducted follow-up assessments. In comparison to control groups, MBSR showed a larger reduction in symptoms than TAU, however, this was not observed for psychoeducation or CPT. The results for PCGT varied between studies.

The relevance

Despite the existence of evidence-based treatments for PTSD, the prognosis for PTSD, especially in veterans, remains poor. It is not uncommon for one treatment to work for some individuals while being ineffective for others with the same clinical symptoms. Therefore, research on other interventions is highly relevant to provide patients with a broader range of treatment options to choose from. This review study holds clinical importance in expanding the range of treatment options available. The literature on this subject, indicates that mindfulness, as a standalone- or support intervention, or when integrated with other evidence-based treatments, may be a viable alternative for PTSD-treatment.

The majority of the first-line treatments for PTSD involve interventions that concentrate on processing the trauma(s). However, many patients discontinue their treatment prematurely due to difficulties tolerating such approaches. For some individuals, the treatment may be too challenging or inappropriate. MBSR, in contrast, does not approach the traumatic experiences underlying the condition in the same way as other treatments. This may make it a more appropriate intervention for individuals who may be unable to fully confront their trauma.

Furthermore, the treatment of PTSD is a challenging process that involves learning regulation techniques as an essential element of a treatment plan. Experiencing intense feelings of fear, shame, grief, and anger is common and plays a crucial role in the therapeutic process. It is essential to learn techniques that enhance self-regulation to prevent these strong emotions from becoming overwhelming. The use of mindfulness techniques may be beneficial in stabilizing a patient's condition before engaging in further treatment, such as trauma-focused interventions. Moreover, when administered in conjunction with established treatments, mindfulness has the potential to be an effective complementary approach with a synergistic effect.

Comparability

Considering the potential benefits of mindfulness as either a standalone- or support intervention, it is advisable to ensure that the control intervention in the studies is of a comparable type in order to examine which is more effective.

As Psychoeducation should be integrated into all PTSD-treatment as an adjunct to first-line treatments, it presents an appropriate treatment for comparison with MBSR. On the contrary, CPT is a type of trauma-focused cognitive-behavioural therapy that is among the recommended first-line treatments for PTSD. It has been extensively researched and has been shown to be effective in reducing the severity of PTSD-symptoms. The article of Kearney et al. (a. 2) was a non-inferiority study, and it is not surprising that MBSR was found to be non-inferior to an evidence-based intervention such as CPT. Nevertheless, the study does contribute to the examination of the effects of MBSR on PTSD in a veteran population and strengthen the support of the use of mindfulness. Moreover, choosing TAU as a control group is an effective means of evaluating the potential of mindfulness as a support intervention alongside standard treatment.

Given the potential benefits of interventions that integrate mindfulness into established therapies, it is necessary to conduct more studies that compare them to a control group receiving the same established treatment alone. Only one study included in this review (a. 9) examined an intervention where mindfulness was incorporated with another therapy, i.e. cognitive therapy. However, the control group did not receive the same therapy without the element of mindfulness, making it difficult to determine whether administering mindfulness

with established treatment is an effective complementary approach with a synergistic effect. This highlights a significant lack of research conducted to explore this aspect of mindfulness as a potential treatment for PTSD in veterans.

Other literature

The current literature on the efficacy of MBSR as a treatment for PTSD in veterans is limited, with only one meta-analysis conducted RCTs specifically on this population by Goldberg et al (2020). Although the purpose of their study was to quantify the effectiveness and acceptability of MBSR in veterans, the studies included also examined the effect of MBSR on other psychiatric disorders, resulting in a population that did not exclusively consist of veterans diagnosed with PTSD. While the meta-analysis provides some support for the efficacy of MBSR in treating PTSD in veterans, the results are more uncertain compared to the present review study, which only included veterans diagnosed with PTSD and, additionally, included a larger number of studies on this specific population.

Due to an increased interest in developing effective techniques to treat PTSD in veterans, more RCTs on MBSR have been conducted since the publication of the meta-analysis. Therefore, a newer and more comprehensive comparison was called for in order to evaluate the current evidence. The present review study includes different articles, these are more recent and result from an extensive search, providing even stronger evidence that MBSR significantly reduces PTSD severity in veterans and should be considered in the treatment of PTSD in this population (26). Nevertheless, both the meta-analysis and the present review study emphasize a significant gap in the research on this topic.

Because of the limited research, it may be relevant to mention a recent meta-analysis by Liu et al. (2021), as some of the studies included military personnel and veterans as their population (23). Although their findings are consistent with the present study, it should be noted that their results cannot be directly implemented to the veteran population as several studies in their meta-analysis included a population of adults with PTSD who is likely to have been exposed to different type of trauma than veterans. Due to unique and intense traumatic experiences veterans face during military service, it is a necessity to only include veterans to provide a more comprehensive understanding of the potential benefits of MBSR for veterans with PTSD. Furthermore, since the time of the meta-analysis, there have been several additional

studies that have contributed to the literature on MBSR and PTSD in veterans. Therefore, the present study includes a higher number of relevant studies.

