The long-term effect of mindfulness-based stress reduction therapy on post-traumatic stress disorder in veterans.

Tom Yishay

University of Amsterdam

Student number: 12203424.

Group: 14.

Word count abstract: 153.

Word count paper: 6383.

Supervisor: Dana Ravestein.

**Abstract**

The present study investigates the long-term effect of mindfulness-based stress reduction therapy (MBSR) on veterans' post-traumatic stress disorder (PTSD), compared to an active control condition (ACC). The participants (n = 102) were randomly assigned to a MBSR condition or an ACC (present-center group therapy). PTSD symptoms were measured before, directly after, and 6 months after the intervention using the Post-traumatic checklist (PCL). Expectedly, between baseline and post measurements both conditions' PCL scores significantly decreased. This decrease was significantly larger for the MBSR condition. Furthermore, at 6 months post intervention, both conditions maintained significantly lower PCL scores compared to baseline. However, between post and follow up measurements, both conditions' PCL scores increased resulting in an insignificant difference in PCL scores at follow up measurement. It was concluded that MBSR is effective in the treatment of veterans' PTSD in the long-term. Difficulties in attributing this effect to mindfulness and its exact working mechanism are discussed.

**Can a simple, costless practice as mindfulness benefit military traumatized solders?**

According to the American Psychiatric Association, post-traumatic stress disorder (PTSD) is marked as one of the most distressing psychological damages caused by wars (2013, cited in Jasbi, Bahmanib, Karami, Omidbeygi, Peyravi, & Panahi et al., 2018). The disorder involves an extreme response to a severe stressor with serious symptoms on four different domains, namely: (a) re-experiencing event(s), (b) avoidance, (c) negative mood and cognition and (d) hyperarousal (Blevins Weathers, Davis, Witte, & Domino, 2015, cited in Jasbi et al., 2018). These symptoms are associated with severe functional impairment and health risks such as greater rates of suicide, medical utilization, and more impactful physical symptoms (Gillock, Zayfert, Hegel, & Ferguson, 2005, cited in Possemato, Bergen-Cico, Treatman, & Treatman et al., 2016). The prevalence of PTSD is high. As many as 24% of veterans are diagnosed with the disorder overall (Wilk, West, & Duffy, 2013 cited in Cushing & Braun, 2018). To illustrate, 23% of veterans who returned from operations in Afghanistan and Iraq were diagnosed with PTSD. Additionally, PTSD diagnosis is growing rapidly. Between the years of 2001 and 2009, the number of diagnosed American veterans increased by 21.6% (American Department of Veterans, 2017, cited in Cushing & Braun, 2018). The societal consequence of PTSD regards both economical and medical areas. Medical care, suicides and lack of productivity of veterans diagnosed with PTSD were estimated to cost between four and six billion dollars to the American economy over the period of two years (Tanielian, Jaycox, Schell, Marshall, Burnam, & Eibner et al., 2008, cited in Wahbeh, Goodrich, Goy & Oken, 2016).

At present times, the two most common therapies, prolonged exposure, and cognitive therapies are insufficient for the reduction of PTSD in veterans. Following participation in these therapies, 30% to 50% of veterans' PTSD did not decrease with dropout rates of up to 38% (Schnurr, Friedman, & Engel, 2007; Forbes, Lloyd, & Nixon, 2012, cited in Polusny, Erbes, Thuras, Moran, Lamberty, & Collins et al., 2015). Additionally, PTSD can remain for a life-time period with a risk of relapse - the reoccurrence of symptoms after treatment (Kulka, Schlenger, Fairbank, Hough, Jordan, & Marmar et al., 1990, cited in Wahbeh et al., 2016; Perconte, 1988). Mindfulness-based therapies are perhaps more effective in resolving these issues. Mindfulness practices aim to focus attention on the present moment with non-judgmental regard (Kabat-Zinn, 1990, cited in Polusny et al., 2015). Mindfulness-based interventions have been shown to result in less to no dropout rates, and longer-term effects on PTSD in veterans than conventional therapies (Jasbi et al., 2018; Polusny et al., 2015). However, prior research on the negative effect of mindfulness on veterans’ PTSD stressed the need for a longer follow up (Polusny et al., 2015). Thus, due to the chronicity and relapse of veterans' PTSD symptoms and prior research, a longer follow up is required. The present study investigates the long-term effect of mindfulness-based stress reduction therapy on veterans' PTSD.

Theoretical frameworks of PTSD have centered experiential avoidance as a maintaining factor of the disorder (Resick & Schnicke, 1992, cited in Badour, Blonigen, Boden, Feldner, & Bonn-Miller, 2012). Experiential avoidance is a pattern of behaviors used to blunt, change, or control past traumatic experiences. The maintaining effect of experiential avoidance on PTSD can be explained by a withdraw from activities similar to the traumatic stimuli. A withdrawal that is progressively generalized to non-traumatic stimuli. As a result of experiential avoidance, necessary positive experiences with trauma-related stimuli is limited. Vital behaviors for overcoming associations between trauma and stimuli are not reinforced and thus learning is absent (Thompson & Waltz, 2010). This perpetuates PTSD's symptoms. In support of this theoretical explanation, less avoidance coping mechanism was found to predict lower PTSD symptoms among veterans (Badour et al., 2012). Less experiential avoidance associated with a decrease of PTSD symptoms can be obtained by exposure to trauma-related stimuli. Exposure to trauma-related stimuli is vital to reduce experiential avoidance through learning. Mindfulness therapies constitute such exposure. Mindfulness encourages individuals to accept and engage with their cognitive and affective states relating to the trauma. Such an engagement is non-judgmental and neutral. This practice exposes veterans to avoided internal stimuli thereby allowing acceptance, learning, and engagement with them. It can, therefore, serve as an indirect exposure mechanism to trauma-related cues and internal states, decreasing experiential avoidance (Possemato et al., 2016; Vujanovic, Niles, Pietrefesa, Schmertz, & Potter, 2011). Mindfulness's long-term negative effect on veterans' PTSD can be attributed to the acquisition of a more mindful mindset, promoting acceptance, rather than avoidance, of traumatic stimuli (Lykins & Bear, 2009). Finally, the lower relative drop-out rates of mindfulness-based treatments are explained by comfortable settings and procedures allowing collaboration between the participants and therapists (Polusny et al., 2015; Jasbi et al., 2018; Becker, Zayfert, & Anderson, 2004; Lang, Strauss, Bomyea, Bormann, Hickman &, Good et al., 2012). In conclusion, by undermining experiential avoidance and providing comfortable settings, mindfulness-based therapies are expected to be effective for the reduction of PTSD symptoms.

