



Mindfulness to Manage Moral Injury: Rationale and development of a live online 7-week group intervention for veterans with moral injury

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ABSTRACT

Background: Military service puts service members at risk for *moral injury*. Moral injury is an array of symptoms (e.g., guilt, shame, anger) that develop from events that violate or transgress one's moral code.

Objective: We describe adaption of in-person mindfulness training program, Mindfulness to Manage Chronic Pain (MMCP), to address symptoms of moral injury to be delivered live via the web. We discuss how we will assess benchmarks (i.e., recruitment, credibility and acceptability, completion rates, and adherence) of the Mindfulness to Manage Moral Injury (MMMI) program.

Methods: Aim 1: To develop and then adapt the MMCP program based on feedback from experts and veterans who took part in Study 1. Aim 2: To develop an equally intensive facilitator-led online Educational Support (ES) program to serve as a comparison intervention and conduct a run-through of each program with 20 veterans (10 MMMI; 10 ES). Aim 3: To conduct a small-scale randomized controlled trial (N = 42 veterans; 21 MMMI; 21 ES) in which we will collect pre-post-test and weekly benchmark data for both refined intervention arms.

Results: Study 1 and 2 are completed. Data collection for Study 3 will be completed in 2022.

Conclusion: MMMI is designed to provide a live facilitated mindfulness program to address symptoms of moral injury. If Study 3 demonstrates good benchmarks, with additional large-scale testing, MMMI may be a promising treatment that can reach veterans who may not seek traditional VAMC care and/or who prefer a web-based program.

1. Introduction

There is increasing recognition that combat, among other experiences, escalates one's exposure to potentially morally injurious events (pMIEs) while serving in the military. pMIEs are events that may violate one's deeply held moral code. When moral beliefs are breached and the service member is not able to make meaning of pMIEs or resolve the incongruity between personal experiences and moral code/beliefs, moral injury may develop [1–5]. pMIEs have typically been described as stemming from witnessing, perpetrating, and being betrayed. In a national weighted sample of post-9/11 veterans (N = 7200), 27.9% reported witnessing, 18.8% reported perpetrating, and 41.1% reported

being betrayed [6]. Moral injury presents itself as a mixture of moral symptoms (e.g., shame, guilt, disgust, contempt, remorse, lack of forgiveness for self or others, lack of self-worth, spiritual or existential crises). There is growing interest in developing complementary and integrative approaches for the treatment of moral injury [7], and recent studies have shown that some patients prefer telehealth appointments over in-person appointments [8,9]. In this paper we describe how we adapted the Mindfulness for Military with Chronic Pain, a live, in-person facilitator delivered mindfulness intervention developed by Miller, Gaylord, and colleagues [10] originally developed for active-duty members with pain. Specifically, we focused the new program on the psychological pain associated with moral injury, developed the new

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program to be delivered live, facilitated, and online, and worked to ensure the new program would be appropriate for and acceptable to veterans.

1.1. Moral injury

Although moral injury occurs in other occupations (for a review see Lentz and colleagues [11]), combat situations (and especially insurgency warfare), often result in ambiguous, split-second decisions, in which the sanctioned course of action is not readily apparent or results in collateral harm [12]. Recent era combat veterans often report encountering challenging ethical dilemmas (e.g., Should I fire at a child soldier?) to which they did not know how to respond [13]. Moreover, killing or shooting at an enemy combatant haunts some service members who believe killing is wrong, but whose mission involves killing combatants [14]. Among U.S. Marines and Army soldiers deployed to Iraq, 87% and 77%, respectively, reported shooting or directing fire at a combatant, and 65% and 48%, respectively, reported being responsible for the death of a combatant [15].

Some service members can make meaning of events that transgress their moral beliefs, but in other instances, the difficulty or inability to resolve these discordant experiences with one's personal deeply held moral code/beliefs may result in moral injury [1–4]. Thus, potential moral injurious events (pMIEs) can result in moral injury, but not all pMIEs result in moral injury. It is also important to recognize that distress may develop over time as veterans reflect on their actions or inactions and encounter others' responses to their experiences [16,17].

A growing body of literature has acknowledged that pMIEs are often complicated and involve combat and non-combat experiences [18–23]; however, in general, pMIEs appear to fall into two classes (i.e., direct acts and indirect acts). Direct acts are those in which the service member holds themselves responsible; indirect actions are those in which they hold others responsible. Direct actions include perpetrating events (e.g., killing or injuring a civilian) or acts of omission (e.g., failing to prevent an injury), whereas indirect acts include witnessing actions that transgress one's moral code (e.g., witnessing cruel behavior toward civilians) or experiences of betrayal (being betrayed by leaders or experiencing sexual assault from a unit member) [19,24]. Although more empirical exploration is needed on these different types of moral injury, feeling personally responsible for perpetrating a transgressive act that violates one's moral code may be more likely to induce guilt, shame, feeling morally flawed, difficulty with self-forgiveness, and self-handicapping behavior. In contrast, witnessing acts that transgress one's moral code or perceiving betrayal by leaders or peers, may be more likely to result in disgust, contempt, mistrust and lack of other forgiveness [19,25,26]. It is also possible that some pMIEs (e.g., excessive destruction, suffering of refugees, starvation) do not involve specific culpability [27], but may result in moral injury, although less research has examined non-culpable types of events.

While moral injury and PTSD can co-occur, these conditions are distinct [28]. DSM-5 criteria restrict PTSD diagnosis to "exposure to actual or threatened death or serious injury, or a threat to the physical integrity of self or others," [29]. For most PTSD events, the central emotion is fear. In contrast, many veterans who experience pMIEs and experience moral injury symptoms do not meet criteria for DSM-5 PTSD Criterion A [26].