Strengths and weaknesses

One of the strengths of this review study is its comprehensive search strategy, which encompasses all relevant articles from three central databases. The strict exclusion criteria implemented in this study have ensured that only relevant articles have been included, enhancing the comparability between the studies. Specifically, it is crucial that the individuals recruited for these studies have been diagnosed using a consistent definition of PTSD.

Consequently, outdated or less relevant terms such as “post-traumatic neuroses” and “moral injury” were excluded, and only PTSD and its synonyms was selected as the primary term.

However, the recent literature has based their study populations on both DSM-4 and DSM-5 due to the shift in diagnostic criteria in 2013. This change has potential consequences on the actual diagnosis of PTSD. The more recent DSM-5 definition has the potential of excluding individuals that would have met the previous DSM-4 diagnostic criteria. Furthermore, the applicability of established treatments, tested and developed based on DSM-4 criteria, for individuals diagnosed using DSM-5 criteria remains questionable (11). As a result, this has increased the heterogeneity of the studies, creating variations in the total number and characteristics of participants included.

Moreover, these consequences also apply to the discrepancy between DSM-5 and ICD-10. Therefore, the current literature may not be directly applicable to Norwegian veterans and other countries utilizing the globally accepted diagnostic system for classifying PTSD. Since ICD-10 criteria are used in Norway and many other countries, studies using these criteria are necessary to accurately assess the efficiency of MBSR in these patients. However, the findings in the current literature suggest that MBSR does have a positive effect on PTSD in veterans, and it is likely that similar efficacy would be observed in studies from other countries, based on ICD-criteria, as well.

Finally, it is important to note that additional RCTs are necessary to gain a better understanding of the effect of MBSR for treating PTSD in veterans and to improve the evidence base. Moreover, the present review study includes only nine small RCTs, and therefore, larger studies with a bigger population are required to obtain more reliable data.

Conclusion

In conclusion, this review study provides support that MBSR may improve symptoms of PTSD in veterans. This results from it being given alone, as a complementary intervention, or incorporated in other established treatment. The collective findings from nine RCTs consistently demonstrate a notable reduction in PTSD symptoms in this population. While some studies do not explicitly indicate MBSR's superiority over control interventions, it is noteworthy that MBSR may have greater efficacy in comparison to psychoeducation, PCGT, TAU and SSRI, in reducing PTSD symptoms. This would be measured either by CAPS or PCL. The findings of this study contribute towards our understanding of the available treatment options for veterans with PTSD. However, further research is needed to better understand the potential benefits of MBSR and to improve the evidence base for this promising approach.

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Tables

Table 2 below: Overview of the findings in the articles included.

MBSR = Mindfulness-based stress reduction. MF = mindfulness. CG = control group. CAPS = The Clinician Administered PTSD Scale. PCL = PTSD checklist. CI = 95% confidential interval.

* To make the effect size measures between the studies as comparable as possible, I have chosen to calculate the change from baseline to post-treatment, and from baseline to the given follow-up weeks. The calculations are based off the result tables given in each article. The p-value or CI interval written in these columns are from statistics analyses to examine the statistically difference between MBSR and the control group.

Article (authors, year published, title)	Objective	Duration (weeks)	Intervention vs control group	Outcome	Mean decrease PCL*	Mean decrease CAPS*
<p>1. Possemato K, Bergen-Cico D, Buckheit K, Ramon A, McKenzie S, Smith AR, et al. 2022</p> <p>Randomized Clinical Trial of Brief Primary Care-Based Mindfulness Training Versus a Psychoeducational Group for Veterans With Posttraumatic Stress Disorder (27).</p>	<p>This study examined the feasibility and effectiveness of Primary Care Brief Mindfulness Training (PCBMT) compared to a psychoeducational group for reducing PTSD symptoms.</p>	<p>8</p>	<p>Primary Care Brief Mindfulness Training (PCBMT). N(completers)=21 Four 90-minutes group classes cofacilitated by a mental health worker and a veteran peer specialist.</p> <p>Vs</p> <p>Psychoeducational group (EDU). N(completers)= 20. These classes had a 4-session format, but facilitators could opt to provide additional sessions for a specific cohort. EDU provides a supportive environment for learning about PTSD and recovery options. Locally, these were called “PTSD 101” and were a treatment-as-usual service at study sites; they have not been empirically evaluated. EDU was co-led by a mental health provider and a peer specialist.</p>	<p>MBSR had a larger decrease in PTSD symptoms from pre- to post treatment compared to psychoeducation. MBSR-participants maintained PTSD symptom reduction through the follow-up period.</p> <p><u>Clinical outcome</u> MBSR participants were also more likely to have a PCL score below the clinical cut-off (> 31, n = 11) than EDU participants (n=3) at follow up. p= 0.02.</p> <p>Both interventions resulted in the majority of participants “stepping up” to a higher level of PTSD care.</p> <p>Medium effect size.</p>	<p><u>MF</u> - 9.87 (week 8) - 10.19 (week 16) - 11,56 (week 24)</p> <p><u>CG</u> - 3.26 (week 8) - 4,32 (week 16) - 6,41 (week 24)</p> <p>p=0.02 (week 8) → Significant Week 16 and 24 was not significant (p-value and CI are missing)</p>	