Elementary or brief training programs based on MBSR (mindfulness-based stress reduction) therapy, were shown to reduce veterans' PTSD symptoms in the long and short terms. Wahbeh et al. (2016) found that veterans who practiced mindfulness techniques registered a meaningful reduction of PTSD symptoms. This improvement was compared to baseline measurements and a passive control condition. The mindfulness techniques used in this study were two fundamental techniques practiced in MBSR therapy. Namely, mindfulness meditation and slow breathing. Wahbeh et al. (2016) concluded that elementary use of MBSR is effective in reducing veterans’ PTSD. Furthermore, the longer-term effects of mindfulness were also studied. Possemato et al. (2016) measured reduced PTSD symptoms two months after veterans participated in a brief mindfulness training (BMT) as an addition to primary care (PC). This contrasted with the second condition, PC alone. BMT is a training program in which veterans engaged in four weekly sessions based on MBSR therapy. BMT consisted of different meditations and practice of non-judgmental thought process and acceptance. PC treatment provided mainly medications and some brief psychotherapies sessions (the authors did not specify the frequency of treatment). This research concluded that there is a negative influence of the brief MBSR program on PTSD symptoms in veterans. This conclusion supports the future use of MBSR in research into the treatment of veterans' PTSD. Importantly, the research by Possemato et al. (2016) provides initial evidence for the longer-term negative influence of MBSR on PTSD symptoms among veterans. In sum, brief or elementary use of MBSR therapy for veterans' PTSD yielded a reduction of symptoms in the immediate and longer-terms.

However, the two studies lack an ACC. As a result, improvement can be attributed to general psychological support offered by MBSR. For example, the mere support provided by being part of a condition could have led to a reduction in PTSD symptoms alone. It is difficult to conclude whether the mindfulness practice or the general therapeutic setting, led to the reduction of PTSD symptoms (Boot, Simons, Stothart, & Stutts, 2013). Likewise, only brief or fundamental techniques were tested in the above studies. It is important to test the effects of fully mindfulness-based therapies, like MBSR, on veterans' PTSD. It might be that only elementary or brief interventions based on mindfulness, as additions to other treatments, are helpful.

MBSR and mindfulness-based cognitive therapy (MBCT), fully based mindfulness therapies, reduced veterans' PTSD in the long run in relation to active control conditions (Jasbi et al., 2018; Polusny et al., 2015). In two different studies veterans were randomized to either a MBSR or a MBCT condition and an ACC. Analogously, MBSR, and MBCT are similar therapies differing on a single aspect: the addition of cognitive exercises (practiced in the MBCT therapy). In both therapies, veterans participated in eight weekly meetings. In these meetings, participants practiced mindfulness such as attending to the present moment in a non-judgmental way. Meditation and breathing exercises were also included. Active control conditions met for the same amount of weekly times as the mindfulness conditions. The duration of each meeting differed between the two studies, as discussed below. An ACC was included to control for non-specific therapeutic effects such as general group support and social interactions practiced in all conditions. This allows to attribute the reduction of veterans' PTSD to mindfulness rather than general unrelated effects. The active control conditions differed between the two studies in two relevant ways. Firstly, Polusny et al. (2015) assigned the present-center group therapy (PCGT) as the ACC. This control therapy was shown to decrease PTSD symptoms in the short and long terms (Resick, Wachen, Mintz, Young-McCaughan, & Roache, 2015; Polusny et al., 2015). Participants discussed daily stressors, set goals, and engaged in professional contact with therapists. This contrasts with a general ACC by Jasbi et al. (2016) in which participants discussed general social and personal challenges, playing board games, and went for short trips. Secondly, the study by Jasbi et al. (2018) successfully equalized the treatment duration between the MBCT and the ACC. Polusny et al. (2015) failed to do so and assigned 1.5 extra weekly hours of treatment time for the MBSR compared to the ACC. Both studies measured PTSD symptoms at post-treatment and at two months follow up measurements. The reduction of PTSD symptoms was larger in the mindfulness therapies conditions compared to the active control conditions. All in all, fully mindfulness-based therapies as MBSR and MCBT, were found to have a notable negative effect on veterans' PTSD symptoms. These findings were maintained at two months follow-up compared to an ACC.

The above studies support the present study's aim to investigate the long-term effect of MBSR on veterans' PTSD symptoms, compared to an ACC. Support for the present study is given by four previous investigations. A meaningful reduction of PTSD symptoms following a mindfulness treatment was concluded consistently. Three of the studies above provide evidence for the longer-term effect of mindfulness-based therapies on veterans' PTSD (Polusny et al., 2015; Possemato et al., 2016; Jasbi et al., 2018). Particularly, Polusny et al. (2015) and Possemato et al. (2016) illustrated these trends using MBSR based procedures. This is reflected in the present study's hypothesis that MBSR will be effective in reducing PTSD symptoms in the long-term. The inclusion of an ACC is aimed at accurately attributing veterans' PTSD reduction to mindfulness and is supported by prior research (Polusny et al., 2015). Specifically, the present study uses present-center group therapy in the ACC. Firstly, due to the therapy’s effectiveness in reducing veterans' PTSD in the long and short terms, compared to conventional therapies (Resick, Wachen, Mintz, Young-McCaughan, & Roache, 2015; Polusny et al., 2015). Secondly, PCGT consists of similar non-mindful practices used in MBSR. This is used to control for non-specific therapeutic effects of MBSR. An ACC allows a more precise estimation of the effectiveness of mindfulness on PTSD by controlling for non-specific therapeutic influences. Such non-therapeutic influences may improve PTSD in veterans, regardless of mindfulness therapy (Boot et al., 2013). To this end, this paper further hypothesizes that PTSD symptoms reduction will be evident in both the MBSR and active control conditions, with a larger reduction in the MBSR condition.

