



Higher frequency of mantram repetition practice is associated with enhanced clinical benefits among United States Veterans with posttraumatic stress disorder

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ABSTRACT

Background: There is increasing support for the use of meditation-based treatments for US military Veterans with posttraumatic stress disorder (PTSD). The Mantram Repetition Program (MRP), which is a portable meditative practice that features mindful repetition of a sacred phrase, is associated with significant reductions in PTSD symptom severity. Although regular practice is emphasized in meditation-based interventions, associations between frequency of practice and clinical outcomes are often not reported.

Objectives: This study will examine whether the frequency of mantram repetition is associated with greater improvements in clinical outcomes.

Methods: Veterans with PTSD participating in MRP ($N = 160$; combined experimental groups from two randomized controlled trials). Participants completed pre- and post-treatment self-report measures of anger and well-being and a clinician-administered interview of PTSD severity (CAPS-IV-TR). Veterans also reported average daily mantram repetition practice at post-treatment. We conducted a series of hierarchical multiple regression analyses.

Results: When controlling for race/ethnicity and pre-treatment severity, higher frequency of mantram repetition practice was associated with significantly greater improvements (small effect sizes) in PTSD symptom severity ($F(3,128) = 6.60, p < .001, \beta = .21, p = .007$), trait anger ($F(3,128) = 31.23, p < .001, \beta = .25, p < .001$), state anger ($F(3,110) = 17.62, p < .001, \beta = .16, p = .04$), mental health well-being ($F(3,128) = 28.38, p < .001, \beta = .14, p = .04$), and spiritual well-being ($F(3,127) = 13.15, p < .001, \beta = .23, p = .003$), but not physical health well-being.

Conclusions: Higher frequency of mantram repetition practice appears to have beneficial effects on clinical outcomes for Veterans with PTSD. Strategies that promote skills practice may be an important target for improving clinical outcomes for meditation-based interventions.

La mayor frecuencia de práctica de repetición de mantra se asocia con mayores beneficios clínicos entre los veteranos de los Estados Unidos con Trastorno de Estrés Postraumático

Antecedentes: Cada vez existe más apoyo para el uso de los tratamientos basados en la meditación para los veteranos militares de los EE. UU. con trastorno de estrés postraumático (TEPT). El Programa de Repetición de Mantra (MRP en sus siglas en inglés), el cual es una práctica meditativa portátil que presenta la repetición consciente de una frase sagrada, está asociada con una reducción significativa en la gravedad de los síntomas de TEPT. Aunque se enfatiza la práctica regular en las intervenciones basadas en la meditación, a menudo no se informan las asociaciones entre la frecuencia de la práctica y los resultados clínicos.

Objetivos: Este estudio examinará si la frecuencia de repetición de mantra se asocia con mayores mejoras en los resultados clínicos.

Métodos: Veteranos con TEPT que participan en MRP ($N = 160$; grupos experimentales combinados de dos estudios controlados aleatorizados). Los participantes completaron medidas de auto-reporte de ira y bienestar antes y después del tratamiento y la entrevista administrada por un clínico sobre la gravedad del TEPT (CAPS-IV-TR, en sus siglas en inglés). Los veteranos también informaron una práctica diaria promedio de repetición de mantra después del tratamiento. Realizamos una serie de análisis de regresión múltiple jerárquica.

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补充和综合治疗;冥想;创伤后应激障碍;美国退伍军人;愤怒;福利

HIGHLIGHTS

- Higher frequency of meditation practice during Mantram Repetition Program was associated with greater reductions in PTSD symptoms and anger as well as improvements in well-being.
- Strategies to promote at-home meditation practice may optimize the benefits of MRP.

Resultados: Cuando se controló por raza/etnicidad y gravedad pre-tratamiento, una mayor frecuencia de la práctica de repetición de mantra se asoció con mejoras significativamente mayores (tamaños de efecto pequeños) en la gravedad de los síntomas de TEPT ($F(3,128) = 6.60, p < .001, \beta = .21, p = .007$), rasgos de ira ($F(3,128) = 31.23, p < .001, \beta = .25, p < .001$), estado de ira ($F(3,110) = 17.62, p < .001, \beta = .16, p = .04$), bienestar en salud mental ($F(3,128) = 28.38, p < .001, \beta = .14, p = .04$), y bienestar espiritual ($F(3,127) = 13.15, p < .001, \beta = .23, p = .003$), pero no en bienestar de salud física.

Conclusiones: Una mayor frecuencia de práctica de repetición de mantra parece tener efectos beneficiosos sobre los resultados clínicos de los veteranos con TEPT. Las estrategias que promueven la práctica de habilidades pueden ser un objetivo importante para mejorar los resultados clínicos de las intervenciones basadas en la meditación.

