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ORIGINAL PAPER

Compassion Meditation for Veterans with Posttraumatic Stress Disorder (PTSD): a Nonrandomized Study

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Abstract

Compassion meditation (CM) is a contemplative practice that is intended to cultivate the ability to extend and sustain compassion toward self and others. Although research documents the benefits of CM in healthy populations, its use in the context of psychopathology is largely unexamined. The purpose of this study was to refine and initially evaluate a CM protocol, Cognitively Based Compassion Training (CBCT®), for use with Veterans with PTSD. To this end, our research team developed and refined a manualized protocol, CBCT-Vet, over 4 sets of groups involving 36 Veterans. This protocol was delivered in 8–10 sessions, each lasting 90–120 min and led by a CBCT®-trained clinical psychologist. Quantitative and qualitative data were used to identify areas to be improved and to assess change that occurred during the treatment period. Based on pooled data from this series of groups, CM appears to be acceptable to Veterans with PTSD. Group participation was associated with reduced symptoms of PTSD (partial eta squared = .27) and depression (partial eta squared = .19), but causality should not be inferred given the nonrandomized design. No change was observed in additional outcomes, including positive emotion and social connectedness. The results of this open trial support additional exploration of CM as part of the recovery process for Veterans with PTSD.

Keywords Compassion · Meditation · PTSD · Mindfulness

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Although empirically supported treatments are available for posttraumatic stress disorder (PTSD), most military personnel and Veterans choose not to engage in these treatments or have residual symptoms after treatment completion (Steenkamp et al. 2015). A growing literature suggests that meditation may be useful in recovery from PTSD (see Lang et al. 2012 for a review). Data from clinical and non-clinical samples suggest that compassion meditation (CM) has a positive impact on positive emotion and social functioning, which are areas of difficulty for many individuals with PTSD. Nonetheless, CM has yet to be evaluated for treatment of PTSD. Cognitively based compassion training (CBCT®) is a CM training program. It consists of a sequence of contemplative practices that are believed to cultivate the ability to extend and sustain compassion toward self and others (Negi 2013). CBCT® combines present-moment practices (i.e., focused attention and open monitoring) with analytical contemplative methods, which encourage cognitive reappraisal and alteration of usual mental patterns to expand compassion.

CM and similar approaches (e.g., loving kindness meditation [LKM]) lead to increases in positive emotion in both

clinical and nonclinical samples (for a recent meta-analysis see Zeng et al. 2015). The first published clinical application showed that LKM increased positive emotion and decreased negative emotion among individuals with negative symptoms of schizophrenia ($n = 18$; Johnson et al. 2011). More recently, an open trial with Veterans with PTSD ($n = 42$) found that LKM was associated with decreased symptoms of PTSD and depression (Kearney et al. 2013), increased unactivated positive emotions, and decreased both activated and unactivated negative emotions (Kearney et al. 2014). Finally, evidence from functional MRI shows activation in areas typically associated with positive affect (left medial prefrontal cortex and anterior cingulate gyrus) in an expert meditator engaged in CM (Engstrom and Soderfeldt 2010).

Compassion-based meditative practices have also been suggested to alter social functioning in nonclinical samples. Brief LKM practice was associated with a greater sense of social connectedness and positivity toward others based on explicit and implicit reactions in a laboratory setting (Hutcherson et al. 2008). CM has also been linked to increased empathic accuracy and activation of associated brain circuitry (Mascaro et al. 2013), as well as increased altruistic behavior (Galante et al. 2016; Weng et al. 2013) and activation of brain regions associated with social cognition and emotion regulation, suggesting greater capacity to understanding the suffering of others (Weng et al. 2013). It is unknown, however, what effect CM may have on social connectedness in the context of psychopathology.