The conclusions drawn from prior research, suggesting a negative influence of mindfulness on PTSD in veterans up to two months post intervention, exhibit four fundamental shortcomings. Firstly, confounds that interfere with the negative influence of mindfulness on PTSD in veterans. Prior research assigned veterans to mindfulness-based practices in addition to an existing therapy or failed to equalize the duration of treatment across the conditions (Possemato et al., 2016; Polusny et al., 2015). Longer treatment time and thus increased psychological support in the mindfulness conditions confounds the attribution of veterans’ PTSD improvement to mindfulness alone. To illustrate, the study by Polusny et al. (2015) assigned an extra weekly hour of MBSR therapy in relation to the ACC. Secondly, low external validity in prior research greatly limits the concluded effect. Participants in the prior studies were mainly North American and Caucasian men veterans. Regarding gender, research indicates different coping mechanisms and traumatic events in women compared to men veterans. Ruminative and emotional coping with traumas, more prevalent in women, were shown to predict both chronic and usual PTSD diagnoses (Nolen-Hoeksema, 1995; Ehlers, Mayou &, Bryant, 1998 cited in Gavranidou & Rosner, 2003). Additionally, while men cope with life-threatening stressors on the battlefield, women are often faced with sexual abuse. Military sexual trauma is three times more prevalent in women in active duty, compared to men, and is associated with PTSD development (Wischik, Magny-Normilus, & Whittemore, 2019; Naylor, Wagner, Johnston, & Elbogen et al., 2019 cited in Haskell, Gordon, Mattocks, & Duggal, 2010). Therefore, the interaction between gender-specific factors and PTSD development might alternate the negative effect of mindfulness on veterans’ PTSD (Jasbi et al., 2018). Thirdly, the higher socioeconomic status associated with western countries and Caucasian ethnicities in the US is linked to improved mental health outcomes in veterans (Nayback, 2008). This gap between ethnicities in mental health can be attributed to more economical resources in majorities. Such economic advantages among veterans in prior research may aid the observed effect on mindfulness on veterans' PTSD. This stresses the need to test mindfulness therapies in diverse samples. Finally, veterans' PTSD can be chronic and tends to reoccur after treatment, specifically in women (Polusny et al., 2015; Cushing and Braun, 2018; Nayback, 2008; Perconte, 1988). Prior studies follow up durations are not sufficient to test this concern (Polusny et al., 2015). In sum, more research into the effect of mindfulness on veterans' PTSD is essential due to methodological shortcomings regarding sample diversity and construct manipulations.

The present study adds to the current literature by resolving the above shortcomings. Firstly, the present study investigates a diverse sample of participants from both genders. Secondly, a long-term measurement of six months is included. Thirdly, an equal treatment time for both the MBSR and the ACC is implemented in the present design. The proposed design is thus similar to both Polusny et al. (2015) and Jasbi et al. (2018). It incorporates an ACC and a follow-up. The duration of the follow up used in the present study, six months, is directly based on the advice by Polusny et al. (2015) who expressed their concern about a possible relapse. Likewise, due to the discussed negative effect of MBSR procedures on veterans' PTSD, MBSR is used as the mindfulness therapy. Measurement is held at baseline, post, and six months follow-up. PTSD symptoms are operationalized by the PTSD Check List a self-reported questionnaire (PCL; Weathers, Litz, Herman, Huska, & Keane, 1993 cited in Polusny et al., 2015). Finally, in line with the results of previous literature, the present study predicts two outcomes. Firstly, compared to baseline, immediately and six months after treatment both conditions will score lower on the PCL. Secondly, the MBSR condition will score lower than the ACC at post and follow up times of measurement.

**Method**

*Participants*

As Israel's law demands all citizens to serve in the army, a diverse sample of both males and females as well as all socio-economical classes was recruited. Participants (n = 102) were former soldiers who served two years and eight months (the mandatory duration) in the Israeli defense forces (IDF). Veterans were recruited using posters in the IDF's office of recruitment. Participation was voluntary. The sample size resulted from an analysis by the program G\*power 3.1.9.6, ensuring an alpha level of 0.05 and power of 0.8 (Faul, Erdfelder, Buchner, & Lang, 2009). Likewise, inclusion criteria were: (a) current full or subthreshold PTSD according to the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV; American Psychiatric Association, 2000), (b) agreement to avoid other treatments for PTSD during the study and follow up, (c) PTSD due to experiences during service and in the army, (d) willingness to follow a full eight weeks program of intervention and to fill questionnaires at three time points. Exclusion criteria were: (a) present substance dependence, (b) present psychotic disorder, (c) ideation of suicide or homicide, (d) cognitive or medical conditions that interfere with treatment, and (e) experience in formal mindfulness training programs. These criteria are based on previous studies by Polusny et al. (2015) and Jasbi et al. (2018) and are aimed to account for confounding conditions as a substance or psychotic disorders.

*Materials*

**Dependent variable.** Post-traumatic checklist, DSM 5 version (Blevins Weathers, Davis, Witte, & Domino, 2015 cited in Jasbi et al., 2018). This questionnaire consists of 20 items, with higher scores indicating more severe PTSD symptoms. Each item is ranked from zero (=not at all) to four (= extremely) and thus highest and lowest possible scores are 80 and zero respectively. An example item is: "Repeated, disturbing dreams of the stressful experience". Similar to the DSM-5 criteria, the questions are clustered into four domains: avoidance, negative mood, and cognition, re-experiencing events, and hyperarousal.