美国患有创伤后应激障碍的退伍军人中更高频率的咒语重复练习与提高的临床获益增加有关

背景: 越来越多的人支持对患有创伤后应激障碍 (PTSD) 的美国退伍军人使用基于冥想的疗法。咒语重复计划 (MRP) 是一种便携式冥想练习, 其特点是有意识地重复一个神圣的短语, 与 PTSD 症状严重程度的显著降低有关。尽管基于冥想的干预强调定期练习, 但通常没有报告练习频率与临床结果之间的关联。

目的: 本研究将考查咒语重复的频率是否与临床结果的更大改善有关。

方法: 患有 PTSD 的退伍军人参与 MRP ($N = 160$; 来自两个随机对照试验的组实验组)。参与者完成了治疗前和后对愤怒和幸福感的自我报告测量以及临床医生进行的 PTSD 严重程度访谈 (CAPS-IV-TR)。退伍军人还报告了治疗后的平均每日咒语重复练习。我们进行了一系列层次多元回归分析。

结果: 当控制种族/民族和治疗前严重程度时, 更高频率的咒语重复练习与 PTSD 症状严重程度的显著改善 (小效应量) 相关 ($F(3,128) = 6.60, p < .001, \beta = .21, p = .007$), 特质愤怒 ($F(3,128) = 31.23, p < .001, \beta = .25, p < .001$), 状态愤怒 ($F(3,110) = 17.62, p < .001, \beta = .16, p = .04$), 心理健康 ($F(3,128) = 28.38, p < .001, \beta = .14, p = .04$) 和精神健康 ($F(3,127) = 13.15, p < .001, \beta = .23, p = .003$), 但与身体健康无关。

结论: 较高频率的咒语重复练习似乎对患有 PTSD 的退伍军人的临床结果产生有益影响。促进技能练习的策略可能是改善基于冥想的干预临床结果的重要目标。

1. Introduction

Interest in complementary and alternative therapies for Veterans with trauma-related conditions, including posttraumatic stress disorder (PTSD) has grown in recent years in response to high dropout rates from, non-response to, and reduced appeal of trauma-focused treatments (see Gallegos, Crean, Pigeon, & Heffner, 2017 for a review). Furthermore, there is increasing enthusiasm and evidence for the use of spiritually integrated interventions (Harris et al., 2021), such as the Mantram Repetition Program (MRP). The MRP teaches the mindful repetition of a sacred word or phrase (mantram repetition) intermittently throughout the day combined with one-pointed attention and monotasking, which can be used to support coping with internal and external stressors (Oman, Bormann, & Kane, 2020; Wadlinger & Isaacowitz, 2011). MRP does not prescribe a set number of repetitions or length of times one should practice. To date, two randomized controlled trials (RCT) of MRP have established the efficacy of MRP for Veterans with PTSD. In a trial of group-delivered MRP combined with treatment as usual (TAU), MRP + TAU had a greater impact than TAU alone in terms of change in PTSD symptoms, depression, overall mental health, and spiritual well-being (Bormann, Thorp, Wetherell, Golshan, & Lang, 2013). Similarly, in a study comparing individually delivered MRP to

Present Centered Therapy (PCT; a non-trauma-focused psychotherapy), MRP participants demonstrated greater reductions in PTSD symptoms and insomnia (Bormann et al., 2018), with the most pronounced effects on symptoms of hyperarousal (Crawford, Talkovskiy, Bormann, & Lang, 2019). Despite evidence for the efficacy of MRP for PTSD, rigorous examination of treatment elements responsible for observed improvements is a crucial next step to improve clinical care. One such element includes the possibility of a dose-response relationship between the frequency of meditation practice and positive symptom change.

Surprisingly, there is relatively sparse research exploring the impact of frequency of meditation practice (i.e. dose-response) on indices of well-being and related outcomes in healthy adult samples. For example, a systematic review (Zeng, Chio, Oei, Leung, & Liu, 2017) found that 61% of the studies reviewed did not evaluate the association between meditation practice frequency and changes in outcomes of interest. Among those studies that did report meditation practice, frequency of practice was not significantly associated with changes in positive emotions; however, these studies were quite heterogeneous, and Zeng et al. (2017) were unable to make clear conclusions from this relatively small number of studies. However, several recent studies have found links between meditation practice frequency

and beneficial outcomes among healthy adults, including positive emotions and well-being. Fredrickson et al. (2017) demonstrated that among adults ($N = 339$) randomized to mindfulness meditation (present moment awareness practices) or loving-kindness meditation (LKM), frequency of both types of meditation practice was associated with increases in positive emotions. Similarly, Jazaieri et al. (2016) reported that among healthy adults in compassion training ($N = 51$), increased frequency of compassion meditation practice was associated with reduced mind wandering to unpleasant thoughts and increased mind wandering to pleasant thoughts, as well as increases in caring behaviours towards oneself and others. Goldberg, Knoopel, Davidson, and Flook (2020) found that not only was increased practice time associated with improved practice quality and mindfulness skills, but also the frequency of practice predicted improvements in and psychological symptoms among participants ($N = 96$) enrolled in an eight-week Mindfulness-Based Stress Reduction (MBSR) course. In a study that compared mindfulness and Transcendental Meditation (TM) practice in a convenience sample of meditation practitioners ($N = 35$), greater number of days per week of practice was related to increased mindfulness skills and psychological well-being for both groups (Schoormans & Nyklíček, 2011). Finally, Montero-Marin et al. (2019) found that meditation practice frequency and session length were predictive of improved psychological adjustment among a convenience sample of meditation practitioners ($N = 210$). Despite preliminary evidence demonstrating the relevance of meditation practice frequency on beneficial outcomes in non-clinical adult samples, conclusions drawn from these studies were generally limited by small sample sizes and methodological shortcomings (e.g. non-randomized, convenience sampling), so a clear consensus on the dose–response relationship needed to affect positive change has yet to be established.