<p>2. Kearney DJ, Malte CA, Storms M, Simpson TL.</p> <p>2021</p> <p>Loving-Kindness Meditation vs Cognitive Processing Therapy for Posttraumatic Stress Disorder Among Veterans A Randomized Clinical Trial (28).</p>	<p>To determine whether group loving-kindness meditation is noninferior to group cognitive processing therapy for treatment of PTSD.</p>	<p>12</p>	<p>Lovingkindness meditation (LKM) (n = 91). N(completers) = 60. 12 weekly 90-minute group sessions.</p> <p>Vs</p> <p>Cognitive processing therapy (CPT) (n = 93). N(completers) = 50. 12 weekly 90-minute group sessions. Combines cognitive restructuring with emotional processing of trauma-related content.</p>	<p>MBSR resulted in reduction in PTSD symptoms, but it was not found to be better than CPT at any point. Change over time in PTSD symptoms was not found to be superior for either loving-kindness meditation or CPT at any time point This study supports the use of MBSR as a treatment for PTSD among veterans. For both interventions, the magnitude of improvement in PTSD symptoms was modest.</p> <p><u>Clinical outcome</u> The proportion with clinically meaningful improvement was defined as ≥ 10 points (completers in %): <u>MF</u>: 19, <u>CG</u>: 15 (week12), <u>MF</u>: 16, <u>CG</u>: 15 (month 6) <u>MF</u>: 19, <u>CG</u> 26 (month 12) →No significance differences <u>Loss of diagnosis (completers) in %</u> - no longer meeting DSM-criteria. <u>MF</u>: 22, <u>CG</u>: 25 (week 12) <u>MF</u>: 21, <u>CG</u> 20 (month 6) <u>MF</u>: 27, <u>CG</u>: 22 (month 12) →No significance differences <u>PTSD remission (completers) in %</u> Defined as CAPS < 12. <u>MF</u>: 7, <u>CG</u>: 5 (week12) <u>MF</u>: 4, <u>CG</u>: 6 (month 6) <u>MF</u>: 8, <u>CG</u> 8 (month 12) →No significance differences</p>		<p><u>MF (n=90)</u> - 5,64 (week 12) - 6,87 (month 6) - 9,07 (month 12)</p> <p><u>CG (n=93)</u> - 5,71 (week 12) - 6,09 (month 6) - 7,16 (month 12)</p> <p>→No significance difference at any point (p-value not given) 95% CI at month 6: -2.59 to 6.78.</p>
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<p>3. Kang SS, Sponheim SR, Lim KO.</p> <p>2022</p> <p>Interoception Underlies Therapeutic Effects of Mindfulness Meditation for Posttraumatic Stress Disorder: A Randomized Clinical Trial (29).</p>	<p>Assessed pre- and postintervention PTSD symptoms and electroencephalog raphy (EEG) measures of neural outcomes, including spontaneous brain activity, cognitive task-related brain responses, and interoceptive brain responses (heartbeat-evoked brain responses).</p>	<p>8</p>	<p>Mindfulness-based stress reduction (MBSR) intervention (n = 47). 8 weekly 2.5-hour group sessions and a daylong retreat.</p> <p>Vs</p> <p>Present-centered group therapy (PCGT). n = 51. 9 weekly 1.5-hour group sessions focused on current life problems as manifestations of PTSD. Session 1 focuses on providing psychoeducation about PTSD and treatment rationale, building group cohesion, and goal setting. Sessions 2 through 8 focus on discussing daily difficulties. Session 9 focuses on reviewing accomplishments and planning for the future.</p>	<p>Compared with the control group, the MBSR group had greater improvements in PTSD- symptoms. Most participants had PTSD symptom improvements after 8-week interventions (Table 1).</p>	<p><u>MF</u> - 7,84 (week 8)</p> <p><u>CG</u> - 1,7 (week 8)</p> <p>p=0.001 →Significant</p>	<p><u>MF</u> - 14,65 (week 8)</p> <p><u>CG</u> - 9,22 (week 8)</p> <p>p=0.001 →Significant</p>
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<p>4. Davis LL, Whetsell C, Hamner MB, Carmody J. Rothbaum BO, Allen RS, et al.</p> <p>2019</p> <p>A Multisite Randomized Controlled Trial of Mindfulness- Based Stress Reduction in the Treatment of Posttraumatic Stress Disorder (30).</p>	<p>This study examined the efficacy of mindfulness- based stress reduction (MBSR) in the treatment of PTSD in U.S. military veterans.</p>	<p>8</p>	<p>Mindfulness-based stress reduction (MBSR) (n=71), n (completers) = 65. 8 weekly, 90-minute sessions, and a six-hour retreat prior to week 6.</p> <p>Vs</p> <p>Present-centered group therapy (PCGT) (n=81), n (completers)= 77. 8 weekly, 90-minute sessions and a lunch gathering prior to week 8.</p>	<p>Both the MBSR and PCGT groups achieved improvement in PTSD as measured by the CAPS.</p> <p>No statistically differences between groups, measured with either CAPS or PCL at week 3, 6 and 16. However, a statistically difference between the groups were measured by the PCL at week 9. This difference was not maintained posttreatment, at week 16.</p> <p>In conclusion, MBSR did not have a advantage over PCGT in our sample. Small effect size.</p> <p><u>Clinical outcome</u> The efficiency of MBSR, was defined as a decrease in CAPS-score >30%. <u>MBSR</u>: 45,2%, <u>PCGT</u>: 37,7% p=0,293 → No significance</p> <p><u>Rates of remission</u> Defined as CAPS-score >45 <u>MBSR</u> 30.7%, <u>PCGT</u> 27.3% p=0.662 → No significance</p>	<p><u>MF</u> - 4,4 (week 3) - 6,4 (week 6) - 9,3 (week 9) - 6,9 (week 16)</p> <p><u>CG</u> - 3,4 (week 3) - 0,8 (week 6) - 6,1 (week 9) - 4,9 (week 16)</p> <p>p= 0,57 (week 6) p= 0,04 (week 9) p= 0.68 (week 16)</p> <p>→ Significant at week 9</p>	<p><u>MF</u> -13,2 (week 3) -15,7 (week 6) - 25,2 (week 9) - 19,5 (week 16)</p> <p><u>CG</u> - 10,3 (week 3) -17,6 (week 6) - 16,2 (week 9) - 17,8 (week 16)</p> <p>p=0,53 (week 6) p=0.58 (week 9) p=0.97 (week 16)</p> <p>→No significance difference between group.</p> <p>‘Numbers based on table 4 in article, p- value also found in table 3.</p>