**Intervention.** Mindfulness-based stress reduction therapy (MBSR). This therapy consists of a standard structure of eight weekly group meetings, two and a half hours each (Kabat-Zinn, 1990 cited in Polusny et al., 2015). In the present study, derived from Polusny et al. (2015), adjustments were made for PTSD treatment so that: (1) the first session includes psychoeducation and treatment rationale, (2) seven weekly sessions of 2.5 hours and (3) 6.5 hours re-treat, resulting in a total of nine sessions. By means of encouraging acceptance and non-judgmental of the present moment, participants learn to accommodate their psychological and physical states. Didactic and meditation training are also introduced to participants. Meditation involves three types. Firstly, body scan, the direction of attention to different body parts. Secondly, sitting meditation, the direction of attention and self-observation of internal states. Thirdly, mindful yoga, increasing the awareness of the body through acts of stretching and movement. Lastly, the therapy fosters the practice of mindfulness as a general daily skill (e.g. mindful eating).

**Active control condition.** Present-center group therapy (PCGT). This is an active control treatment in which professional contact, therapeutic relational, and feature specific stress reduction techniques (e.g. problem-solving) are used to reduce stress, similarly to MBSR. Additionally, problems that manifest from PTSD are discussed. Session one is parallel to MBSR, practicing psychoeducation regarding PTSD and treatment. The second till eighth sessions are focused on current life difficulties and the final session is aimed at future goals and reviewing accomplishments (Foy, Unger, & Wattenberg, 2004 cited in Polusny et al., 2015). The intervention in the present study was expanded to 2.5 rather than 1.5 hours per each of the nine weekly meetings. This addition of time to the ACC was done to standardized treatment duration across the conditions. PCGT was found to have negative effects on PTSD symptoms in three different studies, validating its use (Polunsy et al., 2015; Frost, Laska, & Wampold, 2014; Resick, Wachen, & Mintz, 2015, cited in Polunsy et al., 2015).

**Mindfulness Manipulation-Check.** The Five Facet Mindfulness Questionnaire (FFMQ) (Baer, Smith, Hopkins, Krietemeyer & Toney, 2006). Change in mindfulness tendencies in participants was measured by this questioner. The FFMQ is a self-reported survey constating of 39 items. A Likert scale, ranging from one (=" very low mindfulness") to five (=" high mindfulness") was applied. Five aspects of mindfulness are explored using this questioner: (a) acting with awareness, (b) describing, (c) observing, (d) nonjudging, and (e) nonreactivity. Thus, the total score of the test is between 39 and 195, with a higher total score indicating more mindfulness.

*Analysis plan*

**Standardization Checks.** Two standardization checks were carried to ensure non-significant variation regarding sex and age across the two conditions and thus avoid related confounds. Thus, the difference in the average gender ratio or age difference between the MBSR and active control conditions were tested. Age standardization was investigated by an independent T-test. The assumptions of this test, namely normality and homogeneity of variance were examined using the Shapiro-Wilk test and Levene's test respectively. As for gender standardization, Pearson's chi-squared test was carried.

**Manipulation check.** In order to investigate the change in mindfulness skills in each condition, a manipulation check of mindfulness is required. This check is aimed to test whether participants in the mindfulness condition developed more mindfulness skills compared to the ACC. Consequently, this determines whether the reduction of PTSD symptoms in the MBSR condition can be attributed to the mindfulness intervention. Thus, a factorial mixed ANOVA analysis was conducted. The first independent and between-subjects variable was type of condition. The second independent and within-subjects variable was times of measurement. The assumptions of this test are normality (tested by Shapiro-Wilk test), homogeneity of variance (tested by Levene's test), and sphericity (tested by Mauchly's test).

**Testing expectations.** The main analysis tests the influence of MBSR therapy on PTSD symptoms. In order to study whether participants in the MBSR condition exhibit fewer PTSD symptoms over three times of measurement, compared to the ACC and baseline, a factorial mixed ANOVA was selected. Thus, two conditions were tested at three time points. This is test is selected due to two features of this design. Firstly, the first independent variable, namely intervention type, requires a between-subjects analysis. Secondly, the second independent variable, times of measurement, requires a within-subject analysis. A factorial mixed ANOVA analysis includes three assumptions named in the manipulation check.

*Procedure*

Participants arrived at the lab were asked to send proof of PTSD diagnosis as stated in the inclusion criteria. Thereafter they were given a consent document elaborating on the duration, requirements, and procedure of the study. Participants were informed that they would be assigned to either the experimental or the ACC, randomly. They were also informed that leaving the study is possible at any given moment. Those who were found eligible to participate attended a preparatory session in which the requirements and research's schedule were discussed. After formal consent to participate in the study, the randomization procedure was held to assign participants to either the MBSR or ACC conditions. Therapies were given by two instructors per condition, all graduated with a master's degree in clinical psychology, and started on the same date. For the MBSR condition, instructors underwent a nine days practicum at the Hebrew University of Jerusalem. For the PCGT a two days training was given. All instructors were supervised every week by experienced Ph.D. level clinicians of the same university. All sessions were held in the same building and rooms, at the Medical center of veterans in Jerusalem, Beit Halochem. PTSD symptoms indicated by the PCL scores were measured on three occasions: (1) before the first session of treatment- baseline, (2) after the last session of treatment- post-treatment, and (3) six months after study completion- follow up. At the last measurement point, six months after treatment, participants were also debriefed regarding the aim and use of the study and the condition they participated in.

**Results**

Disclaimer: the presented study utilizes artificially simulated data and therefore cannot be used to make scientific conclusions. As the data is simulated, all participants (n = 102) were included in the analysis. There was no drop out of participants nor outliers. Descriptive statistics are summarized in Table 1.