1.2. Moral injury as a risk factor for poor mental health and substance use and misuse

pMIEs and moral injury symptoms are associated with depression, suicidality, and substance use problems across combat eras [30–36]. The betrayal and killing of civilians have been shown to increase the risk for maladjustment beyond combat exposure alone (e.g., [14,37–40]). Moreover, chronic emotional distress, such as guilt, and particularly shame, increase the risk of psychological and behavioral problems

among veterans [41]. Trauma-related guilt from combat experiences was shown to mediate the relationship between atrocity exposure and the development of PTSD and depression [42]. In addition, across combat eras (e.g., Vietnam War, Post-9/11), trauma-related guilt is a significant predictor of suicide ideation and attempted suicide [43–45].

1.3. Theoretical explanations for moral injury

The most widely used framework to explain moral injury was developed by Litz et al. [3]. Litz et al. extended the shattered assumptions theory (e.g., [46]) to moral injury, maintaining that when pMIEs occur, these events may result in 'shattered-assumptions', that is, the believe that the world is not "just". Litz et al. argue that guilt and shame may result from shattered assumptions, especially if the "internal if the attribution about the cause of a transgression is global (i.e., not context dependent), internal (i.e., seen as a disposition or character flaw), and stable (i.e., enduring; the experience of being tainted)" ([3] p. 699).

Given that traumatic events may violate one's beliefs about the world, others, and themselves, various researchers (e.g., [3,47]) have argued for a meaning making framework. That is, the internal conflict between their pre-trauma beliefs (e.g., "The world is a just place." "I am a good person." "People are benevolent.") and post-trauma psychological pain may lead veterans to try and make sense of these events. Thus, veterans may need to modify their appraisal of the event and alter their views of the world, others, and themselves, such that the new evaluations better match their altered beliefs. This process may have the potential to reduce negative moral emotions and increase psychological growth. Further, this process is consistent with Park [48], who contends meaning making may provide stability and predictability to understanding life events.

In the functional model of moral injury, Farnsworth et al. [2] argue against focusing on symptoms to determine moral injury. Specifically, they contend that symptoms may overlap among disorders and conform to DSM-5 criteria [29], further pathologizing painful moral emotions associated with pMIEs. Rather, they propose that moral injury can be defined as "expanded social, psychological, and spiritual suffering stemming from costly or unworkable attempts to manage, control, or cope with the experience of moral pain." (p.392). Importantly, some emotions, while painful, may be functional if they serve to preserve the veteran's moral obligations to a larger culture.

1.4. Risks and protective factors for moral injury

In an integrative review of moral injury, Griffin et al. [18] identified various domains that appear significant for the risk or attenuation of moral injury. The social domain includes the strength of social support and social bonds from friends, family, and others (e.g., [49–51,36,52]), social connection [38]; community involvement [21], trust and understanding for military commands, partners, the community [53], and resentment from civilians [54–57].

For some veterans, moral injury is associated with spiritual or existential crisis (e.g., doubting God's existence, feeling abandoned by God) (e.g., [1,16,52,58,59]). Although spiritual or existential crisis may follow from moral injury, spiritual/religious struggles may also explain the association between pMIEs and mental health outcomes. For instance, Witvliet et al. [60] found beliefs that God was punishing them was associated with PTSD, depression, and anxiety symptoms in military veterans. Evans et al. [61] found religious/spiritual struggles fully mediated the association relation between pMIEs and PTSD and anxiety. These same researchers found a significant indirect effect of pMIEs exposure on depressive symptoms through religious/spiritual struggles. Moreover, religious strain was associated with self- and other-directed moral injury. Further, religious strain mediated the association between transgressive acts and level of altruism and moral injury among combat veterans [62].

Other research has shown individual and personality characteristics,

such as over-identification, that is, over-identifying with one's failings and shortcomings, mediated the association between self-directed moral injury and suicidality [39]. In addition, among recent-era combat wounded veterans, a form of rumination, focusing on problem-focused thoughts (e.g., consistent thinking of causes, consequences, and symptoms of negative affect) mediated the association between both self-directed and other-directed moral injury and symptoms of depression, anxiety, and PTSD [63]. Nonjudging and awareness (components of mindfulness) have also been shown to moderate the effects of the association between moral injury symptoms and drug abuse symptoms among community veterans [64]. Moreover, a recent study of first responders found mindfulness attenuated the association between pMIEs and PTSD, anxiety, and depression [65].

1.5. Treatment for moral injury

Given the prevalence and scope of moral injury and accompanying mental health needs among service members and veterans identified during the post-9/11 era, stakeholders have adapted existing paradigms and developed new paradigms for treatment. New treatments, developed specifically to address warrior ethos and the mental health sequelae associated with morally injurious experiences within military populations, represent promising innovations for moral injury treatment. Adaptive disclosure, conceptualized to facilitate meaning-making following morally injurious experiences and traumatic loss, demonstrated efficacy in a pilot study [66] and randomized controlled trial [67] and has been implemented in active duty and veteran treatment settings. The Impact of Killing (IOK) was created in an iterative process in consultation with veterans, to address guilt, shame, functional impairment, self-handicapping behaviors, and spiritual distress among veterans at high risk for mental health outcomes due to killing in war [68]. Following a focus group to inform the protocol [69], IOK was tested in a randomized controlled pilot study, with participants reporting significant improvement in PTSD and general mental health symptoms and quality-of-life measures [70]. Building Spiritual Strength (BSS), a group-intervention, was empirically evaluated in two randomized controlled trials and demonstrated efficacy in the reduction of PTSD symptoms [71,72]. Empirical investigations of novel treatments, informed by military-specific contexts, interdisciplinary professionals, and military personnel, may support stakeholders' ability to address military-connected moral injury.