Both positive emotion and social functioning are potentially important targets in recovery from PTSD. PTSD is a maladaptive response to exposure to a traumatic event, characterized by unwanted re-experiencing of the event, avoidance, negative cognitive appraisals, and hyperarousal (American Psychiatric Association 2013). In addition to strong negative affect, PTSD is characterized by deficits in positive affect (Litz and Gray 2002) and avoidance of positive affective stimuli (Clausen et al. 2016). The importance of cultivating positive emotion is suggested by Fredrickson's (2001) Broaden and Build Theory, which posits that positive emotions enhance the ability to think flexibly and thereby build psychological resources that enable successful coping. In this way, positive emotions are believed to counteract the deleterious effects of negative emotions (Fredrickson 2001). High positive emotionality and intentionally inducing positive emotion have been associated with resilience, i.e., the ability to recover from negative experiences and to change based on situational demands (Tugade and Fredrickson 2004) and the ability to cope with highly stressful events (Fredrickson et al. 2003). Thus, positive emotion induced by CM may independently reduce dysphoria, which appears to be the best predictor of problems in psychosocial functioning among those with PTSD (Pietrzak et al. 2010). In addition, positive emotion has been shown to reduce fear-based reactivity (Fredrickson et al. 2000) so may ameliorate PTSD-related anxious responding and hyperarousal. Finally, positive emotions cultivated in CM may enhance one's ability to take another's perspective and foster closeness, thus providing social reinforcement and support. Sharing of positive events, rather than providing support during negative events, is predictive of relationship health (Gable et al. 2006).

Problems with social functioning also are common among those with PTSD. Individuals with PTSD have diminished ability to empathically connect with others (Nietlisbach et al. 2010) and demonstrate poorer marital and family functioning and more impairment in interpersonal relationships and social activities (Schnurr et al. 2009). Social impairment is a predictor of chronicity of the disorder (Marshall et al. 2006), has been linked to increased risk of suicide for PTSD patients (Panagioti et al. 2011), and predicts return for additional care after initial treatment (Fontana and Rosenheck 2010). Social support, on the other hand, has been shown to buffer against development of PTSD and to predict improvement (e.g., Ozer et al. 2008). A greater sense of social connection is associated with better psychological and social functioning (Hagerty et al. 1996), including reduced anxiety and greater self-esteem (Lee and Robbins 1998), and may have a protective effect against stress, depression, and PTSD (see, for example, Cacioppo et al. 2006; Cacioppo and Patrick 2008). Thus, a greater sense of connection to and caring for others as encouraged by this practice may also translate into symptom reduction. For example, higher levels of altruism have been associated with lower levels of symptomatology in Veterans with PTSD (Kishon-Barash et al. 1999).

The goal of the study presented herein was to adapt and collect preliminary data on the clinical impact of a modified version of CBCT® for Veterans with PTSD. An iterative refinement process using quantitative and qualitative feedback was used to refine the original CBCT® protocol to reflect military/Veteran culture and to enhance digestibility of the material and relevance to PTSD. Pooled data from this set of groups are presented as an initial index of the feasibility and potential clinical utility of the intervention.

Method

Participants

Participants ($n = 36$) were Veterans with PTSD who were able to consent and willing to participate. Co-occurring disorders such as depression, anxiety, or treated substance abuse or dependence problems were permitted provided that PTSD was the primary presenting complaint as determined by clinical interview. Exclusion was on the basis of the following: (1) high risk for suicide or homicide that required urgent or emergent evaluation or treatment within the three months prior to

study entry, (2) untreated substance abuse or dependence problems, (3) serious Axis I mental disorders, such as psychotic disorders or bipolar type I, or serious dissociative symptoms (4) cognitive impairment that would interfere with treatment, (5) current circumstances that involve recurrent traumatization (e.g., currently engaged in a violent relationship), and (6) concurrent enrollment in any other treatment specifically targeting PTSD symptoms or social functioning (e.g., couples therapy). Participants were allowed to continue current pharmacological treatment provided that no additional treatment response was expected and no changes were anticipated during the study period.

The enrolled sample included 36 Veterans, 31 of whom went on to begin the intervention (refer to Fig. 1 for detailed study flow). The enrolled group was mostly male ($n = 29$, 80%) with an average age of 43.9 years ($SD = 12.6$). The group was also predominantly Caucasian ($n = 22$, 61%), with 7 (19%) individuals identifying with more than one race, 2 Native American/Alaskan Native, 3 African-American and 1 Native Hawaiian/Pacific Islander; twelve (33%) individuals identified as Hispanic. On average, the group reported 13.9 years ($SD = 1.8$) of education, and eleven (30%) were currently employed. Twelve (33%) Veterans were married or had a permanent partner. The average number of lifetime traumatic events endorsed was 6.5 ($SD = 3.0$, range 2–13); the most commonly endorsed events were transportation accidents ($n = 26$), combat ($n = 25$), and physical assault ($n = 20$). The majority ($n = 24$, 67%) had served in the recent conflicts in Iraq and Afghanistan, but several major deployments since Vietnam were represented. Twenty-one (58%) individuals reported some type of combat injury, and most ($n = 22$, 61%) were receiving compensation from the VA.