Table 1. *Number of participants per condition, sex ratio and mean age. Values in Parenthesizes are standard deviations.*



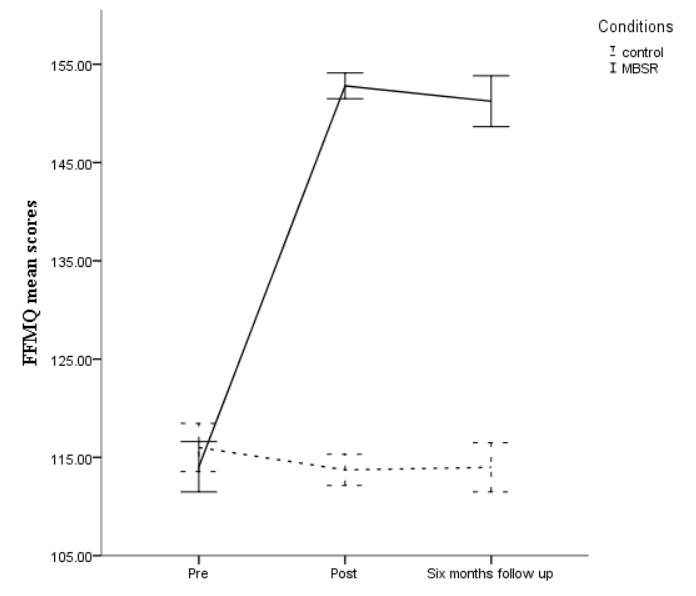
Standardization checks were performed in order to investigate whether participants differed on gender ratio or average age across the two conditions. In both checks, condition type was the independent variable while gender ratio or mean age was the dependent variable. As for the gender ratio between the conditions, a Chi-square test was performed. The assumption of this test, independence of observations, is met with eighty percent of cell counts exceeding five (the minimum expected count was 24). No significant difference in gender ratio between the MBSR and control conditions was found, *χ*2(1) = 0.16, *p* = .692. Meaning, gender did not confound the results of the present study. An independent T-test was carried to examine the difference in the average age between the two conditions. The two assumptions corresponding to this test are both met, normality (all *W*’s < 0.10, all *p*'s > .183) and homogeneity of variances (*F*(1,100) = 0.37, *p* = .544). The T-test (*t*(100) = 1.89, *p* = .061) was insignificant, indicating no influential difference between the mean age across the two conditions. Thus, the standardization checks establish successful randomization to conditions.

A manipulation check was carried to investigate whether the mindfulness program resulted in better mindfulness skills in the MBSR condition compared to the ACC and baseline. A Factorial Mixed ANOVA was performed on the scores of the FFMQ questionnaire. The analysis was a two (conditions: MBSR vs. ACC) (between-subjects) by three (pre, post and follow up measurements) (within-subjects) levels procedure. Conditions were the independent variable while the scores on the FFMQ at times of measurement were the dependent variable. Table 2 outlines descriptive statistics. This test corresponds to three assumptions. Firstly, the assumption of normality, all *W*’s > 0.95, all *p*'s > .070. Secondly, the assumption of equality of error variances, all *F*'s(1,100) > 0.025, all *p*'s > .250. Thirdly, the assumption of sphericity, tested by Mauchly's test, *χ*2(2) = 37.89, *p* < .001. The first and second assumptions were met. However, as Mauchly's test was violated (*χ*2(2) = 37.89, *p* < .001) and as the Epsilon (*Ɛ* = .77) value was larger than 0.75, the Greenhouse-Geisser correction of sphericity was applied. Both the main effects of condition (*F*(1,100) = 39.69, *p* < .001) and times of measurement (*F*(1.51,151.74) = 114.99, *p* < .001) were significant. The interaction between condition and time of measurement (*F*(1.51,151.74) = 144.27, *p* < .001) was significant too. This indicates score differences on the FFMQ survey between the two conditions, across all time measurements. This is visually illustrated in Figure 1. Error bars in the graph were corrected for repeated measures. The confidence intervals (CI) of the means indicate significance if they do not overlap at all or less than 25% of overlap. In the case of more than approximately a 25% overlap, differences between the conditions are deemed non-significant. This method of significant interpretation holds for all subsequent analyses. First, at baseline, the difference of FFMQ scores between the conditions was insignificant. This was in line with the expectation that before the intervention the conditions will score similarly on the FFMQ survey. Second, between baseline and post measurements, the MBSR condition registered an increase in FFMQ scores while the ACC slightly decreased. The MBSR condition scored significantly higher compared to both baseline measurement and the ACC. These trends were in line with the expectations that FFMQ scores will increase only in the MBSR condition. Finally, from post to follow up measurements, an insignificant decrease in FFMQ scores was registered in the MBSR condition while no change occurred in the ACC. Overall, changes were in line with the expectations. Firstly, the MBSR condition's scores were significantly higher at post and follow up measurements, compared to the ACC and baseline. Secondly, the ACC's scores on the FFMQ did not differ significantly across all times of measurement. Thus, the expected manipulation succeeded. The MBSR condition developed significantly more mindfulness skills than the active control conditions at all measurement times (besides pre-measurement).

Table 2. *Mean FFMQ scores across times of measurement across conditions. Values in Parenthesizes are standard deviations.*

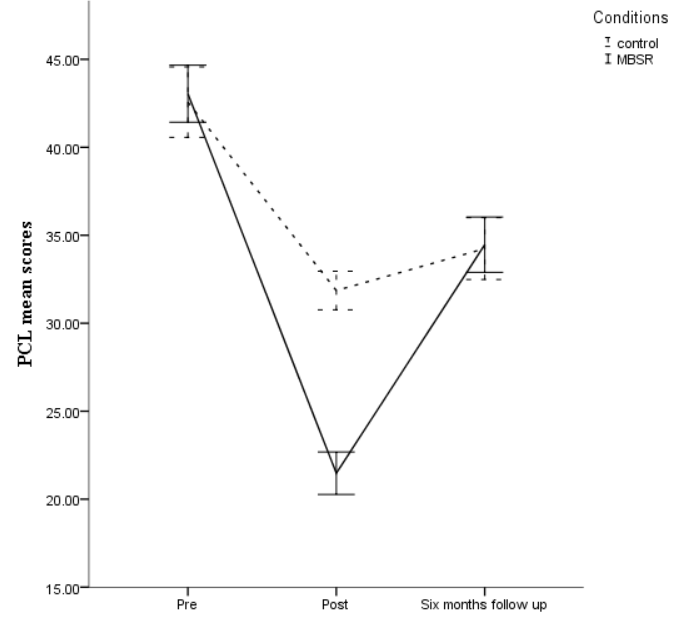
Figure 1.