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<p>5. Bremner JD, Mishra S, Campanella C, Shah M, Kasher N, Evans S, et al.</p> <p>2017</p> <p>A pilot study of the effects of MBSR on PTSD symptoms and brain response to traumatic reminders of combat in Operation Enduring Freedom/ Operation Iraqi Freedom combat veterans with PTSD (31).</p>	<p>The purpose of this study was to assess the effects of MBSR on PTSD symptoms and brain response to traumatic reminders measured with positron-emission tomography (PET) in Operation Enduring Freedom/ Operation Iraqi Freedom (OEF/OIF) combat veterans with PTSD.</p>	<p>8</p>	<p>Mindfulness-based stress reduction (MBSR) (n =17), n (Completes) = 9. 8 weekly, 2,5 h sessions and an all-day (6 h) session during week 6.</p> <p>Vs</p> <p>Present-centered group therapy (PCGT) n=9, n (completes) = 8 9 sessions. The initial phase of PCGT treatment was psychoeducational. After this phase, the primary content of PCGT was discussion of everyday problems of group members and coming to a better understanding of how PTSD creates or intensifies these problems.</p>	<p>MBSR therapy (but not PCGT) has a reduction in PTSD symptoms measured with the CAPS, and that persisted for 6 months after treatment. The difference between the groups reached significance.</p> <p><u>An interesting finding:</u> MBSR in this sample of PTSD patients did not lead to flooding of traumatic memories, dissociation, or other negative consequences.</p>		<p><u>MF</u> - 28 (week 8)</p> <p><u>CG</u> - 8 (week 8)</p> <p>p=0,016 →Significant</p> <p>These effects persisted 6 months after the ends of treatment (figure1 in the article).</p>
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<p>6. Polusny MA, Erbes CR, Thuras P, Moran A, Lamberty GJ, Collins RC, et al.</p> <p>2015</p> <p>Mindfulness-Based Stress Reduction for Posttraumatic Stress Disorder Among Veterans: A Randomized Clinical Trial (32).</p>	<p>To compare mindfulness-based stress reduction with present-centered group therapy for treatment of PTSD.</p>	<p>8</p>	<p>Mindfulness-based stress reduction therapy (MBST) (n = 58). 8 weekly 2.5-hour group sessions and a daylong retreat.</p> <p>Vs</p> <p>Present-centered group therapy (PCGT) (n=58). 9 weekly 1.5-hour group sessions focused on current life problems as manifestations of PTSD. Session 1 focuses on providing psychoeducation about PTSD and treatment rationale, building group cohesion, and goal setting. Sessions 2 through 8 focus on discussing daily difficulties. Session 9 focuses on reviewing accomplishments and planning for the future.</p>	<p>Both groups had an improvement in PTSD-symptoms measured by PCL, but participants in MBSR had a better improvement (week 9 and week 17). All participants also showed improvements in CAPS at week 17, but it was greater in the MBSR. The magnitude of the average improvement suggests a modest effect.</p> <p><u>Clinical outcome</u> A minimal clinically important difference was defined as PCL or CAPS improvement ≥ 10 points:</p> <p><u>PCL:</u> <u>MF:</u> 35.5%, <u>CG:</u> 22.8% p=0.12 (week 9) → No significance <u>MF:</u> 48,9%, <u>CG:</u> 28.1% p=0,03 (week 17) → Significant</p> <p><u>CAPS:</u> <u>MF:</u> 63.5%, <u>CG:</u> 49.1% p= 0,13 (week 9) <u>MF:</u> 66.7%, <u>CG:</u> 54.5% p= 0,22 (week17) →No significance</p> <p><u>Rates of loss of diagnosis</u> <u>MF:</u> 42,3%, <u>CG:</u> 43,9% p=0,87 (week 9) <u>MF:</u> 53,3%, <u>CG:</u> 47,3% p=0,55 (week17) →No significance</p>	<p><u>MF</u> - 7.9 (week 9) - 9.2 (week 17)</p> <p><u>CG</u> - 3.0 (week 9) - 2.8 (week 17)</p> <p>p=0.002 (week 9) → Significant</p> <p>p<0.001 (week 17) → Significant</p>	<p><u>MF</u> - 13.6 (week 9) - 20.1 (week 17)</p> <p><u>CG</u> - 10.8 (week 9) - 11.9 (week 17)</p> <p>p=0.37 (week 9) → not significant</p> <p>p=0.004 (week 17) → Significant</p>
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<p>7. Possemato K, Bergen-Cico D, Treatman S, Allen C, Wade M, Pigeon W.</p> <p>2016</p> <p>A Randomized Clinical Trial of Primary Care Brief Mindfulness Training for Veterans with PTSD (25).</p>	<p>This study tested if a brief mindfulness training (BMT) offered in PC can decrease PTSD severity.</p>	<p>4</p>	<p>Primary care brief mindfulness training (PCBMT). (n=36), n (completers) =16. 20 hours total for an average of 5 hours per week</p> <p>Vs</p> <p>Primary care treatment as usual (PCTAU) (n=26). All participants received usual Primary Care treatment, which could include primary care mental health integrated (PCMHI) care. PCMHI can include medications prescribed by primary care providers and brief psychotherapy provided by mental health clinicians (e.g., psychologists and clinical social workers) embedded in PC. No difference between groups.