In addition to frequency of meditation practice, differentiating between meditation practice for coping with distress/symptoms versus practice for skill development/cultivation appears significant. Practice for skill cultivation is believed to be make the mantram more accessible, facilitate skills cultivation, and build an association between the mantram repetition and relaxation response (Berkovich-Ohana, Wilf, Kahana, Arieli, & Malach, 2015). Distinguishing between cultivation and coping may be reflected in differential changes in mindfulness ability, as improvements in mindfulness domains may be linked specifically to cultivation. For example, the Five Facet Mindfulness Questionnaire (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006) identified five domains of mindfulness: observing, describing, acting with awareness, nonjudging of inner experience, and nonreactivity of

inner experience. Using meditation for coping in times of stress may primarily help decrease nonreactivity, whereas cultivation may be more likely to impact nonjudging, though this has not been empirically examined.

Considering meditative-based practices are increasingly used for psychological conditions, such as PTSD, anxiety, and depressive disorders, there is a surprising dearth of literature examining meditation practice frequency effects among clinical populations (see, e.g. Edenfield & Saeed, 2012 for review). Moreover, Lloyd, White, Eames, and Crane (2018) reviewed 16 controlled trials for mindfulness-based interventions among various non-clinical (healthy adult/community samples) and clinical samples (e.g. PTSD, depressive disorders, pain conditions, cancer) revealing that fewer than half of the included studies reported the associations between meditation practice frequency and outcome measures, and the results were mixed. The majority of prior studies that evaluated the effects of practice time on clinical outcomes were in the context of MBSR and mindfulness-based cognitive therapy (MBCT), both of which recommend extensive daily meditative practice (formal practice of 45 min per day, six days per week). Most studies reported average daily practice from 24 to 34 min (Lloyd et al., 2018).

Evaluating the frequency of mantram repetition practice may be especially pertinent, as it is portable; practice is recommended intermittently at various times and situations throughout the day (e.g. before bed) but sitting practice is not required. Moreover, there is not an explicit requirement to practice for a given length of time or to repeat one's mantram for a set number of repetitions. MRP has also been adapted for internet delivery, with initial evidence for feasibility, acceptability, and efficacy (Kostovich et al., 2021; Vannini, McLean, Bormann, & Lang, 2021). In contrast, TM, which also involves the repetition of a mantra, is expected to be practiced as a 20-min formal seated meditation at least twice per day. Thus, mantram repetition affords a higher degree of individual variability in the frequency of practice that may be distinct from other meditative practices. There has been limited research examining the impact of the frequency of MRP on psychological outcomes. Several studies (Barger, Weinrich, Bormann, Bouvier, & Brosz Hardin, 2015; Bormann et al., 2009; Bormann, Walter, Leary, & Glaser, 2017; Kostovich et al., 2021; Vannini et al., 2021) report that mantram repetition practice was generally high among various samples (e.g. caregivers of Veterans, homeless women, nurses, healthcare providers, students); however, these studies did not evaluate the association between mantram practice frequency and outcomes of interest. To date, two studies have reported preliminary evidence that practice frequency may be an important component

of MRP efficacy. Bormann, Becker, et al. (2006) found that healthcare workers who reported engaging in a high number of mantram repetition practices per day ($M = 8.1$, $SD = 2.34$) as compared to low utilizers ($M = 3.0$, $SD = 0.95$) had significantly reduced trait-anxiety and improved religious and spiritual well-being at the end of MRP. In this study, mantram repetition use was measured both by an ambulatory counter and a weekly self-report of the average mantram repetition per day; these indices were highly related ($r = 0.83$). In a study of adults living with HIV who received MRP over 10 weeks, greater mantram repetition practice as measured by a counter was associated with greater improvement in measures of intrusive thoughts, spirituality, and quality of life (Bormann, Gifford, et al., 2006). Unexpectedly, low users showed greater improvement in trait anger. A single frequency of use item (1 = never to 4 = routinely) was not significantly related to counter data but was suggestive of better outcomes associated with more practice. Data from an open trial involving a mixed sample of Veterans and VA healthcare workers are also consistent with the idea that clinical response to MRP is positively associated with mantram repetition use (Bormann, Smith, Shively, Dellefield, & Gifford, 2007).