Evidence suggests symptoms and mental health diagnoses commonly associated with pMIEs can be treated effectively with existing evidence-based treatments when moral injury is integrated in the underlying theory of the intervention [73]. However, Klassen and colleagues [73] suggested moral injury treatments may be most efficacious when practitioners are attuned to the therapeutic alliance and conceptualize moral injury from a culturally responsive framework to facilitate client-centered exploration and appraisal of pMIEs. Among military personnel who experienced pMIEs and were diagnosed with PTSD, prolonged exposure (PE) and cognitive processing therapy (CPT) demonstrated efficacy in improving symptoms of PTSD, as well as secondary outcomes, such as guilt and anger [74,75]. PE is theorized to treat moral injury by using exposure techniques to habituate participants to the morally injurious event [76]. CPT targets cognitions to facilitate reappraisal of morally injurious experiences [76]. However, to date, no randomized controlled trial of PE or CPT has directly measured moral injury recovery as a primary outcome; moreover, efficacy studies may not reflect moral injury among persons who do not meet PTSD diagnostic criteria. Acceptance and commitment therapy (ACT), an intervention designed to change a person's relationship to and the function of pain, was implemented in a group treatment format to explore the acceptability and feasibility of ACT for moral injury [77]. More broadly, ACT demonstrated efficacy to improve PTSD, suicidal ideation, and shame [77–79]. In ACT, mindfulness is conceptualized to support openness and awareness to self and others to reduce the

negative effects of moral injury [80]. More broadly, Rozek and Bryan [76] suggested clinicians can target moral injury in treatment by explaining how interventions and techniques, such as mindfulness, address moral injury symptoms.

1.6. Mindfulness for mental health disorders and substance use

Mindfulness has been defined as, "paying attention in a particular way: on purpose, in the present moment, and non-judgmentally," [[81], p.4]. Mindfulness involves intentionally attending to present-moment experiences and having a nonjudgmental, metacognitive awareness of body sensations, thoughts and emotions, while letting go of fixation on thoughts and experiences of the past or future. By learning to purposefully direct attention, individuals can change automatic cognitive processes or emotional reactivity, thereby increasing cognitive flexibility and enhancing their ability to choose their next course of action [82–85]. One form of mindfulness training that has widespread use is Mindfulness-Based Stress Reduction (MBSR), which incorporates a range of mindfulness practices and exercises to increase awareness, promote non-judgment and acceptance, and generate compassion for oneself and others. Well-controlled studies and reviews find mindfulness training to be efficacious in reducing depression [85,86], anxiety [85–87], PTSD [88–90], substance abuse [91], insomnia [79,92], and chronic pain [93,94]. Further, online mindfulness training has benefits for depression, anxiety, and psychological well-being, especially if the mindfulness-based intervention is guided [95].

1.7. Rationale for mindfulness as a treatment for moral injury

There is an acute need to make flexible mental health treatments accessible to military populations. SAMHSA [96] reported that despite pervasive mental health needs, only 50% of veterans who need mental health care seek treatment, and only 50% of treatment seekers will complete treatment. Researchers have called for innovative, flexible, and complementary and alternative methods designed to focus treatment on alleviating moral injury [68,97] and have shown that mindfulness has benefits for moral injury symptoms [89,98]. Moreover, Bravo et al. [8] found 59.5% of combat-wounded veterans surveyed indicated they would be willing to participate in a mindfulness treatment online. The military's unique experiences, however, are dramatically different than civilian settings and some pMIEs are distinct to combat veterans. These unique experiences underscore the critical need for skillful adaptation of mindfulness training and gathering information on feasibility and acceptability of such an intervention from veterans.

Given its theoretical underpinning, it is possible that mindfulness may benefit symptoms associated with moral injury. For this reason, we adapted a 6-week live, in person facilitator led mindfulness-training intervention, Mindfulness for Military with Chronic Pain (MMCP), that was developed for active-duty service members receiving services at a pain clinic by Miller, Gaylord, and colleagues [10]. In creating the MMCP program, the authors had utilized elements of the Mindfulness-based Stress Reduction (MBSR) program (usually taught in person), adapting them to create an interactive, instructor-led program that was relevant to active-duty Army personnel experience chronic pain. Using the framework of MMCP, we developed Mindfulness to Manage Moral Injury (MMMI) as a 7-week (one 75–90 min session weekly) program focused on psychological pain associated with moral injury. Unlike MMCP, MMMI was envisioned as a live, facilitated group program delivered by video teleconferencing, with relevance to those who had military backgrounds.

Attitudinal barriers to help-seeking play an important role among treatment-seeking behaviors [15,99,100]. Veterans may be influenced by stigma and negative beliefs of mental health treatment, as well as cultural values for self-reliance and stoicism [101]. Logistical barriers to access and retention in services were given particular attention in the development of MMMI. Specifically, we hoped to increase access to the

program by creating a culturally responsive program and by limiting frequently cited barriers to mental health treatment among military populations, such as occupational and family responsibilities, disabilities, mental health symptoms, or living in distant or rural locations (for systematic reviews see Refs. [102,103]).

In the MMMI program, we used elements of MBSR, which are compatible with tenets of Monitor and Acceptance Theory (MAT) [104, 105]. Specifically, MAT posits that in order to modify one's relation to a monitored experience, acceptance is necessary for reducing affective reactivity, such that attention monitoring and acceptance skills together explain how mindfulness improves negative affectivity, stress, and stress-related health outcomes. In line with the MAT framework and taking advantage of MBSR's standard training, through a series of exercises and home practice, the seven weekly sessions bring attention to the present moment and engagement in compassion/nonjudgment. Various mindfulness exercises teach participants how to notice what is happening in their body and mind in the moment and bring awareness to how they typically react to or respond to these experiences. In contrast to the MMCP program, which focused on mindfulness for physical pain in active duty members, the MMMI program focuses on psychological pain from moral injury. Whereas in the MMCP program, participants are taught about the role of stress (including stress induced by holding onto thoughts and emotions) in exacerbating physical pain, in the MMMI program participants are made aware of how thoughts/emotions/sensations are connected to MIEs, and how moral injury symptoms can be managed in a compassionate manner. For example, during meditation activities, participants might experience distressing thoughts/emotions. The MMMI program encourages participants to become aware of thoughts/emotions without trying to escape, avoid, or change them in anyway. Through these practices, the participant learns vital skills that can be applied to such thoughts/emotions/sensations throughout the day. By bringing awareness to difficult experiences, while also teaching veterans how to manage and release judgment and bring acceptance to these experiences, psychologically painful emotions may be replaced with compassion and acceptance. By reducing condemnation and blame and increasing acceptance, veterans may see themselves and others as worthy, despite being imperfect.