</p>	<p>PTSD severity decreased in both conditions. Participants randomized to PCBMT (n = 36) experienced similar decreases in PTSD severity compared with PCTAU participants (n = 36), as measured by both the CAPS and the PCL at posttreatment and the 8-week follow-up (table 3).</p> <p>A medium to large effect sizes for the effect of PCBMT completion on PTSD.</p> <p><u>MBSR completers</u> Post hoc analyses comparing MBSR completers (n = 16) with TAU participants (n = 26) revealed that MBSR completers reported a larger decrease in PTSD severity (by the CAPS p=0.03). PCBMT completers (n = 16), compared with participants who did not attend any of the PCBMT sessions regardless of randomization assignment (n = 42), had a larger decrease in PTSD (via the CAPS and PCL).</p> <p><u>Clinical outcome (completers)</u> Defined as a CAPS decrease of >15 points or >10 points on the PCL. Completers: 75% experienced a clinically decrease in their PTSD severity from pre- to posttreatment (<i>no more information than this given</i>).</p>	<p><u>MBSR (n=36)</u> - 7.1 (week 4) - 60 (week 8) <u>CG</u> - 7 (week 4) - 7.6 (week 8)</p> <p>p=0.63 →not significant</p> <p><u>MBSR completers (n=16)</u> -13.7 (week 4) - 11.4 (week 8)</p> <p>p=0.16 (compared to CG) →not significant</p> <p><u>CG + nonattenders (n=42)</u> - 4.8 (week 4) - 5.1 (week 8)</p> <p>p=0,04 (week 4, compared to completers): →Significant</p>	<p><u>MBSR (n=36)</u> - 16.3 (week 4)[*]</p> <p><u>CG</u> - 6.3 (week 4)</p> <p>p=0.34 →not significant</p> <p><u>MBSR completers (n=16)</u> -16.3 (week 4)</p> <p>p=0.03 (compared to CG) → significant</p> <p><u>CG + nonattenders (n=42)</u> - 3.3 (week 4)</p> <p>p=0.001 (compared to completers) → Significant</p> <p>[*]Numbers for 8-week follow-up is not given for CAPS.</p>
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<p>8. Kearney DJ, McDermott K, Malte C, Martinez M, Simpson TL.</p> <p>2013</p> <p>Effects of participation in a mindfulness program for veterans with posttraumatic stress disorder: a randomized controlled pilot study (24).</p>	<p>To assess outcomes associated with Mindfulness-Based Stress Reduction (MBSR) for veterans with PTSD.</p>	<p>8</p>	<p>Mindfulness-Based Stress Reduction (MBSR) (n = 25), n (completers) = 21. This group met once per week (2.5 hours per session) for 8 weeks, plus a 7-hour session on a Saturday.</p> <p>Vs</p> <p>Treatment as usual (TAU) (n = 22). Participants continued to receive usual care for PTSD within the same Veteran Health Administration.</p>	<p>Intention-to-treat analyses: For PTSD the 95% CIs for between group effect sizes (difference) included zero at the posttreatment and 4-month time points, which means significance better improvement for MBSR.</p> <p>Medium-to-large effect sizes</p> <p><u>Clinical outcome</u> Defined as a PCL-change of > 10 points: <u>MBSR</u>: 8%, <u>CG</u>: 5 (week 8). p=0.426 <u>MBSR</u>: 9%, <u>CG</u>: 5 (month 4). p=0.63 → No significance</p>	<p><u>MF</u> (n=25): - 7.43 (week 8) - 5.45 (month 4)</p> <p><u>CG</u> (n=22): - 4.41 (week 8) - 2.75 (month 4)</p> <p>95% CI: -1.12 to 0.11 (week 8) -1.03 to 0.2 (month 4) → Significant at week 8 and month 4.</p> <p><u>MBSR completers</u> (n=21): - 7 (week 8) - 5 (month 4)</p> <p><u>CG</u>: - 4 (week 8) - 3 (month 4)</p> <p>95% CI -1.19 to 0.07 (week 8) -1.10 to 0.16 (month 4) → Significant at week 8 and month 4.</p>	
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<p>9. Jasbi M, Bahmani DS, Karemi G, Omidveygi M, Peyravi M, Panahi A, et al.</p> <p>2018</p> <p>Influence of adjuvant mindfulness-based cognitive therapy (MBCT) on symptoms of post-traumatic stress disorder (PTSD) in veterans – results from a randomized control study (33).</p>	<p>Explored the influence on symptoms of PTSD among Iranian veterans of the Iran–Iraq war of mindfulness-based cognitive therapy (MBCT) as add-on to a standard treatment with citalopram.</p>	<p>8</p>	<p>Standard treatment for all patients consisted of citalopram (30–50 mg/day at therapeutic dosages).</p> <p>Mindfulness based cognitive therapy (MBCT) (n=24). 8 weekly 60-70 minutes group sessions.</p> <p>Vs Control group (n=24). Met once per week for socio-therapeutic group events such as exchanging daily life experiences, playing board games, undertaking short trips in the immediate countryside, checking medication adherence and checking blood pressure. Lasting 70 min to three hours (short trips in the immediate countryside).</p>	<p>The key findings of the present study were that among military veterans around 53 years old with PTSD and treated with a standard SSRI, adjuvant MBCT improved symptoms of PTSD compared to a control condition.</p>	<p>Re-experiencing the events: <u>MF:</u> - 4.66 <u>CG:</u> - 1 p < 0.001</p> <p>Avoidance <u>MF:</u> - 1.83 <u>CG:</u> - 0.5 p < 0.05</p> <p>Negative mood and cognition <u>MF:</u> - 7.84 <u>CG:</u> - 1.41 p < 0.001</p> <p>Hyperarousal <u>MF:</u> - 5.93 <u>CG:</u> - 1.33 p < 0.001</p> <p>→Significant for all</p>	
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Appendices