*Visualization of the difference in mean FFMQ scores over three times of measurements for the MBSR and control conditions. Error bars were adjusted due to repeated measures.*



The main analysis used the scores on the PCL survey to explore the effect of times of measurements and condition type on PTSD symptoms. A two (condition: MBSR vs. ACC) (between-subjects) by three (times of measurements: pre, post and follow up) (within-subjects) Factorial Mixed ANOVA was tested. Condition type was the independent variable while the scores on the PCL at times of measurement were the dependent variable. Descriptive statistics are summarized in Table 3, outlining the PCL mean score across times of measurement per condition. Three assumptions correspond to the Mixed ANOVA test; (a) homogeneity of variance (all *F*'s(1,100) > 0.10, all *p*'s > .300), (b) normality (all *W*’s > 0.94 all *p*'s > .038) and (c) sphericity (Mauchly's test: *χ*2(2) = 27.99, *p* < .001). The first assumption was met. The second assumption was met to all times and conditions except the MBSR condition at post time of measurement (*p* = .039). As the number of participants in the MBSR condition (n = 48) was greater than 30, the data is considered normally distributed due to the Central Limit Theorem and thus the assumption is met (Field, 2018). As Mauchly's test was violated (*χ*2(2) = 27.99, *p* < .001) with an Epsilon (Ɛ = .82) value larger than 0.75, the Greenhouse-Geisser correction of sphericity was used. The main effect of time measurement was found to be significant, *F*(1.60, 160.47) = 138.69, *p* < .001. The main effect of condition was found to be non-significant, *F*(1,100) = 1.46, *p* > .050. Importantly, the interaction effect between condition and times of measurement was significant, *F*(1.60, 160.47) = 20.45, *p* < .001. This reveals a different change in PCL scores in each condition, across all times of measurement. Figure 2 outlines the results visually with adjusted error bars due to repeated measures. As the figure indicates, the expectations of the present study were partially met. Firstly, at baseline, there was no significant difference between the conditions' scores on the PCL. Next, in line with the expectations, both conditions experienced a significant decrease in PCL scores between baseline and post measurements. The decrease of PCL scores was significantly larger for the MBSR condition, compared to the ACC. Between the post and the follow-up measurements, both conditions registered an increase of PCL scores. The increase of PCL scores in both conditions was not in line with the expectations. The increase was only significant for the MBSR condition, compared to the post measurement. However, as expected, the MBSR condition's scores were significantly lower at follow up measurement compared to baseline. Finally, at follow up measurement, the difference between the conditions was insignificant. This is not in line with the findings of the study by Polunsy et al. (2015) and the expectation that the PCL scores will be significantly lower in the MBSR condition at all times compared to the ACC.

Table 3. *Mean PCL scores across times of measurement by condition. Values in Parenthesizes are standard deviations.*

Figure 2*.* *Mean PCL scores measured at baseline, post, and six-month follow-up. confidence intervals were adjusted due to repeated measures.*

**Discussion**

The present study investigated the long-term negative effect of mindfulness-based stress reduction therapy on veterans' PTSD. In line with the first hypothesis, MBSR is effective in reducing veterans' PTSD in the long term. At six months follow up, compared to baseline, the MBSR condition exhibited meaningfully less PTSD symptoms. The second hypothesis was partly supported. As hypothesized, between baseline and post measurements, both conditions registered a meaningful decrease in PTSD symptoms. This decrease was larger for the MBSR condition. Unexpectedly, between post and follow-up measurements, both conditions led to an increase in PTSD resulting in similar levels of PTSD symptoms between the two conditions. This increase in PTSD symptoms was larger for the MBSR despite high levels of mindfulness. The MBSR condition was more mindful after the intervention and six months later, compared to the ACC and baseline. This indicates that the manipulation was successful. The ACC maintained similar levels of mindfulness across all times of measurement, indicating no change in mindfulness. Thus, the present study confirms its primary hypothesis and partly supports its second one.

While similar to previous research, the present study contributes to the conclusion that mindfulness reduces veterans’ PTSD symptoms in the long term. This contribution is manifested by solving crucial shortcomings of prior research, discussed in the introduction. In line with previous research, mindfulness-based therapy reduced veterans' PTSD in the immediate and longer terms. Specifically, the present study constitutes a replication of Polusny et al. (2015) with the extension of the follow-up duration from two to six months. In line with their research, both conditions were again effective in reducing PTSD at follow up measurement. Despite the analogy, the present study adds importantly to former research. Firstly, the notion of treatment confounds in prior research. Past studies administered mindfulness in addition to existing psychological or medical treatment of unknown duration or failed to equalize treatment time across conditions (Jasbi et al., 2018; Possemato et al., 2016; Wahbeh et al., 2016 & Polusny et al., 2015). By standardizing treatment duration across conditions and by employing mindfulness psychotherapy alone- the present study rules out such confounds. Secondly, the limitation of external validity and diversity in prior studies' samples. Most of prior research utilizes small sizes that trouble statistical inferences and highly homogeneous samples regarding gender and social status elements (Jasbi et al., 2018; Wahbeh et al., 2016; Possemato et al., 2016). The present research overcomes these weaknesses by recruiting a large and diverse sample of veterans from both genders equally and with a versatile background. Lastly, the present study sheds light on the possibility of relapse of veterans’ PTSD symptoms. Prior research has stressed the concern of veterans’ PTSD relapse as all past investigations did not continue to measure symptoms longer than two months post intervention (Polusny et al., 2015; Perconte, 1988). The present research refutes concerns of relapse by extending the follow-up measurement to six months after study completion. As the results indicate, six months since the intervention, veterans' PTSD was still largely lower than at baseline. Thus, the long-term reduction of veterans’ PTSD is strongly supported after solving critical withdraws of past research.