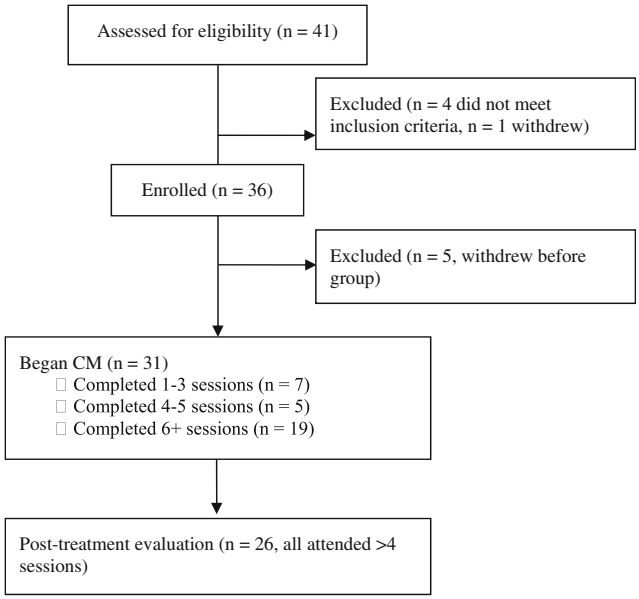

Fig. 1 Participant flow

Procedure

This study was approved by the Institutional Review Board of the VA San Diego Heathcare System. Potential participants were referred to the study by mental health providers or expressed interest directly in response to advertisement. Interested individuals came to the clinic to complete informed consent, HIPAA authorization, and the initial evaluation for eligibility. Consenting, eligible individuals went on to complete the assessment battery. Beginning with the first group meeting, weekly measures of PTSD, depression and alcohol use were gathered. The assessment battery was repeated at post-intervention. Credibility was measured after the first session and satisfaction after the last session. Finally, weekly diaries were used to quantify meditation practice. Participants completed 8–10 classes, each lasting 90–120 min (refer to Table 1 for the final schedule). All groups, which ranged in size from 6 to 8 at the start, were led by a licensed clinical psychologist (PC), who completed the CBCT® Teacher Certification Program, which includes a week-long retreat/workshop, a supervised practicum experience, and a post-practicum weekend workshop. As part of the practicum, audiotapes of sessions were reviewed by experts in CBCT® (TH, LN), and weekly supervision was provided to assure adherence to the intervention.

Intervention CBCT® was designed to engender well-being through a set of meditative practices that aim to increase compassion, i.e., the sense of caring for the well-being of others and wanting them to be free from their difficulties and distress. Developed at Emory University in 2004 by Professor Negi, CBCT® is based on techniques from the Indo-Tibetan Buddhist tradition. As a secularized protocol, however, CBCT® is independent from and supportive of any faith or belief system. The course is typically taught in weekly meetings supplemented by daily guided meditation recordings. Group meetings for this study were structured approximately as follows: welcome agenda setting (5 min), homework review (15 min), participants' summary of past week's material (10 min), didactics (20 min), mindfulness exercise incorporating new concepts (15 min), meditation incorporating new concepts (15 min), homework assignment, and question/answer session (10 min). Participants were provided with a written manual to facilitate their understanding of the material. Homework involved daily meditation practice, which gradually increased from 6 min per day at the beginning to 15 min per day at the end. CBCT® includes tools with the explicit aim of expanding compassion to be more inclusive, broadening the sense of in-group, and dampening out-group bias.

Broadly speaking, the structured sequence of exercises begins with stabilizing attention and developing present-moment awareness then provides analytical practices to increase well-being and unbiased compassion toward self and