Appendix 1

DSM-5 Diagnostic Criteria for PTSD.

Note: The following criteria apply to adults, adolescents, and children older than 6 years (1).

A. Exposure to actual or threatened death, serious injury, or sexual violence in one (or more) of the following ways.

1. Directly experiencing the traumatic event(s).
2. Witnessing, in person, the event(s) as it occurred to others.
3. Learning that the traumatic event(s) occurred to a close family member or close friend. In cases of actual or threatened death of a family member or friend, the event(s) must have been violent or accidental.
4. Experiencing repeated or extreme exposure to aversive details of the traumatic event(s) (e.g., first responders collecting human remains; police officers repeatedly exposed to details of child abuse). Note: Criterion A4 does not apply to exposure through electronic media, television, movies, or pictures, unless this exposure is work related.

B. Presence of one (or more) of the following intrusion symptoms associated with the traumatic event(s), beginning after the traumatic event(s) occurred:

1. Recurrent, involuntary, and intrusive distressing memories of the traumatic event(s).
2. Recurrent distressing dreams in which the content and/or affect of the dream are related to the traumatic event(s).
3. Dissociative reactions (e.g., flashbacks) in which the individual feels or acts as if the traumatic event(s) were recurring. (Such reactions may occur on a continuum, with the most extreme expression being a complete loss of awareness of present surroundings.
4. Intense or prolonged psychological distress at exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event(s).
5. Marked physiological reactions to internal or external cues that symbolize or resemble an aspect of the traumatic event(s).

C. Persistent avoidance of stimuli associated with the traumatic event(s), beginning after the traumatic event(s) occurred, as evidenced by one or both of the following:

1. Avoidance of or efforts to avoid distressing memories, thoughts, or feelings about or closely associated with the traumatic event(s).
2. Avoidance of or efforts to avoid external reminders (people, places, conversations, activities, objects, situations) that arouse distressing memories, thoughts, or feelings about or closely associated with the traumatic event(s).

D. Negative alterations in cognitions and mood associated with the traumatic event(s), beginning or worsening after the traumatic event(s) occurred, as evidenced by two (or more) of the following:

1. Inability to remember an important aspect of the traumatic event(s) (typically due to dissociative amnesia, and not to other factors such as head injury, alcohol, or drugs).
2. Persistent and exaggerated negative beliefs or expectations about oneself, others, or the world (e.g., “I am bad,” “No one can be trusted,” “The world is completely dangerous,” “My whole nervous system is permanently ruined”).
3. Persistent, distorted cognitions about the cause or consequences of the traumatic event(s) that lead the individual to blame himself/herself or others.