There has been some examination of the effect of mantram repetition practice in Veterans with PTSD. An uncontrolled pilot study of MRP for Veterans with PTSD ($n = 62$) revealed that the intervention effect was attenuated by controlling for the frequency of mantram repetition use, suggesting that those who used mantram repetition more may have responded better to the intervention (Bormann et al., 2005). In a secondary analysis of the data that were presented in Bormann et al. (2013), Bormann, Oman, Walter, and Johnson (2014) demonstrated that mantram repetition practice mediated the effect of the MRP on increased mindful attention; mindful attention was also shown to mediate the effect of MRP on PTSD, depression, and psychological well-being. Thus, these findings imply, but did not test, a multiple mediation such that mantram practice builds mindful attention, which then leads to symptom change. Bormann et al. (2014) did not examine the direct effects of mantram repetition practice on changes in PTSD symptom severity nor the association between mantram repetition practice and other clinical outcomes.

The current study expands and improves upon the previous work in several ways. First, we harmonized data from two RCTs of Veterans with PTSD, allowing for increased generalization. Second, we used the gold-standard semi-structured interview for PTSD (Clinician Administered PTSD Scale; CAPS) as our primary outcome of interest, strengthening the validity of assessment, in contrast to the Bormann et al. (2005) uncontrolled open-label pilot study, which presented

the self-report PTSD checklist utilized as the primary outcome of interest. Third, our present analyses examine how mantram repetition practice frequency impacts secondary outcomes (e.g. anger, well-being), improving upon prior work that was limited to self-reported PTSD symptom outcomes only (Bormann et al., 2014).

The aim of the current work is to examine whether the frequency of mantram practice is related to the observed clinical effects of the MRP, including PTSD symptom severity, state and trait anger, as well as indices of mental, physical, and spiritual well-being. We examine (1) the average number of times per day the mantram was repeated; and (2) in a subset of individuals, whether individuals practiced mantram repetition when not needed.

2. Method

2.1. Design and procedure

The present study was a secondary analysis of data from two randomized controlled trials of MRP among Veterans with PTSD conducted at the United States Department of Veterans Affairs (VA) outpatient mental health clinics. We refer to Bormann et al. (2013) as Study 1 ($n = 71$), which was a single site RCT, where Veterans randomized to MRP + TAU (medication and case management) received MRP delivered in six weekly, 90-min group sessions. Study 2 ($n = 89$) refers to Bormann et al. (2018), which was a two-site RCT where MRP was delivered in eight weekly, 60-min individual sessions. MRP includes training in three inter-related skills: mantram repetition (silent, intermittent repetition of sacred word or phrase), one-pointed attention, and slowing down; participants learn to redirect attention, regulate emotion, and generate relaxation response via regular application of these skills. Full details of Study 1 and 2 procedures were published elsewhere (see Bormann et al., 2013, 2018, respectively). Both studies were approved by VA Healthcare System and associated academic institutions' human subjects review committees.

2.2. Participants

Participants endorsed at least one military-related trauma and met DSM-IV-TR (APA, 2000) criteria for PTSD, as evaluated by the CAPS. Veterans with severe suicidal ideation, unmanaged schizophrenia or bipolar disorder, or dementia were excluded. Veterans were asked to remain on stable regimens of psychotropic medications.

We examined the subsample of Veterans who were randomized to MRP and completed post-treatment measures from Study 1 and Study 2. In Study 1, 71

Veterans were randomized to MRP, with 66 completing post-treatment (93% retention). In Study 2, 89 Veterans were randomized to MRP, with 69 completing post-treatment (78% retention). The combined, final sample consisted of $N = 135$ (84% overall retention).

2.3. Measures

2.3.1. Outcome measures

Clinician-Administered PTSD Scale (CAPS; Weathers, Keane, & Davidson, 2001). The CAPS is clinician-administered, semi-structured interview for evaluating PTSD diagnosis and symptom severity based on the Diagnostic and Statistical Manual of Mental Disorders (4th ed., tex. rev., DSM-IV-TR, American Psychiatric Association, 2000). The CAPS measures symptoms of reexperiencing, avoidance and numbing, and hyperarousal and rated for both frequency and intensity (Weathers et al., 2001). CAPS total severity scores range from 0 to 136, with higher scores indicating greater severity. The CAPS is considered to be the 'gold standard' clinical interview for PTSD, and has good psychometric properties (e.g. interrater reliability, internal consistency, and convergent validity; Weathers et al., 2001). Study 1 interrater reliability was high (kappa's 0.93–0.97; Bormann et al., 2013). Study 2 interrater reliability was high (kappa's 0.98–0.99; Bormann et al., 2018). In the present study, the internal consistency of the CAPS total severity was good to excellent at pre- and post-treatment (Cronbach's $\alpha = 0.82$, $\alpha = 0.98$, respectively).

State-Trait Anger Inventory–Short Form (STAXI-2; Spielberger, Jacobs, Russell, & Crane, 1983; Spielberger, 1999). The STAXI-2 consists of two subscales: state anger and trait anger. Subscale scores range from 10 to 40, with higher scores indicating the greater intensity of anger (state) and how often angry feelings are experienced (trait). The STAXI-2 has good internal consistency and good concurrent validity (Spielberger, 1999). In the present study, the internal consistency was good to excellent for state and trait anger subscales at pre-treatment (Cronbach's $\alpha = 0.95$, $\alpha = 0.91$, respectively) and post-treatment (Cronbach's $\alpha = 0.93$, $\alpha = 0.86$, respectively).