Table 1 Outline of group meetings

Session schedule for cognitively based compassion training, Veteran Version (CBCT-Vet)
Session 1: Introduction to CBCT
Overview of the sessions and orientation to group process and procedures. Learn basic breathing meditation and how to set up a meditation space. Rationale for CBCT for PTSD symptoms.
Session 2: Focusing attention
Benefits of attending to the breath and redirection of common misconceptions about getting rid of thoughts and emotions. Introduction to empirical basis for the intervention to instill hope and confidence in the methods.
Session 3: Creating space
Development of present moment focused awareness. Sensory distractions are introduced to heighten attention instead of continuing to tie attention to the breath. Returning to the breath or a strengthening moment visualization is taught for coping with flashbacks, strong thoughts and/or emotions.
Session 4: Mindful, open and aware
Continued practice on present moment focused awareness to obtain stability in meditation. Mindful listening to a partner in class is used to demonstrate difficulties in listening without interruption to another and what is learned about another by paying silent attention, and to expand connection to others.
Session 5: Re-engaging heroic spirit
Introduction of positive cognitive reflection into stabilized meditation. Superheroes are used as an example of accepting flaws. Expecting perfection or self-blaming is a barrier to self-awareness and compassion.
Session 6: Seeing ourselves in others
Introduction to the idea that that all beings want to avoid suffering and find satisfaction in life. Clarity in understanding that it is behavior and not humanity that can be inappropriate assists participants in building a more open acceptance of others.
Session 7: Appreciation and gratitude
Ordinary objects, talents and skills are shown to have been obtained through the contributions of both known and unknown others. This creates an awareness of interdependence and builds appreciation and gratitude for the human family.
Session 8: Empathy and engaged compassion
In the context of interdependence (i.e., others who do not necessarily like them or even know them are continually helping them to live their everyday life), it becomes easier to see that all people have bad habits. Understanding that change is difficult for all people and that we are not completely aware of the underlying issues others have helps participants to wish to relieve suffering for others.
Session 9: Putting it all together (1)
Review and relapse prevention. Helps participants to understand the links between the sessions and allows participants to create meditation cards to keep to support coping when they might not have access to guided meditations. Personalized meanings of the sessions are shared among members.
Session 10: Putting it all together (2)
Coping cards for applying meditation in everyday actions are created in class. Homework exercise reviewed to provide a springboard for brainstorming and understanding. Lessons on how to avoid compassion fatigue and continue to build positive emotions are taught.

others. Participants begin by recalling a time or place in which they were safe and taken care of by another to prime a sense of safety and security to sustain this positive affect and increase the awareness of the value of compassion in their own lives. Next, participants take part in an attention-training practice—following the sensations of the breath as they unfold—to promote attentional stability and mental clarity; a key objective of this is to learn to notice and release ("catch and release") distractions as they arise. This increased mental stability then supports present-moment awareness, sometimes called open monitoring. Here, the attentional focus shifts to how mental experiences unfold from moment to moment, as the practitioners attempt to neither push away such experiences nor become overly involved in them. This practice improves calmness of mind and provides insight into habitual mental patterns.

The stability and insights from these exercises then support the analytical reflections that follow. The next topic is to examine the nature of distress and dissatisfaction in one's life and cultivate more realistic and constructive attitudes in the face of difficult circumstances. With an emphasis on approaching one's situation with increased self-kindness, the practitioner strengthens the determination to replace unhelpful perspectives and attitudes with more constructive ones, thus increasing a sense of self-efficacy and promoting a realistically based optimism.

With a greater caring for self and the insight that constructive attitudes and perspectives are essential to enhancing well-being, CBCT® then focuses on attitudes and perspectives that are directed toward other people. Humans are fundamentally social creatures; relating constructively and positively with others is central to anyone's well-being. Thus, the participant goes on to examine how all people, despite many differences, share a fundamental desire for being well, flourishing and avoiding distress and dissatisfaction. This practice leads to a greater capacity to see others as like oneself at a basic level, setting the stage for greater empathic response and more inclusive compassion. Next, participants spend time reflecting on how their own well-being is dependent on the efforts of others, thus cultivating an appreciation for the received kindness of others, intended or unintended. These teachings are meant to generate authentic gratitude, moderate unrealistic attitudes of independence and isolation, and generate a deepening affection, even for those outside one's social group.

The practice concludes with a focus on the arising and sustaining of compassion toward others. Here, the participant embraces others as deserving of understanding and care because everyone—including loved ones, but also strangers and even difficult people—has inherent value and the equal right to pursue freedom from suffering. By focusing on the difficulties and distress experienced by so many, a deeper empathic response is evoked, and when supported by the inner strength

developed earlier in the practice, this empathy is transformed to become an engaged and motivated sense of caring for others and lead to more spontaneous and consistent prosocial thoughts and behaviors.

Protocol Refinement The CBCT® program was manualized before the initial group based on clinical experience with Veterans with PTSD (AJL, PC, ME) in collaboration with CBCT developers (LN, TH) to create the Veteran version, CBCT-Vet. Initial modification was aimed at increasing military/Veteran relevance and facilitating use by individuals with psychopathology. The guided meditations encourage emotional experiences and thus could be difficult for individuals with PTSD to tolerate. The therapist spent time in session talking about this possibility and how to handle it and made herself available between sessions as needed. Veterans were provided with strategies for managing flashbacks or strong emotions that are consistent with the practice, e.g., taking a deep breath and reseating oneself, then returning attention to the breath. Similarly, difficulty focusing could be handled by placing hands on one's belly (to get a physical reminder of breathing) and breathing until the experience passed.