As we describe below, we have adapted the MMCP program for moral injury using a three-study iterative developmental process. If supported, this work would have the potential to provide a novel and flexible theoretically grounded form of treatment delivered in-home for veterans experiencing moral injury symptoms. This program is critical as moral injury symptoms may be the drivers of subsequent mental health and substance use issues for some veterans [3].

2. Method

2.1. Project overview

With MMCP as a template, our goal was to develop an online, interactive, instructor-led training program that included a range of mindfulness practices that would increase awareness, promote non-judgment and acceptance, and generate compassion for oneself and others, and which would in theory reduce moral injury symptoms. Our objective was that participants would become regular in their mindfulness practice and use the various mindfulness techniques when experiencing symptoms of moral injury.

In order to develop the finalized protocol, we planned the following phases of program development: Initial development (the research team would meet weekly to modify some of the content as appropriate and develop new content, exercises, and activities relevant to moral injury); obtain feedback from subject matter experts and incorporate suggestions into the initial MMMI program; the team would participate in a full live facilitator-led run through of the initial MMMI program; the research team would make modifications to MMMI as appropriate; Study 1 (N = 6 veterans) full live facilitator-led run through of the MMMI program with

no comparison control group; Study 2 involved (N = 20 veterans; (MMMI) = 10) full facilitator-led run through of program with Educational Support comparison (n = 10) control group; Study 3 (final randomized full trial with 42 participants with two groups per each condition and separate facilitators for each of the four groups (MMMI [n = 21]; ES [n = 21])).

2.2. Mindfulness for managing moral injury (MMMI) program development

The study team met weekly for five months to develop the program. We used an iterative developmental process to discuss, develop, and revise content as well as create new content and exercises that would be relevant for veterans with moral injury. Although the MMCP program was six sessions, we added a seventh session to ensure that the program would allow time to cover moral injury and address self-compassion exercises, which although not included in the MMCP program, are included in MBSR as part of loving-kindness practice. The MMCP sessions were approximately 75 min. This length was viewed positively by MMCP participants [10]. For this reason, the length of the MMMI sessions was 75 min–90 min.

2.2.1. MMMI program structure

Each of the seven sessions has a theme (i.e., What is Mindfulness? What is Moral Injury?, Moral Injury and Mental Health, Compassion for Others, Leaning In, Being Your own Best Friend, and Moving Forward). Using the basic template of MMCP, all sessions have a similar overall structure and began with an icebreaker, a review of the agenda, a brief mindfulness exercise that was taught the previous week, a review and discussion of the home practice, and an interactive didactic that involved discussion of that week's key content. The interactive didactic often includes short videos, cartoons, short individual or group exercises or discussion, and role-plays. The overall goal of the didactic portion of the session is to understand moral injury, explain and practice mindfulness exercises (e.g., compassion, forgiveness) that participants will practice and use and that may reduce stress and other negative emotions associated with moral injury (e.g., anger, guilt), and to pique interest in mindfulness. Given that negative emotions associated with moral injury may be associated with poor coping strategies, we also review the topic of False Refuge. False Refuge originated from Buddhist teachings and has been incorporated into programs, such as Mindfulness-based Relapse Prevention [86]. At the end of each session, the facilitator reviews the 'toolkit' and reminds participants of the various mindfulness techniques they are gaining in their 'toolkit.' The facilitator then briefly recaps the session, explains and ensures participants understand the home practice, which typically involves practicing a new skill discussed in the session. The session ends with a closing mindfulness exercise and each group member checked out by responding to the prompt, "I am feeling ...". Although we had a carefully designed curriculum with specific objectives, to optimize group member engagement and interaction, in some exercises that asked for examples, facilitators often gave their own personal examples first. Facilitators are requested to cover each of the session objectives but are allowed some flexibility to account for different group dynamics, questions, interests, and so forth.

2.3. Mindfulness facilitator qualifications

The study team decided that mindfulness-training facilitators should be licensed mental health professionals with expertise in mindfulness theory and delivery, and who have experience working with veterans.

2.4. Subject matter experts

Detailed feedback on the initial MMMI manual was provided by five subject matter experts, four of whom were active duty or former military members. Subject matter experts were individuals known to the research

team, who had conducted research and/or treatment of veterans with moral injury and/or were subject matter in mindfulness and its delivery. They had access to all initial MMMI session materials, including the facilitator guides, PowerPoint slides, links to videos, and so forth. In general, their feedback was very positive, however, two individuals recommended that we tie the mindfulness activities more closely to moral injury so that participants could clearly see how the various skills they would learn could be beneficial for moral injury. Another was concerned that a videoclip might be upsetting for veterans with PTSD. Other comments were more minor (e.g., be sure and include men and women, all branches, and so forth). The feedback provided by these experts was discussed by the research team and incorporated into the program.

2.5. Team training

Prior to the facilitator administering the training to participants in Study 1, the facilitator presented the full course of training to the study team. This run-through provided the facilitator practice and allowed the research team to make small changes to the training/delivery prior to Study 1.

2.5.1. Study 1

2.5.1.1. Participant screening criteria. Participants ($n = 6$) were post 9/11 veterans who met the following criteria: 1) at least one deployment to the regions of Iraq and/or Afghanistan and 2) reported experiencing at least two or more moral injury symptoms at the time of enrollment. Exclusion criteria include: 1) have a current suicide plan and/or 2) have no access to the internet.