Short Form 12 item (version 2) Health Survey (SF-12; Ware, Kosinski, Turner-Bowker, & Gandek, 2002). The SF-12 is a brief self-report questionnaire measured health-related quality of life based on the full version (Ware & Sherbourne, 1992). The SF-12 yields two subscales reflecting mental health-related (Mental Component Summary; MCS) and physical health-related (Physical Component Summary; PCS) well-being. PCS and MCS scores were computed and normalized according to published algorithms (Ware, Kosinski, & Keller, 1995). Scores on each subscale range from 0 to 100, with higher scores

indicating better physical and mental health functioning. The SF-12 has good test-retest reliability and internal consistency (Ware et al., 2002).

Functional Assessment of Chronic Illness Therapy–Spiritual Well-Being Scale (FACIT-Sp; Brady, Peterman, Fitchett, Mo, & Cella, 1999; Peterman, Fitchett, Brady, Hernandez, & Cella, 2002). The FACIT-Sp, a subscale of the FACIT, measures spiritual well-being among individuals with chronic illness. FACIT-Sp scores range from 0 to 48, with higher scores indicating greater spiritual well-being. The FACIT-Sp has good convergent validity and internal consistency (Brady et al., 1999; Peterman et al., 2002). In the present study, the internal consistency was good for FACIT-Sp scores at pre-treatment (Cronbach's $\alpha = 0.89$) and post-treatment (Cronbach's $\alpha = 0.88$).

2.3.2. Mantram repetition practice

Frequency of mantram repetition practice was collected from the last available session in Study 1 and at post-treatment in Study 2. Two items were administered at post-treatment in both studies to gauge the frequency of mantram repetition use: 'During the past week, on how many days did you remember to repeat your mantram? (continuous)', and 'How often per day, on average, did you remember to initiate mantram repetition?' (continuous). The frequency of practice variable was calculated by multiplying average days per week by average times per day and divided by 7. Previous studies have shown a high correspondence between these self-report questions and use as tracked by a wrist counter ($r = 0.83$ – 0.87 ; Bormann, Becker, et al., 2006; Bormann et al., 2007). A subsample of participants (Study 2) was also asked, 'Do you repeat mantram when you do not need it?' (yes/no).

2.4. Analytic plan

Analyses were conducted using SPSS software (version 26.0). Cases with missing values were excluded from each model list-wise. We examined each variable for outliers, and we checked the data to ensure that all assumptions were met for linear regression analyses. We calculated Pearson's correlations between demographic variables (age, gender, race/ethnicity; a combined race/ethnicity variable was coded as 0 = white/non-Latinx-Hispanic and 1 = other; 'other' included individuals who endorsed 'Latinx or Hispanic' for ethnicity and/or 'American Indian', 'Alaska Native Asian', 'Black or African American', and/or 'Native Hawaiian or Pacific Islander' for race) and pre- to post-treatment changes in our outcomes of interest (PTSD symptom severity, state and trait anger, mental health well-being, physical health well-being, and spiritual well-being). Significant correlations were included as covariates. We also explored descriptive statistics for demographic and outcome variables by

study and study site; full results of these analyses are not reported herein, but samples across sites did not significantly differ in ways that precluded their combination for these analyses.

We performed a series of hierarchical linear regression models to evaluate the associations between average daily mantram repetition use and outcome variables of interest: PTSD symptom severity, state and trait anger, physical and mental health well-being, and spiritual well-being. For each model, step 1 included significant covariates and baseline scores on the outcome of interest, and step 2 added mantram repetition practice frequency. We performed a second series of hierarchical linear regression models to evaluate the association between mantram repetition use when not needed (yes = 1/no = 0) and outcomes of interest.

4. Results

4.1. Descriptive analyses

Table 1 reports participant demographic characteristics for the combined sample ($N = 141$). Table 2 presents pre-treatment clinical characteristics, post-treatment mantram repetition practice variables, and their bivariate correlations. Overall, participants reported a high frequency of practice, averaging 7.83 ($SD = 10.40$) mantram repetition episodes per day.

4.2. Mantram practice effects

We ran hierarchical regression models to examine the association between average daily mantram practice frequency and pre- to post-treatment changes in clinical outcomes of interest (see Tables 3 and 4); for each model, we entered race/ethnicity and relative pre-treatment score in step 1. Increased average daily mantram practice frequency was associated with significantly greater pre- to post-treatment reductions in PTSD severity ($R^2 = .14$, $F(3, 128) = 6.60$, $p < .001$; $\Delta F = 7.58$, $p = .05$), state anger ($R^2 = .33$, $F(3, 110) = 17.62$, $p < .001$; $\Delta F = 4.24$, $p = .04$), and trait anger

($R^2 = .43$, $F(3, 128) = 31.23$, $p < .001$; $\Delta F = 13.37$, $p = .001$). Increased average daily mantram repetition practice frequency was associated with significantly greater increases in mental health well-being ($R^2 = .41$, $F(3, 128) = 28.38$, $p < .001$; $\Delta F = 4.25$, $p = .04$), and spiritual well-being ($R^2 = .24$, $F(3, 127) = 13.15$, $p < .001$; $\Delta F = 9.25$, $p = .003$). Finally, increased average daily mantram repetition practice frequency was associated with significantly greater decreases in physical health well-being ($R^2 = .23$, $F(3, 128) = 12.61$, $p < .001$; $\Delta F = 6.81$, $p = .01$).