In addition, we assumed little to no exposure to meditation to make the program accessible to any Veteran with interest, so we developed additional materials to facilitate understanding of meditation. Education in the science of compassion, including brief videos to illustrate difficult concepts, supplemented straightforward didactic materials that were provided in the participants' manuals. In addition, we believed that it was important that Veterans apply meditation practices to PTSD-relevant experiences, so homework was designed to encourage and help trouble-shoot that process. The language from the original CBCT® guided meditations was retained to the extent possible to maintain consistency of the intervention, although adaptations to reflect an 8th grade reading level and Veteran-relevant terminology were important to foster accessibility of the material. In addition, group discussion was used to enhance understanding and application of the material.

Finally, we were concerned that the group nature of the intervention, which is the standard for instruction in meditation, could create a barrier to individuals who typically prefer one-on-one therapy. On one hand, compassion is often enhanced by exposure to experiences of others shared in the class and Veterans can help each other through the struggles and joys of learning meditation. On the other hand, individuals who have experienced trauma are frequently uncomfortable with discussing symptoms or traumatic experiences in a group setting. To manage this concern, potential participants were helped to understand that the focus of the class was learning meditation rather than discussing traumatic events. It is our aspiration, however, that the skills developed in the group will facilitate one's ability to discuss and cope with distressing experiences, such as during trauma-focused psychotherapy. To the extent that traumatic events were brought up by group members, the group leader gently redirected the discussion from trauma specifics to expressing the ways in which they were cognitively or emotionally impacted while meditating. Participants were encouraged to remain after class to discuss specific concerns that might not be central to the group's current work, and referrals to additional services were provided as needed.

The treatment development team (AL, PC, ME, TH, LN) made subsequent refinements to the manual after the completion of each group based on therapist input, qualitative interviews, and quantitative data. The changes, which were evaluated based on subsequent participant feedback, were as follows. The groups were reduced from 120 to 90 min to reflect participant comments about the group seeming too long. Veterans requested more time for group discussion and cohesion-building, so classes were reviewed to balance presenting material and exercises with group process. Meditation exercises also were reconfigured to involve paired work or group interaction to foster a feeling of group cohesion while maintaining the integrity of the intervention's goals. To address perceived deficits in conceptual understanding of the intervention that we identified in the qualitative interviews, Veterans were asked to "teach" previously presented concepts to other group members with others being encouraged to chime in if there were other items that might facilitate learning. The class was extended from 8 sessions to 10 to make up for the change in session length and to allow time for discussion and review/skill consolidation. One concern that may be unique to this population was that tinnitus was experienced as louder when there were silences in the recorded guided meditations. These participants were reminded that this experience was common for them throughout their lives, that this was their "new silence," and that if distracted by the ringing, they could bring their attention back to the breath. Finally, some Veterans had difficulty accessing the guided meditations because of unfamiliarity with technology. To manage this, study staff took a more active role in providing support. Table 1 presents the final intervention outline.

Measures

Demographic information was collected via self-report, and the Montreal Cognitive Assessment (MoCA; Nasreddine et al. 2005) was used to screen for cognitive impairment. A score lower than the age/education-adjusted cutoff for psychiatric populations (Gierus et al. 2015) triggered additional neuropsychological evaluation and clinician clearance to participate. The Mini International Neuropsychiatric Interview (MINI 6.0; Sheehan et al. 1998) was used to establish psychiatric diagnoses, including primary diagnosis, and to screen for suicide/homicide risk. The Dissociative Experiences Scale (DES; Bernstein and Putnam 1986) was used to identify

problematic dissociative symptoms, and the Life Events Checklist (Weathers et al. 2013a) was used to inventory lifetime trauma exposure. Finally, each participant was queried about use of mental health services. Issues of clinical concern were further evaluated by clinician review of the electronic medical record.