2.5.1.2. Recruitment and rationale. Study 1 was designed *solely* to generate qualitative feedback on the program and develop preliminary manualization based on any modifications. Given the focus of this initial study and the intended small sample, participants were recruited from: 1) a large national database of combat wounded veterans and 2) the community (e.g., veterans who have participated in previous research studies conducted by the study team).

2.5.1.3. Study pre-training interview development and informed consent. Potential participants completed a brief screening survey. If eligible, interested individuals were asked to review and sign the consent document as well as provide their contact information and availability. Informed consent was completed by the study coordinator who met with eligible participants individually via Zoom to explain and ensure their understanding of all study aspects, to answer any questions, verify veteran status via presentation of their veteran identification card, and receive verbal consent. Next, the study coordinator completed a pre-training survey (e.g., demographic questions) with each participant via Zoom, and ensured each participant's understanding of the Zoom basic functions.

2.5.1.4. Study 1 description. Prior to the first session, participants were emailed all weekly session PowerPoint slides as well as a program with all PowerPoint slides for all sessions. At the beginning of each week during Study 1, the study coordinator contacted the study participants via email with a reminder of the time and date for the week's session, and the corresponding PowerPoint Slides and Zoom information.

The seven weekly sessions occurred in the evening and were approximately 75–90 min in length; however, because one participant was overseas, they took part in the morning. With the consent of all participants, each session was recorded (i.e., visual and audio) using Zoom, and stored on a secured server which was only accessible to the research team. The recordings were used to facilitate make-up sessions for participants who were unable to attend a live session. The make-up

sessions were individually scheduled with the study coordinator.

2.5.1.5. Post-session surveys. The participants were emailed a brief survey after each session that assessed what they liked most and least about the respective session. To assess mindfulness practice outside of group, these post-session surveys also included questions about the frequency (i.e., number of days practiced) and duration of mindfulness practice during the preceding week. At least two reminder emails were sent by the study coordinator throughout the week to encourage survey completion.

2.5.1.6. Post-training semi-structured interviews. During week 5 of the training, the study coordinator contacted all participants to schedule a post-study interview, to take place soon after the final session. The semi-structured post-study interview was conducted by the study coordinator with each participant individually and consisted of a review of each session's outline, and an assessment for any difficulty a participant experienced with understanding content, any suggestions for content or formatting modifications, any barriers to attending the sessions (e.g., time of day), perceptions of burden in completing the mindfulness "home practice" assignments, satisfaction with the facilitator, and acceptability of the overall protocol. The post-study interview lasted approximately 45 min to 1 h and was conducted using Zoom and recorded with participant consent. All six participants completed the training (five participants attended all seven sessions and one participant missed and could not makeup two of the sessions); five participants completed the final post-training interview. All participants who completed the post-training semi-structured interview received a \$75 online Amazon gift card. At the conclusion of Study 1, all participants were provided with recordings of each of the mindfulness exercises and recorded meditations that were presented during the training.

Colaizzi's [107] methodological approach was used to analyze narrative text collected by the study coordinator, given the semi-structured nature of the post-study interview. The initial coding categories were developed by the PI and study coordinator after reviewing the post-study interview responses. Further program refinement and additional preliminary manualization were completed after review of all Study 1 feedback by the research team.

2.5.1.7. Internal monitoring. The PI generated a report for the independent monitors and provided information on the following study parameters: enrollment, demographics, retention, discontinuation guidelines, safety summary, protocol deviations, and quality control. Study reports were generated from aggregate data. Internal monitors provided recommendations for Study 2 and assured the revised procedures adhered to the approved grant. A safety plan was in place, however, there were no adverse events, therefore, no changes were suggested or made regarding participant safety.

2.5.1.8. Revisions to MMMI program based on Study 1 feedback. Based on feedback from the post-study interviews, in consultation with the research team, several content and procedural changes were made to the MMMI program. Specifically, we shortened the time for specific exercises (e.g., Body Scan). We added more direct links from mindfulness to moral injury and generated additional questions to facilitate more discussion among the participants after various mindfulness practices. Further, we added additional opportunities to practice the compassion exercises, and supplementary content and examples such as False Refuge [106]. We also deleted all but one video clip depicting a veteran with moral injury and added several additional PowerPoint slides. Whereas we provided Study 1 participants all the study materials prior to the start of the study and weekly PowerPoint slides shortly before each session, in the feedback interview, they said they preferred to receive only the weekly PowerPoint slides prior to each session. For this reason, Study 2 participants were provided only weekly PowerPoint slides prior to each

session. Also, in Study 1, participants who missed a session scheduled a time to meet with the study coordinator on Zoom to view the missed session's recording. To allow greater flexibility in viewing missed session recordings in Study 2, participants were provided a password-protected link to the video recording which expired after two weeks.

2.5.1.9. Development of Educational Support condition. As an active control condition, we developed an education support (ES) group, which ran concurrently to the mindfulness intervention group. Within the military community, peer support and psychoeducation are considered critical components of alleviation of suffering from traumatic exposure [108,109]. The study team met weekly for two months, implementing an iterative process to discuss, research, and revise content for the ES group. To ensure the comparability of the active and control group conditions, the content and process for the ES group was developed to parallel the mindfulness group. Importantly, the information about moral injury was presented identically and in the same session as the Mindfulness conditions.