We ran additional hierarchical regression models to explore the association between mantram repetition practice when not needed (yes/no) and pre- to post-treatment changes in clinical outcomes among the Study 2 subsample of participants who responded to this item ($n = 57$). Mantram repetition practice when not needed was not significantly associated with changes in any of the outcomes (all $ps > .05$).

5. Discussion

In these secondary analyses of data from Veterans with PTSD randomized to MRP, more frequent mantram repetition at post-treatment was associated with greater improvements, albeit small effect sizes, in PTSD symptom severity, state and trait anger, mental health well-being, and spiritual well-being. This expands upon previous findings (Bormann et al., 2005, 2014) suggesting that higher frequency of mantram repetition augments the efficacy of MRP in reducing PTSD symptoms; we further found that during MRP, mantram repetition frequency also optimizes the benefits of MRP across several other clinical outcomes (anger) and well-being measures (mental health and spiritual well-being). These findings suggest that more frequent practice of repeating one's mantram is beneficial to psychological outcomes and well-being, lending support to the few studies which found clinical benefits from increased use of meditation practice (Lloyd et al., 2018). Particularly, the present findings are consistent with a pilot study of MBCT for Veterans with PTSD, which demonstrated that the average time per week spent on mindfulness practice using audio recordings was correlated with the reduction in PTSD intrusive symptoms (King et al., 2013). Correlations between practice and other outcome measures were not reported, hindering a full comparison. Given the small associations between greater frequency of practice and greater improvements in PTSD symptoms, anger, and well-being, future studies should consider evaluating between-session practice reminders, support, and monitoring as potential methods to enhance treatment effects as part of the MRP protocol.

In contrast, greater frequency of mantram repetition was associated with lower physical health

Table 1. Pre-treatment characteristics ($N = 141$).

Demographics	%	n
Age, m (SD)	51.75	(13.43)
Male gender	88.1	141
Race		
American Indian or Alaska Native	3.8	6
Asian	3.8	6
Black or African American	22.5	36
Native Hawaiian or Pacific Islander	4.4	7
White	64.4	103
Ethnicity: Latin or Hispanic	10.0	16
Relationship status		
Single	21.9	35
Living with partner	5.0	8
Married	35.6	57
Separated/Divorced	35.6	57
Widowed	1.9	3

Table 2. Means, standard deviations, and correlations of pre-treatment clinical measures and mantram repetition practice variables.

Measure	n	Pre-treatment score M (SD)	Change score M (SD)	Bivariate correlation (r)							
				1.	2.	3.	4.	5.	6.	7.	
1. PTSD severity CAPS	160	79.96 (16.53)	20.43 (21.72)								
2. State anger	137	23.04 (7.95)	2.32 (7.60)	.349**							
3. STAXI-2 Trait anger	156	22.65 (9.09)	1.19 (9.23)	.318**	.378**						
4. SF-12 PCS Physical health well-being	156	39.20 (9.37)	0.47 (8.32)	.10	.266**	-.03					
5. SF-12 MCS Mental health well-being	156	36.68 (9.35)	1.74 (9.99)	.032	.049	.057	-.435**				
6. Spiritual well-being	155	22.14 (9.20)	4.08 (6.64)	.354**	.318**	.270**	.06	.242**			
7. Mantram frequency average daily use	129	7.83 (10.40)		.254**	.177*	.325**	-.266**	.118	.235**		
8. Use when not needed (%; n = yes)	63	76.0% (n = 48)		.105	.144	.138	-.092	.117	.124	.273*	

*p < .05, ** p < .001

Note. Bivariate correlations (Pearson's r) reported for change scores and mantram practice variables. 1. CAPS = Clinician-Administered PTSD Scale; 2-3. STAXI-2 = State-Trait Anger Inventory-Short Form 2; 4-5. SF-12 = Short Form 12 item (version 2) Health Survey; MCS = Mental Health Component Summary; PCS = Physical Component Summary; 6. FACIT-Sp = Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being Scale.