4. Persistent negative emotional state (e.g., fear, horror, anger, guilt, or shame).
 5. Markedly diminished interest or participation in significant activities.
 6. Feelings of detachment or estrangement from others.
 7. Persistent inability to experience positive emotions (e.g., inability to experience happiness, satisfaction, or loving feelings).
- E. Marked alterations in arousal and reactivity associated with the traumatic event(s), beginning or worsening after the traumatic event(s) occurred, as evidenced by two (or more) of the following:**
1. Irritable behavior and angry outbursts (with little or no provocation), typically expressed as verbal or physical aggression toward people or objects.
 2. Reckless or self-destructive behavior.
 3. Hypervigilance.
 4. Exaggerated startle response.
 5. Problems with concentration.
 6. Sleep disturbance (e.g., difficulty falling or staying asleep or restless sleep).
- F. Duration of the disturbance (Criteria B, C, D and E) is more than 1 month.**
- G. The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.**
- H. The disturbance is not attributable to the physiological effects of a substance (e.g., medication, alcohol) or another medical condition.**

Specify whether:

With dissociative symptoms: The individual's symptoms meet the criteria for posttraumatic stress disorder, and in addition, in response to the stressor, the individual experiences persistent or recurrent symptoms of either of the following:

1. **Depersonalization:** Persistent or recurrent experiences of feeling detached from, and as if one were an outside observer of, one's mental processes or body (e.g., feeling as though one were in a dream; feeling a sense of unreality of self or body or of time moving slowly).
2. **Derealization:** Persistent or recurrent experiences of unreality of surroundings (e.g., the world around the individual is experienced as unreal, dreamlike, distant, or distorted). Note: To use this subtype, the dissociative symptoms must not be attributable to the physiological effects of a substance (e.g., blackouts, behavior during alcohol intoxication) or another medical condition (e.g., complex partial seizures).

Specify whether:

With delayed expression: If the full diagnostic criteria are not met until at least 6 months after the event (although the onset and expression of some symptoms may be immediate)

Source: APA, 2013a, pp. 271–272.

Appendix 2

Following articles were excluded because:

A) The article did not examine the effect of a mindfulness-based intervention on PTSD-symptoms in veterans

1. Whole Health Options in Pain Education (wHOPE): A Multi-Site Pragmatic Trial of a VA Whole Health Team Approach to Pain Management in Veterans (K. Seal, W. Becker, J. Murphy, A. Martin, K. Reddy, T. Van Iseghem, et al.)
2. Mindfulness-Based Interdisciplinary Pain Management Program for Complex Polymorbid Pain in Veterans: A Randomized Controlled Trial (D. D. McGeary, C. Jaramillo, B. Eapen, T. H. Blount, P. S. Nabity, J. Moreno, et al.)
3. Effects of an integrated mindfulness intervention for veterans with diabetes distress: a randomized controlled trial (M. M. DiNardo, C. Greco, A. D. Phares, N. M. Beyer, A. O. Youk, D. S. Obrosky, et al.)
4. Efficacy of mindfulness-based relapse prevention in veterans with substance use disorders: Design and methodology of a randomized clinical trial ((K. T. Brady, T. Killeen and N. L. Baker)
5. Strength and awareness in action: Feasibility of a yoga-based intervention for post-acute mild TBI headaches among veterans (L. M. Betthausen, J. E. Forster, A. Bortz, M. Penzenik, T. D. Hernandez, N. Bahraini, et al.)
6. Learning to Apply Mindfulness to Pain (LAMP): Design for a pragmatic clinical trial of two mindfulness-based interventions for chronic pain (D. J. Burgess, R. Evans, K. D. Allen, A. Bangerter, G. Bronfort, L. J. Cross, et al.)
7. Reductions in cortisol associated with primary care brief mindfulness program for veterans with PTSD (D. Bergen-Cico, K. Possemato and W. Pigeon).
8. Mechanistic Pathways of Mindfulness Meditation in Combat Veterans With Posttraumatic Stress Disorder (H. Wahbeh, E. Goodrich, E. Goy and B. S. Oken)
9. A Randomized Pilot Study of Acceptance and Commitment Therapy to Improve Social Support for Veterans with PTSD (M. M. Kelly, E. D. Reilly, V. Ameral, S. Richter and S. Fukuda)
10. The chronic pain skills study: Protocol for a randomized controlled trial comparing hypnosis, mindfulness meditation and pain education in Veterans (R. M. Williams, D. M. Ehde, M. Day, A. P. Turner, S. Hakimian, K. Gertz, et al).
11. Attentional control may be modifiable with Mindfulness-Based Cognitive Therapy to Prevent Suicide (M. S. Chesin, J. G. Keilp, A. Kline, B. Stanley, C. Myers, M. Latorre, et al.)
12. Effectiveness of a combined mindfulness-based cognitive therapy and mindfulness-based stress reduction intervention on depression symptoms and quality of life in a group of Iranian veterans with posttraumatic stress disorder (A. Omid and S. Hamidian)
13. Valued living among veterans in breath-based meditation treatment or cognitive processing therapy for posttraumatic stress disorder: Exploratory outcome of a randomized controlled trial (R. J. Schulz-Heik, L. C. Lazzeroni, B. Hernandez, T. J. Avery, D. C. Mathersul, J. S. Tang, et al.)