Unexpectedly, between post and follow up measurements both conditions registered an increase in PTSD. An increase that was larger for the MBSR condition, resulting in similar levels of PTSD between the two conditions six months after the intervention. Treatment standardization duration across conditions might explain these contradictive findings. As a means to equalize treatment time between the conditions, 1.5 hours were added to the ACC. Conceivably an inappropriate extension given the more social practices used in the ACC compared to the MBSR condition. The ACC engaged in group discussions, dialogues, and problem-solving aimed to capture non-specific therapeutic effects that are mostly social. In contrast, the MBSR condition mainly consisted of intrapersonal methods that allow less relative social interaction such as yoga, meditation, and self-observation. As a result, during the intervention and six months later, developing friendships between veterans seems to be more possible for the ACC than the MBSR condition. Consequently, the negative effect of social support on veterans' PTSD symptoms was missing for the MBSR condition. This lack of opportunity to develop social support may explain the larger increase and later indifference in PTSD levels between the MBSR condition and the ACC (Laffaye, Cavella, Drescher, & Rosen, 2008). However, the extent to which social support impacted the reduction of PTSD symptoms is questionable. Despite the lacking potential of social support, the MBSR condition registered overall fewer PTSD symptoms than the ACC. This suggests that mindfulness is the largest negative influence on veterans' PTSD after all. Future research should account for the role of social support in veterans' PTSD reduction. A mediation analysis between mindfulness and PTSD levels using a questionnaire for social perceived support of veterans can shed light on this issue.

The theoretical background to the negative effect of mindfulness on veterans' PTSD is partly supported by the results. Between pre and post times of measurement, only the MBSR condition registered a sharp increase in mindfulness. Accordingly, in the same time frame, the MBSR condition has experienced a profound decrease in PTSD symptoms. A decrease that was meaningfully larger than the ACC. It appears that mindfulness, through indirect exposure, reduces experiential avoidance and thus diminishes PTSD in veterans. What is puzzling, however, is the change in the relationship between mindfulness and PTSD symptoms between post and follow up measures. Despite maintained elevated levels of mindfulness during this period, an increase of PTSD symptoms was observed in the mindfulness condition. Possibly, indirect exposure to trauma-related stimuli by mindfulness is more effective when an external agent, as the therapist, reinforces the retrieval of such stimuli. The exposure mindfulness provides depends on the tendency of individuals to actively retrieve trauma-related stimuli to their awareness and be mindful of it. Although participants acquired a mindful mindset, they might have kept avoiding trauma-related stimuli. Thus, it could be that during the six months since the MBSR therapy, mindfulness' indirect exposure of trauma-related stimuli diminished dramatically, leading to a rise in PTSD symptoms. Overall, the theoretical mechanism by which mindfulness reduces veterans’ PTSD is supported, although it seems to be mediated by the presence of an external helper.

The above explanation is also the second limitation when concluding a negative long-term effect of mindfulness on the veterans' PTSD. The theoretical mechanism by which mindfulness is hypothesized to reduce veterans' PTSD symptoms, indirect exposure, was not directly measured. By means of internal and thus indirect veterans’ exposure to trauma-related stimuli, mindfulness targets experiential avoidance. This means that indirect exposure is a potential mediator in the effect of mindfulness on veterans' PTSD. However, the present research only measured PTSD symptoms and mindfulness skills. Thus, the present study is limited in theoretically explaining the negative effect of mindfulness on veterans' PTSD. Nonetheless, the theoretical mechanism may still be sound but merely unconfirmed. Future research should test for mediation effects of indirect exposure between mindfulness and veterans' PTSD levels. By adding a survey for practiced indirect exposure in veterans and conducting a mediation analysis with these data, the indirect and direct effect of mindfulness on veterans' PTSD can be deemed.

The main conclusion of the present paper is of clear use for the treatment of veterans' PTSD in clinical settings. Mindfulness-based stress reduction therapy is effective in reducing PTSD in veterans. In the short term, this therapy is most effective, resulting in a dramatic decrease in PTSD. Despite a shrinkage in this effect, in the longer-term mindfulness is effective in reducing veterans' PTSD. These findings are in line with previous research and thus constitutes a reliable therapy for veterans’ PTSD. Therapists and patients can benefit from the practice of mindfulness as it appears to be more comfortable and simpler to use compared to currently offered therapies. Overall, mindfulness may undermine the devastating consequences PTSD has for both the veterans' mental health and their societies.

Literature list

Badour, C. L., Blonigen, D. M., Boden, M. T., Feldner, M. T., & Bonn-Miller, M. O. (2012). A longitudinal test of the bi-directional relations between avoidance coping and PTSD severity during and after PTSD treatment. *Behaviour Research and Therapy, 50*, 610-616. Doi: <http://dx.doi.org/10.1016/j.brat.2012.06.006>.

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using selfreport assessment methods to explore facets of mindfulness*. Assessment, 13*, 1, 27-45. Doi: <http://dx.doi.org/10.1177/1073191105283504>.

Boot, W. R., Simons, D. J., Stothart, C., & Stutts, C. (2013). The pervasive problem with placebos in psychology: why active control groups are not sufficient to rule out placebo effects. *Perspectives on Psychological Science, 8*, 4, 445-454. DOI: 10.1177/1745691613491271.

Cushing, R. E., & Braun, K. L. (2018). Mind–Body therapy for military veterans with post-traumatic stress disorder: A systematic review. *The journal of alternative and complementary medicine, 24*, 2, 106-114. Doi: 10.1089/acm.2017.0176.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G\*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*, 1149-1160.

Field, A. (2018). Discovering statistics using IBM SPSS Statistics (5th ed., p. 504). SAGE Publications.

Gavranidou, M., & Rosner, R. (2003). The weaker sex? Gender and post-traumatic stress disorder. *Depression and anxiety, 17*,130–139. Doi: 10.1002/da.10103.

Haskell, S. G., Gordon, K. S., Mattocks, K., Duggal, M., Erdos, J., Justice, A., & Brandt, C. A. (2010). Gender differences in rates of depression, PTSD, pain, obesity, and military sexual trauma among Connecticut war veterans of Iraq and Afghanistan. *Journal of women’s health, 19*, 2, 267-271. Doi: 10.1089=jwh.2008.1262.