The *feasibility* of the approach was evaluated based on participant attrition, time spent in practice, credibility as measured by a 3-item measure adapted from (Borkovec and Nau 1972), satisfaction as measured by the Client Satisfaction Questionnaire (CSQ-8; Attkisson and Greenfield 1994), and qualitative interview. Qualitative interviews were conducted by an experienced qualitative interviewer (SH) with the aim of learning about the understandability, applicability, and efficacy of CM for this group. Interviews were conducted by phone within 2 weeks of the conclusion of the last session attended to give participants an opportunity to reflect on their experience and learning. Each interview lasted approximately 30 min. The interviews were recorded and notes were taken by the interviewer to capture participant responses. The semi-structured interview guide posed nine reflective questions that focused around the (a) experience of practicing CM, (b) potential changes noted from skills they had learned at each intervention session, and (c) personal changes that participants perceived in managing both pleasant and unpleasant situations in their life because of their CM training.

Clinical outcomes were measured on a weekly basis using the DSM-5 version of the PTSD Checklist (PCL-5; Weathers et al. 2013b), the Patient Health Questionnaire depression items (PHQ-9; Kroenke et al. 2001), and the consumption items from the Alcohol Use Disorders Identification Test (AUDIT-C; Bush et al. 1998). Weekly measures were also used by therapists to monitor participant safety, as is typical practice in PTSD treatment. Emotional experience was assessed weekly using the Modified Differential Emotions Scale (mDES; Fredrickson et al. 2003), which consists of daily ratings of the strongest experience of 20 specific emotions in the preceding 24 h. The mDES is scored to quantify positive and negative emotions separately. In addition to the weekly measures, the 20-item Social Connectedness Scale—Revised (SCS-R; Lee et al. 2001) and the short form of the Self Compassion Scale (SCS-SF; Raes et al. 2011), which is comprised of six two-item subscales: self-kindness, common humanity, mindfulness, self-judgment, isolation, and over-identification, were administered before and after treatment.

Data Analyses

The sample description and analysis of clinical change is based on data that were pooled across the four groups of six to eight participants. Although there are differences in terms of content and therapy time within the groups, we believe that the aggregated data are informative in terms of our goals of evaluating the feasibility and clinical impact of CBCT-Vet as the fundamental intervention (CBCT®) remained the same. A flowchart was generated to capture the flow of subjects throughout the study (refer to Fig. 1). Descriptive statistics were used to characterize the participants before treatment. The collection of qualitative data was useful to explore details about participant perceptions of the intervention. Specifically, the qualitative data provided a contextual understanding of differences in participants' reactions and how that influenced their adaptability to the dynamics of the intervention, as well as ways in which they negotiated the practice of CM for stressful life situations. Descriptive statistics were used to characterize the sample. Mixed effects models were applied to measures that were captured weekly, and repeated measures analysis of variance (ANOVA) was used for pre-post change. Effect sizes (partial eta squared) were calculated based on the first and last completion of each clinical measure.

Results

Participants

At the first intervention session attended, participants had a mean PCL-5 score of 45.2 ($SD = 16.5$; $n = 30$ because one participant elected not to complete this measure) and a mean PHQ-9 score of 15.6 ($SD = 6.1$). All had a PTSD diagnosis with the exception of one individual; this person had a primary complaint of subsyndromal PTSD (PCL-5 = 40) with clinically meaningful distress and impairment, so an exception to eligibility criteria was made. The rates of co-occurring diagnoses were as follows: major depressive disorder ($n = 13$, 42%), panic disorder ($n = 5$, 16%), social phobia ($n = 8$, 26%), and obsessive compulsive disorder ($n = 4$, 13%). Before treatment, eight people screened positive for potentially problematic drinking behavior based on the AUDIT-C. Seven participants had completed one or more empirically supported psychotherapy for PTSD in the past, and 15 Veterans were taking one or more psychotropic medication.

Feasibility

Figure 1 presents attrition throughout the study. Eighty-eight percent of those who were assessed for eligibility enrolled in the study; this high rate likely reflects the use of clinician referral and relatively broad eligibility requirements. A significant number (5/36) withdrew before beginning treatment. Those who completed six or more sessions ($n = 19$, 61% of those who began treatment) were exposed to the essentials of the intervention, and those who completed four to five sessions ($n = 5$; 16%) were presented with some concepts but not the full intervention. Those who completed 1–3 sessions ($n = 7$; 22%) did not receive a meaningful introduction to the

practice and, although they were asked to provide data at the end of their involvement, none of them did so. Completers did not differ from drop-outs on any clinical or mechanistic measures (all $p > .05$). Participants generally cited logistical reasons for not completing the group (i.e., surgery, moving, untenable commute, family emergency), although two stated that the group did not meet their expectations.