In lieu of the informational and experiential mindfulness content, weekly foci for the ES group were selected in parallel to the mindfulness group. For example, when mindfulness group members were introduced to mindful walking, ES group members explored exercise and movement. In alignment with the mindfulness group, each ES session had a theme relevant to symptoms associated with moral injury. Session topics included management of stress and moral emotions, exercise, self-care, peer support, boundaries, sleep, and implementing and maintaining new wellness practices. All sessions began with an icebreaker, overview of the session objectives, discussion of home exercises, didactic content about moral injury and the topic of the week, and group discussion. Didactic content was presented with multimedia tools and frequently included pictures, videos, cartoons, and figures. Discussion of didactic material was facilitated to encourage peer support and self-awareness as group members reflected on their strengths and existing supports, as well as challenges and barriers to engaging in wellness practices. To end each session, similar to the Mindfulness group, at the end of the session, the facilitator reviewed of the cumulative 'toolkit', assigned home exercises, and each group member checked out by responding to the prompt, "I am feeling ...". To optimize group member engagement and relational support, group facilitation was characterized by non-judgment, immediacy, and flexibility.

2.5.2. Study 2: Revised MMMI program and pilot Educational Support condition

2.5.2.1. Participant screening and recruitment. Potential participants ($n = 200$) were recruited via a variety of methods including: 1) a large national database of combat wounded veterans, 2) the community (including veterans who have participated in previous research studies conducted by the study team), 3) daily announcement emails sent to largely undergraduate students enrolled at two participating universities, and 4) Facebook advertisements. Of these potential participants, 26 met inclusion criteria (see section 2.1.1.1 above) and 21 of the eligible participants agreed to participate.

2.5.2.2. Study 2 description. In Study 2, we proposed to test our ability to recruit and retain participants, to implement the designed protocol, and to determine treatment adherence of the refined MMMI intervention as compared to a facilitator-led education and support (ES) comparison group ($n = 21$ randomly assigned by sex post 9/11 veterans; 13 MMMI; 8 ES). The two groups (MMMI and ES) were not different in the delivery (i.e., live facilitator led interactive web-based, number of sessions, length of sessions, and both have manualized treatments). Further, some content was identical (e.g., introductions, icebreakers, moral injury content) or similar (e.g., same semi-structured interview). We then video-

recorded the semi-structured interviews and compiled the brief weekly feedback survey to assess the participant comments and suggestions, as well as compliance data.

2.5.2.3. Study pre-training interviews and informed consent. Pre-training interviews and informed consent followed the same procedure as outlined in the Study 1 description, except that in Study 2, participants were randomly assigned by sex to each group and informed of their assignment during the pre-training interviews.

2.5.2.4. Post-session surveys. Brief post-session surveys were emailed to participants in both the MMMI and ES conditions after each session. The weekly surveys for the MMMI group followed the same format as in Study 1. Namely they included questions assessing what participants liked the most and least about the session as well as assess the frequency and duration of mindfulness practice in the preceding week. The weekly surveys for ES only included two questions assessing what participants liked the most and liked the least about each session. A study coordinator sent at least two reminder emails after the survey was sent to encourage participant completion.

2.5.2.5. Attendance, attrition, and post-training semi-structured interviews. The same procedure was used to conduct the post-training semi-structured interviews at the end of Study 2. A week before the training programs ended, the study coordinator scheduled all participants who had attended at least one full training session. On average, participants attended about five of the seven total sessions (average across both groups, $M = 5.25$, $SD = 1.81$; MMMI average, $M = 5.5$, $SD = 1.78$; ES average, $M = 4.83$, $SD = 1.94$). Four participants (2 MMMI, 2 ES) did not attend any sessions. In addition, 2 MMMI participants and 1 ES dropped out after starting the program. Participants were only eligible for the post-training interview if they completed at least one full session. In total, 14 participants completed the post-training interviews. The semi-structured interviews were conducted on Zoom by the study coordinator or graduate research assistant and with the participant's consent, were video recorded for coding purposes. The interview assessed the comprehension of each treatment session, possible modifications for each session, barriers to attending the sessions, perceptions of burden in completing the home practice or home exercises for both the MMMI and ES groups, respectively, and acceptability of the entire protocol. All participants who completed the semi-structured interview received a \$75 online Amazon gift card. At the conclusion of Study 2, all MMMI participants were provided with recordings of each of the mindfulness exercises and recorded meditations that were presented during the training.

The study coordinator transcribed the interviews and worked with the PI to develop the initial coding schemes following Colaizzi's methodological approach [107]. From these themes, a list of proposed changes to the programs were composed and were disseminated to the research team and all changes were agreed upon. Consensus was reached prior to final revisions to the MMMI and ES training programs and the start of Study 3.

2.5.2.6. Internal monitoring. Similar to Study 1, the PI generated a report for the independent monitors and provided information on study parameters, enrollment, participant demographics, attrition, stopping rules, safety summary, protocol deviations, and quality management. Study report tables were generated only from aggregate baseline data. There were no adverse events.

2.5.2.7. Revisions to MMMI program based on Study 2 feedback, facilitator, and team feedback. Study 2 participants had several content and format suggestions. In response to feedback, we allowed more time to understand and discuss moral injury and link moral injury to the various practices. Specifically, we provided more clarification on how moral

emotions were different from mental health symptoms. We also modified the instructions for the self-compassion break exercise to ask participants to think about their moral injury symptoms when practicing this exercise. Self-compassion is a practice which involves treating oneself the way we would treat a dear friend. In this practice one learns to be a good friend to themselves when they need it the most [108]. Self-compassion entails three elements: 1) self-kindness; 2) common humanity; and 3) mindfulness. These elements mutually enhance and engender each other thus fostering self-compassion [110]. Self-compassion requires mindfulness and being mindful of one's own painful thoughts helps bring those thoughts into conscious awareness. Using these concepts, participants could practice using a mindfulness technique as related to their own moral injury symptoms. We also deleted a new mindfulness technique from session 5, which was similar to another mindfulness practice that had been introduced earlier in this session and to reduce the amount of content. In session 6, we give participants the opportunity to choose which mindfulness exercises they wanted to review in the final session (Session 7-Wrap-up). In terms of procedural changes, participants expressed that they wanted resources on how to find mindfulness groups near where they lived, evidence-based mindfulness mobile applications, and evidence-based guided videos. We developed and will provide these materials to all participants. In addition to the audio recordings of each mindfulness exercise, participants requested a document with instructions for each of the exercises covered in the training program, which is in development.