well-being. However, when considering the SF-12 at an item level, this finding is better understood. Notably, the SF-12 physical component subscale contains questions specific to activities dependent on physical health (e.g. health limiting moderate activities, health limiting climbing several flights of stairs). These activities tap into physical mobility ability indicators that may not be impacted by psychological functioning and thus would be unexpected to change as a result of mantram repetition practice. In line with this interpretation, analyses reveal a minimal ($M_{\Delta} = 0.47$) change score found from pre- to post-treatment. Further, the present population had a notably lower mean score on the PCS ($M = 39.20, SD = 9.37$) in comparison to the SF-12 PCS scale norms ($M = 50.12, SD = 9.45$; Ware & Gandek, 1998), indicating lower physical health at baseline, which is not atypical of a clinical

older adult Veteran population (mean age approximately 52 years old). Given the heightened acuity of physical health problems, it is possible that the individuals presenting to MRP used mantram repetition as a means to cope with thoughts, emotions, or sensations associated with these physical health concerns. Moreover, individuals with worsening health may have used their mantram more frequently, thereby explaining why increased mantram repetition frequency might be associated with improved mental health well-being (i.e. improved psychological coping with physical health condition), which would be independent from improved physical ability. Ultimately, while using mantram repetition may have helped in managing the psychological distress related to physical health, it did not change the health conditions themselves. Lastly, the MRP focuses on using mantram repetition to cope with psychological distress but does not directly teach the application of mantram repetition for managing physical health ailments, which may further explain these findings and merit further exploration.

Table 3. Hierarchical regression models for variables predicting change in PTSD symptoms, state anger, and trait anger.

	B	SE B	β	t	p	R ²
CAPS						
Total PTSD Symptoms (Total R ² = .14)						
Step 1						
Race/ethnicity	-6.70	3.79	-.15	-1.78	.08	.09
Baseline PTSD severity	.36	.11	.28	3.18	.002	
Step 2						
Race/ethnicity	-7.25	3.70	-.17	-1.96	.05	.05
Baseline PTSD severity	.32	.11	.24	2.86	.005	
Avg. daily mantram use	.48	.18	.21	2.75	.007	
STAXI-2						
STAXI-S: State anger (Total R ² = .33)						
Step 1						
Race/ethnicity	-1.64	1.24	-.11	-1.32	.19	.30
Baseline state anger	.51	.08	.55	6.82	<.001	
Step 2						
Race/ethnicity	-1.80	1.22	-.12	-1.47	.14	.03
Baseline state anger	.51	.07	.54	6.85	<.001	
Avg. Daily mantram use	.11	.06	.16	2.06	.04	
STAXI-T: Trait Anger (Total R² = .14)						
Step 1						
Race/ethnicity	-1.04	1.32	-.06	-.79	.43	.37
Baseline trait anger	.64	.08	.61	8.55	<.001	
Step 2						
Race/ethnicity	-1.36	1.26	-.07	-1.08	.28	.06
Baseline trait anger	.61	.07	.57	8.37	<.001	
Avg. daily mantram use	.22	.06	.25	3.66	<.001	

Note. CAPS = Clinician-Administered PTSD Scale; STAXI-2 = State-Trait Anger Inventory-Short Form 2.

We found no significant differences across measured outcomes when comparing those who reported repeating their mantram when not distressed to those who only used it for coping. This may have been due to the large portion (76.0%) who reported practicing when not 'needing' their mantram, with only 15 people reporting that they only used their mantram when distressed. Thus, there may not have been enough variance to capture an effect. Using a meditative practice exclusively as a *coping tool* should be differentiated from meditation practice as the *cultivation of a skill*. Other meditation practices frequently emphasize a daily formal seated practice to promote skill building. In contrast, the MRP recommends practice at varying times when not distressed; however, the present study did not specifically track formal practice when not distressed (e.g. 'how many times per day did you repeat your mantram when you did not need it?'). Thus, we are unable to conclude how new adopters may employ mantram repetition for skill cultivation, and the majority of mantram repetition use reported

Table 4. Hierarchical regression models for variables predicting change in physical health well-being, mental health well-being, and spiritual well-being.

	<i>B</i>	<i>SE B</i>	β	<i>t</i>	<i>p</i>	<i>R</i> ²
SF-12						
<i>PCS: Physical health well-being (Total R² = .23)</i>						
Step 1						
Race/ethnicity	.21	1.40	.01	.15	.88	.19
Baseline physical health well-being	-.38	.07	-.43	-5.21	<.001	
Step 2						
Race/ethnicity	.65	1.38	.04	.47	.64	.04
Baseline physical health well-being	-.34	.07	-.39	-4.77	<.001	
Avg. daily mantram use	-.17	.06	-.21	-2.61	.01	
<i>MCS: Mental Health Well-Being (Total R² = .41)</i>						
Step 1						
Race/ethnicity	-3.61	1.42	-.18	-2.53	.01	.39
Baseline mental health well-being	-.61	.07	-.59	-8.47	<.001	
Step 2						
Race/ethnicity	-3.83	1.41	-.19	-2.72	.008	.02
Baseline mental health well-being	-.62	.07	-.59	-8.61	<.001	
Avg. daily mantram use	.14	.07	.14	2.06	.04	
FACIT-Sp						
<i>Spiritual Well-Being (Total R² = .24)</i>						
Step 1						
Race/ethnicity	-2.42	1.09	-.18	-2.22	.03	.19
Baseline spiritual well-being	-.26	.06	-.37	-4.54	<.001	
Step 2						
Race/ethnicity	-2.53	1.05	-.19	-2.41	.02	.06
Baseline spiritual well-being	-.26	.06	-.37	-4.64	<.001	
Avg. daily mantram use	.17	.06	.23	3.04	.003	