Credibility questions were rated on an 8-point scale, with higher numbers indicating greater credibility. Average ratings were as follows: 6.3 ($SD = 1.5$) for how logical the intervention seems for PTSD, 5.9 ($SD = 1.4$) for confidence that the intervention will help with functioning, 5.9 ($SD = 1.4$) for confidence that the approach will help with PTSD, and 6.0 ($SD = 1.7$) for confidence in referring a friend to the program. The range of scores for those who completed 1–3 sessions was 6.14–6.29 whereas the range for those who completed 4 or more sessions was 5.90–6.48. The average CSQ-8 score was 25.5 ($SD = 4.0$, range 12–29, instrument range 8–32). The average number of minutes participants reported practicing each week (and percent of attendees turning in homework records) were as follows: 38 min (75%) during week 1 (target 36 min), 72 min (80%) during week 2 (target 72 min sessions 2–4), 68 min (74%) during week 3, 81 min (89%) during week 4, 85 min (80%) during week 5 (target 90 min sessions 5–10), 77 min (53%) during week 6, 60 min (67%) during week 7, 90 min during week 8 (2/2 participants reporting), and 90 min during week 9 (2/2 participants reporting).

Based on the qualitative interviews, participants felt that 120 min was too long for the sessions; once group length was reduced to 90 min, participants no longer suggested shortening groups. Sessions were reconfigured to allow for additional discussion time because several participants were dissatisfied with the way that time was divided among presentation of new material, discussion, and practiced meditation. Many mentioned that it was at least 3–4 weeks before people felt comfortable in the group, and they worried that because of the time needed to adjust, they had lost time in adequately learning the initial materials, which were built upon in subsequent later sessions. On the other hand, some felt that it was challenging to give everyone a chance to talk during informal discussions, particularly after the group became comfortable. Finally, most participants stated that different learning levels in the class might have been better supported by providing more practice time with new material during the sessions to make some of the homework easier to absorb. This was addressed by having participants summarize past sessions and by using the final two sessions to consolidate learning.

Clinical Response

Figure 2 depicts the change over time in PTSD and depression. The effect sizes, calculated based on change from the first to last session attended, were partial eta squared of .27 for PTSD and.19 for depression. These would typically be interpreted as large effect sizes (Cohen 1988). The change in PTSD symptoms (PCL-5 total score), $F(1,23.8) = 8.0$, $p < .05$, and depression (PHQ-9 total score), $F(1,20.0) = 4.4$, $p = .05$, reached statistical significance, but AUDIT-C did not, $F(1,20.9) = 2.3$, *ns*. No change was observed in positive emotion (mDES positive), $F(1,20.6) = 2.7$, *ns*, or negative emotion (mDES negative), $F(1,21.5) = 0.0$, *ns*, a presented in Fig. 3. Data from the SCS-R and SCS-SF, which are similarly unchanged, are presented in Table 2.

Several participants described an increased sense of peace and resilience during the qualitative interviews: For example:

> "I react a little different to certain things…I'm a lot calmer and I try to think about it first. I try to think about how I'm feeling and why."
> "My tendency before is that I'd get worked up too easily and act out in anger instead of rationally."
> "The meditation training had a very high calming effect…I used the breathing to keep me from getting agitated or if I was feeling anxious or stressed in class."

Also consistent with the intention of the intervention, participants expressed differences in the way that they think about others and themselves. Exemplars of this are as follows:

> "I feel a little bit more compassion for other people's feelings and mine also. I try not to be so judgmental and give them the benefit of the doubt."
> "I was the kind of person that I wouldn't look or smile at people but now I try to be more tolerant and be friendlier. I'm trying to open up a little more to people I don't know."
> "We learned in class that everyone is just trying to be happy and that really clicked for me."

Others, however, suggested to us that the group began changes that were not complete. For instance:

> "I spent a lot of time with unpleasant thoughts. I am able to "catch and release" a little easier and filter through what I want to be thinking. I still feel I have a long ways to go but I think I can do it."
> "I'd like to say that I appreciate people more but I don't."
> "I'm not letting go of things and giving people the benefit of the doubt. I haven't improved in those things but at least I'm aware of it."
> "I don't think I communicate with people any different yet, but I am learning to refocus in my environment to not react."