2.5.2.8. Revisions to ES condition based on Study 2 participant and facilitator feedback. Modifications to the ES Group following Study 2 reflect participant, facilitator, and research team feedback. Overall, participants reported they valued the opportunity to express their opinions in an environment of nonjudgement and understanding, highlighting the benefit of learning from and feeling connected to others in the group. However, participants also noted that at times, they felt discussions moved too quickly and there was too much content to get through in each session. Accordingly, sessions were edited to emphasize opportunities for group discussion and support. Each session was reviewed for clarity and content, allowing for the research team to make psycho-educational content more succinct and additional opportunities for group interaction. Participants also reported a desire to see one another more easily during group discussions and activities, citing that their view of the Zoom platform was variable across the devices they used (i.e., computer, tablet, phone) and that screen share for PowerPoint or technology integrations, such as Zoom Whiteboard, interrupted their view of group members. Consequently, the Whiteboard component of activities was eliminated, reducing the number of transitions for screen view and supporting continuity of visibility for verbal and nonverbal engagement between group members.

Regarding the concept of moral injury, participants reported a desire for more information, including how moral injury develops, the mental health symptoms associated with moral injury, and how skills taught in each session may alleviate associated mental health symptoms. In response, the research team added information about, and examples of, moral injury to each slide about moral injury, to better support participants understanding of exposure to pMIes and mental health. Additionally, the research team described the relationship between moral emotions, mental health symptoms, and the tools taught during each session to underscore the potential benefits of implementing the skills to support wellbeing.

2.5.3. Study 3: Revised mindfulness program and Educational Support condition

2.5.3.1. Participant screening and recruitment. Recruitment for potential participants ($n = 42$; MMMI = 21; ES = 21) has just started. begun. Participants will be recruited primarily through: 1) an organization

which specializes in recruiting participants for clinical trials (Trialfacts; <https://trialfacts.com>) as well as the same methods used in Studies 1 and 2, which include: 2) a large national database of combat wounded veterans, 3) veterans who have participated in previous studies, 4) daily announcement emails sent to undergraduates enrolled at two of the participating universities, and 5) Facebook advertisements.

2.5.3.2. Study 3 description. The primary aim of study 3 is to evaluate the preliminary feasibility of the MMMI and ES interventions. We will collect information on acceptability, adherence, and implementation/practicality in the two intervention arms. In Study 3, we will also assess moral injury symptoms (e.g., guilt, shame), possible mechanisms of changes (e.g., acceptance, nonjudgment, compassion), and possible secondary outcomes (e.g., mental health symptoms, substance use). This data will be used to generate potential avenues for future research.

2.5.3.3. Study pre-training interviews and informed consent. Pre-training interviews and informed consent will follow the same procedure as outlined above in the Study 1 description. Participants will also be randomized by sex in Study 3, however, in Study 3 there will be 2 MMMI and 2 ES groups. Participants will also be informed of their group assignment in these pre-training interviews.

2.5.3.4. Description of study 3 baseline survey. The baseline survey will take approximately 25 min to complete and will be sent to participants to complete four weeks prior to the start of the training programs. Measures will include brief psychometrically valid assessments of mental health symptoms, moral injury, combat experience, PTSD symptoms, trait and state mindfulness, mood, self-compassion, acceptance, social support, problem-focused thoughts, and alcohol use and substance use (for specific measures, see Table 1).

2.5.3.5. Post-session surveys. As in Studies 1 and 2, weekly surveys will be emailed to participants in both the MMMI and ES conditions after each session. The weekly surveys for the MMMI group will follow the same format as in studies 1 and 2, and assess what participants liked the most, the least, and ask about home practice. The weekly surveys for the ES group will also follow the same format as Study 2 and assess what participants liked the most and least. Some additional questions were added to the MMMI and ES weekly surveys. For the MMMI weekly surveys questions were added to assess mindfulness skills practiced (e.g., sitting meditation with mindful breathing), where they practiced mindfulness (e.g., during short breaks at work), and if they experienced any challenges to practicing mindfulness during the preceding week. For the ES weekly surveys, we added questions assessing which home exercises they completed (e.g., logging daily stressors), time spent completing the exercises (e.g., hours, minutes), if they found the exercises helpful over all (yes/no), and if they experienced any challenges in completing the exercises in the preceding week. Weekly surveys for both groups also now included brief scales that assess moral injury, state mindfulness, positive and negative mood, and moral injury symptoms and so forth. A study coordinator will send at least two reminder emails after the survey is sent to encourage participant completion. We anticipate the weekly surveys will take approximately 10–15 min to complete.

2.5.3.6. End of study survey. Following the last session, participants will be sent and have four weeks to complete a final survey. In addition to several baseline survey measures, we will add questions assessing acceptability and demand for the training program (for specific measures, see Table 1).

2.5.3.7. Post-training interviews. Slight changes to the study procedure will occur for the Study 3 post-training interviews. The procedure will include the study coordinator or graduate research assistant scheduling

Table 1
Study 3 Measures.