Note. SF-12 = Short Form 12 item (version 2) Health Survey; PCS = Physical Health Well-Being Score; MCS = Mental Health Well-Being Composite Score; FACIT-Sp = Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being Scale.

by Veterans may be aimed to cope with stressful thoughts, emotions, and situations. Tang, Rothbart, and Posner (2012) found that early stages of meditation training are more effortful and require more conscious attentional control, which gradually require less effort to reduce mind wandering, with ultimately an advanced stage being effortless. It might be necessary to practice the cultivation of meditation as a skill, absent of immediate distress, to eventually achieve effortlessness around attentional control. One MBSR trial evaluating formal practice (e.g. body scan, yoga, seated meditation) found that increases in mindfulness mediated the relationships between frequency of meditation practice and improvement in psychological symptoms (Carmody & Baer, 2008). However, informal practice (e.g. doing routine activities mindfully) was unrelated to these outcomes, indicating that formal practice may be a particularly necessary component of improving mindfulness abilities. Since a large proportion of the current sample did practice when not needed, the majority of participants may have been seeing the effect of skill cultivation, though more precise practice tracking is recommended to further understand these findings.

MRP teaches two other skills, one-pointed attention and monotasking, which were not explicitly tracked by participants. It is important to better understand the overlap of these skills with initiating repetition of the mantram itself, and how these overlapping skills/practices are applied during times of distress and during skills cultivation practice. Thus, not only should future studies consider the relevance of

measuring the frequency of meditation practice, but also seek to assess the quality of meditation practice, context of skill application, as well as consistency and duration of practice time, especially during the initial phases of skill acquisition and implementation.

This study's findings should be considered in relation to its strengths and limitations. This study harmonized data from two RCTs, with both group and individual intervention delivery, providing more strength in the stability of these findings. However, these data may not generalize to younger or older Veteran cohorts or populations outside the US. Additionally, our sample was a majority male, white Veterans, and due to limited diversity with respect to race and ethnicity, we are unable to provide more detailed findings regarding specific racial and/or ethnic differences in meditation practice. The findings may not generalize to civilian samples, and future studies should implement procedures to address the current lack of racial/ethnic diversity and inclusivity. We also cannot conclude whether women Veterans would evidence similar patterns of outcomes enhanced by practice frequency. Frequency of practice was determined through two combined items to create an average daily frequency variable; however, the first question specifically anchored response to 'the past week' while the subsequent question was not, and Veterans may have responded to the second question based on recollection outside of this past week interval. These studies used the gold-standard clinical assessment for PTSD in addition to other psychometrically sound measures of well-being, allowing for

broader assessment of practice impact as opposed to limiting to symptom severity. However, our assessments were collected at pre- and post-treatment, and mantram practice frequency was collected exclusively at post-treatment, thus restricting the findings to participants who completed treatment and post-treatment assessment, which is another notable limitation of the present study. Additionally, those who did not see benefit nor practiced frequently may have attrited early and are not captured in this data.

Future research would benefit from repeated measurement, ideally using experimental methodologies such as ecological momentary assessment to better evaluate relationships between practice and clinical outcomes in real-time, real-world settings (Lloyd et al., 2018). As the MRP does not prescribe any particular practice schedule, this may be especially fruitful in building home-practice recommendations. Wearable technology and smartphones may provide a valuable means to prompt in vivo subject assessment, monitor practice frequency, and support or encourage meditation practice both for skill cultivation and coping in times of distress. Though clinical implications should be interpreted cautiously in light of small effect sizes, other strategies to promote meditation practice should be considered. For example, one such strategy, self-monitoring one's behaviour, has been implicated as an intervention in and itself (e.g. Avina, 2008) and may be beneficial to incorporate into meditation-based interventions. Specifically, self-regulatory behaviours do appear to be important, as lack of skills in goal setting and habit formation appear to interfere with adopting a consistent mindfulness practice (Mrazek et al., 2020). In addition, one meta-analysis supports the notion that smartphone apps, text messages, and other online programs may be beneficial in encouraging home practice and recording the frequency of meditation practice (Parsons, Crane, Parsons, Fjorback, & Kuyken, 2017). Future research should assess differences in cultivation and coping across both clinical and non-clinical samples as findings from non-clinical samples may demonstrate different acquisition of mindfulness skills if primarily practicing in less affective situations. For example, an ongoing study in our lab is examining the benefits of real-time, text message support to encourage skill development and practice in MRP (versus self-guided version), and future research should continue to explore this and other strategies to promote meditation practice within contemplative interventions.

Taken together, this study demonstrates, across two RCTs, more frequent mantram repetition use is generally associated with improved clinical distress and well-being when no set schedule of practice is prescribed. Strategies that promote skills practice, including reminders to practice between sessions, may be an

important target for improving clinical outcomes for meditation-based interventions.

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Data availability statement

Final de-identified dataset will be made available in electronic format to other researchers upon request (to corresponding author). The request will be honoured only under a written agreement that the recipient will not take steps to re-identify the data to protect VA human subjects' privacy.

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