Jasbi, M., Bahmanib, D. S., Karami, G., Omidbeygi, M., Peyravi, M., Panahi, A., Mirzaee, J., Holsboer-Trachsler, E., & Brand, S. (2018). Influence of adjuvant mindfulness-based cognitive therapy (MBCT) on symptoms of post-traumatic stress disorder (PTSD) in veterans – results from a randomized control study. *Cognitive Behaviour therapy, 47*, 5, 431–446. Doi: <https://doi.org/10.1080/16506073.2018.1445773>.

Kring, A. M., Johnson, S. L., Davison, C. G., & Neale, M. J. (2012). Abnormal Psychology*. John Wiley and Sons*, *12*.

Lykins, E. L. B., Baer, R. A. (2009). Psychological Functioning in a Sample of Long-Term Practitioners of Mindfulness Meditation. Journal of Cognitive Psychotherapy, 23, 3. DOI: 10.1891/0889-8391.23.3.226.

Nayback, A. M. (2008). Health disparities in military veterans with PTSD: Influential sociocultural factors. *Journal of Psychosocial Nursing and Mental Health Services*, *46*, 6, 43-51.

Laffaye, S., Cavella, S., Drescher, K., & Rosen, C. (2008). Relationships among PTSD symptoms, social support, and support source in veterans with chronic PTSD. Journal of Traumatic Stress, 21, 4, 394-401. DOI: 10.1002/jts.20348.

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*, 6, 759–786. Doi: 10.1177/0145445512441200.

Perconte, S. T. (1988). Stability of positive treatment outcome and symptom relapse in Post-traumatic stress disorder*. Journal of Traumatic Stress 2*,2.

Polusny, M. A., Erbes, C. R., Thuras, P., Moran, A., Lamberty, G. J., Collins, R. C., Rodman, J. L., & Lim, K. O. (2015). Mindfulness-based stress reduction for posttraumatic stress disorder among veterans a randomized clinical trial. (2015). *JAMA*, *314*, 5, 456-465. DOI: 10.1001/jama.2015.8361.

Possemato, K., Bergen-Cico, D., Treatman, S., Allen, C., Wade, M., & Pigeon, W. (2016) A randomized clinical trial of primary care brief mindfulness training for veterans with PTSD. *Journal of clinical psychology,* *72*, 3, 179–193. DOI: 10.1002/jclp.22241.

Resick, P. A., Wachen, J. S., Mintz, J., Young-McCaughan, S., Roache, J. D., Borah, A. M., Borah, E. V., Dondanville, K. A., Hembree, E. A., Litz, B. T., & Peterson, A. L. (2015). A randomized clinical trial of group cognitive processing therapy compared with group present-centered therapy for PTSD among active duty military personnel. *Journal of Consulting and Clinical Psychology*, 83, 6, 1058–1068. Doi: <http://dx.doi.org/10.1037/ccp0000016>.

Thompson, B. L., & Waltz, J. (2010). Mindfulness and experiential avoidance as predictors of posttraumatic stress disorder avoidance symptom severity. *Journal of Anxiety Disorders 24*, 409–415. Doi: 10.1016/j.janxdis.2010.02.005.

Vujanovic, A. A., Niles, B., Pietrefesa, A., Schmertz, S. K., & Potter, C. M. (2011). Mindfulness in the Treatment of Posttraumatic Stress Disorder Among Military Veterans. *Professional Psychology, 42*, 1, 24-31. DOI: 10.1037/a0022272.

Wahbeh, H., Goodrich, E., Goy, E., & Oken, B. S. (2016). Mechanistic pathways of mindfulness meditation in combat veterans with post-traumatic stress Disorder. *Journal of clinical psychology*, *72*, 4, 365-383. DOI: 10.1002/jclp.22255.

**Reflection form**

**Introduction & Method**

What was the most important feedback on the introduction and method?

How did you improve these components?

**The most important feedback on this section was about the active control condition, integration and argumentation and language. Firstly, it was not clear why I chose to include the active control group. I fixed this issue by explaining explicitly the reason research uses active control groups and its importance for this paper. Secondly, my theory was not well-explained. I let central parts implicit. I fixed this by going over my paper again and making every statement explicit, while trying to have a single logical line. Finally, my language was at times vague, wordy and hard to follow. This was fixed by making sentence simple, powerful, and concise. I rewrote the whole paper this way and paid extra attention to my word choice and sentences.**

**Results**

What was the most important feedback on the results?

How did you improve these components?

**The main feedback regarded the APA style of reference and redundancy. I should pay closer attention to how report the results in APA style and to not repeat the confidence intervals analysis. Improved these by stating once the interpretation of confidence intervals and asked a friend to help me with APA styling.**

**Discussion & Abstract**

What was the most important feedback on the discussion and abstract?

**The abstract should have been written in the past form and outline the results clearly. Outlining the results in a clear manner was also on of the feedback point for my discussion. Further, my discussion was at times nuclear and the language had to be revised. Lastly, some ideas were implicit should have made explicit.**

How did you improve these components?

**I corrected the language neatly for the entire paper, including this part. I revised and integrated a lot of repetitive or unclear information regarding the first and second paragraphs. Lately, I revised some arguments so the goal of the sentences is clear and related to first paragraph.**

**Whole research paper**

Which component did you spend the most time on?

**The introduction and methods. I revised this part countless times.**

Which component did you find the most difficult?

**The introduction. Constructing a convincing argument for conducting a research is very difficult.**

Which components are you satisfied about and which components are you less satisfied about?

**I am very satisfied with the methods and results. I put a lot of effort in my introduction and I hope it is also good, but not sure. My discussion is good I hope but the feedback is not available yet.**

**Motivation & Success**

Reflect on your own process: What went well, what would you do different a next time?

What lessons will you take from this to the next reports? (i.e. what have you learned, which you can apply when writing papers in the future like your bachelor thesis?)

**I think the communication between Dana and I went very well. This was very helpful for me, especially in the beginning as I wasn’t sure what to do. Next time I will try to make sure my scientific relevance is possible to argue for. I found this part the most difficult, and maybe because there was a lot of research about the topic before. I will take the lesson of processing feedback carefully and paying attention to writing style. This lesson is applicable to every paper I will submit in the future.**