Construct	Measure	Pre-Screening	Baseline	Active Intervention							Post Intervention		
		Zoom Call	Online Survey	Online Survey							Online Survey	Zoom Call Interview	
				Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7			
Verify Veteran Status Screening Survey	Research team created	X											
	Research team created	X											
	Research team created	X											
Study Overview and Informed Consent													
Demographics	Research team created	X											
DSM-5 Mental Health	DSM-5 Self-Rated Level 1 Cross-Cutting Symptom Measure [114]		X										X
Moral Injury	Expressions of Moral Injury Scale - Military Version [115]		X										X
	Moral Injury Symptom Scale - Military Version Short Form [116]		X										X
	Moral Injury Outcome Scale [23]		X	X	X	X	X	X	X	X	X		X
Combat Experiences	Deployment Risk and Resilience Inventory 2 – Combat Experiences [117]		X										
PTSD	Post-Traumatic Stress Distress Checklist for DSM-5 [118]		X										X
Suicidal Ideation	Suicidal Ideation Attributes Scale [119]		X										X
Mindfulness	Five Facet Mindfulness Questionnaire [120]		X										X
	State Mindfulness Scale [121]		X	X	X	X	X	X	X	X	X		X
Positive and Negative Affect/Mood	Positive and Negative Affect Schedule Scale [122]		X	X	X	X	X	X	X	X	X		X
Self-Compassion	Self-Compassion Short Scale [123]		X	X	X	X	X	X	X	X	X		X
Acceptance and Avoidance	Acceptance and Action Questionnaire-II [124]		X	X	X	X	X	X	X	X	X		X
Social Support	Friendship Scale Assessment [125]		X	X	X	X	X	X	X	X	X		X
Ruminative Thinking	Ruminative Thought Styles Questionnaire [126]		X	X	X	X	X	X	X	X	X		X
Alcohol and Other Drug Use/Misuse	Alcohol Use Identification Test1 [127]		X										X
	Questions on Cannabis Use		X										X
Training Appropriateness/ Acceptability of the Program	Research Team Created												X
Home Practice Items	Research team created			X	X	X	X	X	X	X			
Semi-Structured Interview Items	Research team created												X

Note. Resources for Veterans Assistance will be added to the end of each survey (i.e., Pre-screening, Baseline, Weekly, Post-Intervention Survey).

the post-training interviews; however, given the number of participants in Study 3, we trained and have enlisted graduate students in a military counseling program or advanced undergraduate student veteran research assistants to assist with post-training interviews. Transcription and initial theme development will be carried out by the PI, study coordinator, and research assistants. Final themes refinements to the MMMI and ES programs will be discussed with the research team prior to enacting any program revisions (for specific measures, see Table 1). At the conclusion of Study 3, all MMMI participants will be given recordings of each of the mindfulness exercises and recorded meditations that will be presented during the training.

2.5.3.8. *Internal monitoring.* As in studies 1 and 2, the research team will generate a study report for the independent monitors and provide information on the following study parameters: enrollment, status of participants, demographics of participants, retention of participants, stopping rules, safety summary, protocol deviations, and quality management. Study report tables will be generated only from aggregate baseline data for the study population.

2.5.3.9. *Final revisions to mindfulness and Educational Support programs.* After the research team reaches consensus on the proposed changes to the programs, the PI and study coordinator will make these changes to

the program manuals and materials.

2.6. Study 3 compensation

Study 3 participants will not receive compensation for completing the screening survey or pre-training interview. However, all participants who attend at least 1 MMMI/ES session will receive \$75 for completing the semi-structured interview. Participants in Study 3 will receive \$10 each week (up to \$70 total) for completing items the weekly surveys, as well as a \$20 bonus for completing all weekly assessments. In Study 3, participants will also receive \$30 for completing the baseline survey and \$50 for completing the post survey for a possible \$245 if all components are completed. Compensation is provided in the form of an online Amazon gift card, Venmo, or check based on the participant's preference. Compensation is being provided for completion of assessments (e. g., self-report questionnaires and semi-structured interviews), which will help us establish if feasibility and acceptability meet our predetermined rules. Further, compensation has been associated with better retention rates for military-based clinical trials [111].

2.7. Fidelity assessment

Given that all sessions were recorded for Studies 1, 2, and 3, we plan to have members of our study team who were not involved in facilitating the sessions review the recordings and assess how closely the facilitators followed the session objectives when delivering the training programs. These team members will note any content that was delivered as planned and when deviations occurred (e.g., some content was omitted) and ensure that mindfulness was not discussed in the ES group.

2.8. Planned analyses

We will first determine if enrollment, attendance, survey and interview completion met our predetermined goals as established in the grant. To test the efficacy of MMMI and ES on outcomes, all analyses will be conducted using random-effects growth modeling in multilevel models using *Mplus* Version 8.6 [112]. Individual variability in level-1 change in outcomes from baseline to post-training follow-up will be modeled as a function of the level-2 predictor condition (i.e., MMMI vs ES). Two parameter estimates from the growth models will be examined to determine program effectiveness: (1) condition (test of acute-phase effects) and (2) condition X time (a test of maintenance). This approach will be used for all outcomes. For testing conditional effects of treatment efficacy, procedures will be the same as outlined above, but proposed moderators will be included as a level 2 predictor and cross-level interactions with treatment condition on level 1 outcomes will be examined (following approaches suggested by Aguinis et al. [113]). Given that this is a pilot trial, our primary focus will be on estimating confidence intervals for effect size estimates which we hope will provide a basis for a large-scale randomized trial.

3. Conclusions

At present, the ability to provide treatment for veterans with moral injury symptoms is challenging. Moral injury is not a diagnosable disorder. Thus, treatment for moral injury is often by means of other mental health concerns that may lead to discussion and treatment of moral injury. Further, some former military members do not qualify for Veterans Affairs Medical Center (VAMCs) services. In addition, stigma [110], practical limitations [102,103] and negative prior experiences [104] may lessen willingness to receive mental health services from VAMCs. For this reason, our goal was to develop a novel and easily accessible treatment for moral injury that was not designed for those seeking mental health services explicitly but that veterans would find appealing and acceptable. This work provides an intermediate step toward informing a culturally tailored invention for veterans who report

moral injury symptoms and who may benefit from mindfulness for these symptoms. While this treatment was tailored for veterans, we believe this approach may have utility for those in other occupations that experience pMIEs and subsequent moral injury.

Data availability

No data was used for the research described in this paper.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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