B) The population studied was not veterans, or veterans diagnosed with PTSD.

1. Comparing meditative scuba diving versus multisport activities to improve post-traumatic stress disorder symptoms: a pilot, randomized controlled clinical trial (L. Gibert, M. Coulange, J. C. Reynier, F. Le Quiniat, A. Molle, F. Beneton, et al).
2. The Cerebral Interoceptive Mechanism Underlying Treatment Effects of Mindfulness Meditation (S. S. Kang, S. Sponheim and K. Lim)
3. Mindfulness based stress reduction as a treatment for chronic insomnia in traumatic brain injury patients (J. K. Werner and J. F. Collen)
4. Methylation of FKBP5 and SLC6A4 in relation to treatment response to mindfulness based stress reduction for posttraumatic stress disorder (J. R. Bishop, A. M. Lee, L. J. Mills, P. D. Thuras, S. Eum, D. Clancy, et al.)
5. Investigating Clinical Benefits of a Novel Sleep-Focused Mind-Body Program on Gulf War Illness Symptoms: A Randomized Controlled Trial (Y. Nakamura, D. L. Lipschitz, G. W. Donaldson, Y. Kida, S. L. Williams, R. Landward, et al.)
6. Mindfulness-based Stress Reduction in Addition to Usual Care Is Associated with Improvements in Pain, Fatigue, and Cognitive Failures Among Veterans with Gulf War Illness (D. J. Kearney, T. L. Simpson, C. A. Malte, B. Felleman, M. E. Martinez and S. C. Hunt).
7. The effectiveness of mindfulness training in improving the quality of life of the war victims with Post Traumatic stress disorder (PTSD). (E. A. Marzabadi and S. M. H. Zadeh).
8. Post-9/11 veterans and their partners improve mental health outcomes with a self-directed mobile and Web-based wellness training program: A randomized controlled trial (J. R. Kahn, W. Collinge and R. Soltysik).
9. Functional Improvements 6+ Months After GOALS Training Predicted Decreased PTSD Symptoms Among Veterans with PTSD/mTBI (R. Santiago and T. Novakovic-Agopian)
10. Mindfulness-based Therapeutic Sailing for Veterans With Psychiatric and Substance Use Disorders (W. R. Marchand, W. Klinger, K. Block, S. VerMerris, E. Nazarenko, H. Curtis, et al.)

C) The intervention was not based on mindfulness

1. Individual Treatment of Posttraumatic Stress Disorder Using Mantram Repetition: A Randomized Clinical Trial (J. E. Bormann, S. R. Thorp, E. Smith, M. Glickman, D. Beck, D. Plumb, et al.)
2. Mindful attention increases and mediates psychological outcomes following mantram repetition practice in veterans with posttraumatic stress disorder (J. E. Bormann, D. Oman, K. H. Walter and B. D. Johnson)

D) The intervention was mindfulness combined with physical exercise

1. A 12-week integrative exercise program improves self-reported mindfulness and interoceptive awareness in war veterans with posttraumatic stress symptoms (W. E. Mehling, M. A. Chesney, T. J. Metzler, L. A. Goldstein, S. Maguen, C. Geronimo, et al.)
2. Veterans Group Exercise: A randomized pilot trial of an Integrative Exercise program for veterans with posttraumatic stress (L. A. Goldstein, W. E. Mehling, T. J. Metzler, B. E. Cohen, D. E. Barnes, G. J. Choucroun, et al.)

E) The article was not a randomized controlled trial

1. Changes in mindfulness and posttraumatic stress disorder symptoms among veterans enrolled in mindfulness-based stress reduction (K. R. Stephenson, T. L. Simpson, M. E. Martinez and D. J. Kearney)

Abbreviations

MBSR = Mindfulness-Based Stress Reduction

CG = Control group

PTSD = Post-Traumatic Stress Disorder

RCTs = Randomized Controlled Trials

TAU = Treatment as Usual

PCGT = Present Centered Group Therapy

SSRI = Selective Serotonin Reuptake Inhibitor

PCL = PTSD Checklist

CAPS = Clinician Administered PTSD

DSM = Statistical Manual of Mental Disorders

ICD = International Classification of Diseases

VA/DoD = The US Department of Veterans Affairs and the US Department of Defense

TF = Trauma-Focused Psychotherapies

CBT = Trauma-Focused Cognitive-behavioural therapy

CPT = Cognitive Processing Therapy

PE = Prolonged Exposure

EMDR = Eye Movement Desensitization Reprocessing Therapy

CT-PTSD = Cognitive Therapy for PTSD

NKVTS = Norwegian centre for violence and traumatic stress studies

NICE = National Institute for Health and Care Excellence

ISTSS = International Society for Traumatic Stress Studies