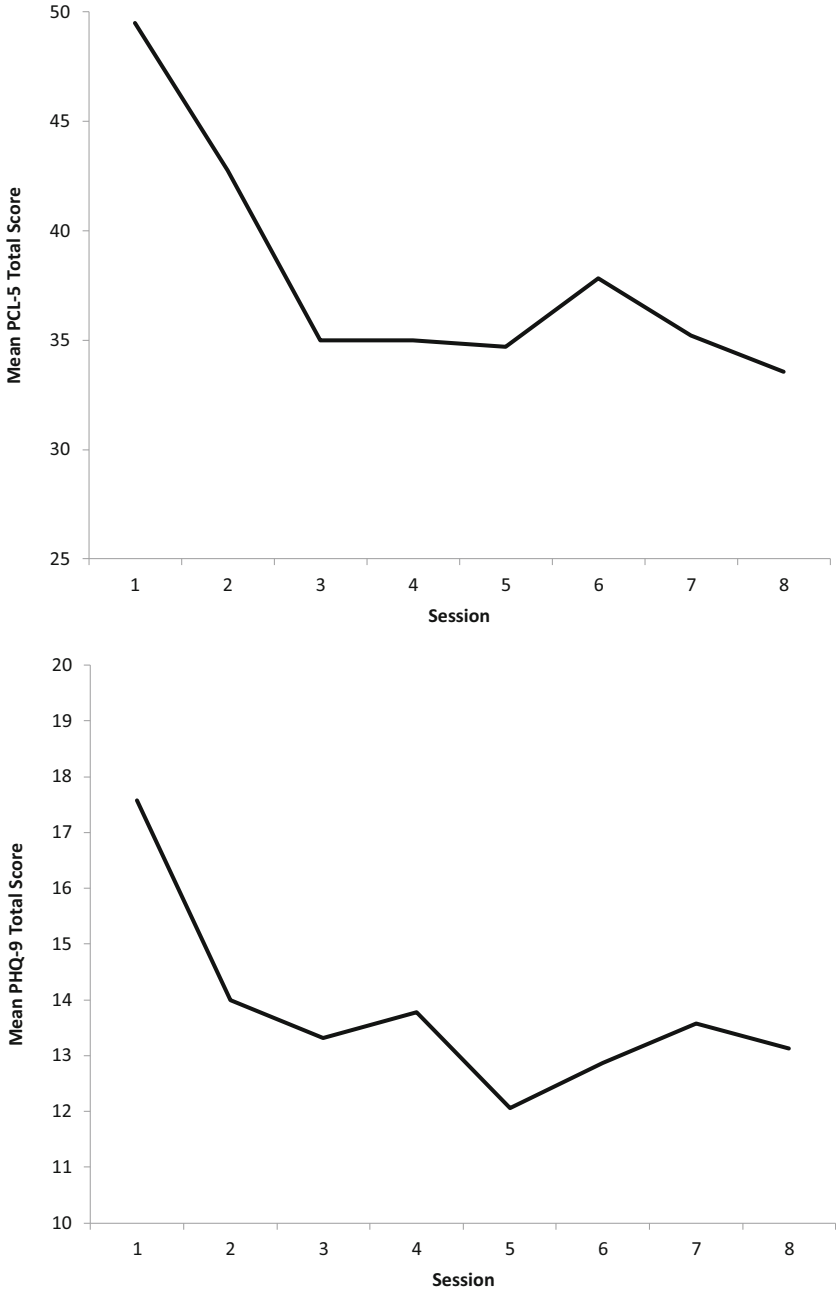

Fig. 2 Change in symptoms over the period of the group. *Note:* PCL-5: PTSD Checklist for DSM-5. PHQ-9: Patient Health Questionnaire depression items. Sessions 9 and 10 are not depicted because the very small sample size in those sessions (n = 2) creates a misleading visual

Discussion

This project adapted a standard CM program to meet the needs of Veterans with PTSD. The resulting manualized protocol, CBCT-Vet, appears to have potential in supporting recovery among Veterans with PTSD. The now ten-session protocol was implemented in a series of four groups within a general VA mental health clinic, involving participants who are generally representative of those who seek care at the facility. This open trial suggests that compassion meditation may help alleviate symptoms of PTSD and depression, although causality cannot be concluded based on this study design and the mechanism by which change occurs is unclear. The intervention was received well by participants based on ratings of credibility and satisfaction as well as qualitative interviews. The program was feasible to implement, although 69% completion is on the low end of what is typically observed in Veterans with PTSD (e.g., Polusny et al. (2015), who had 78% completion of mindfulness-based stress reduction in their recent randomized trial).

Our conjecture that CM increases positive emotion, which was based largely on data from non-clinical samples, was not consistent with what we observed in our

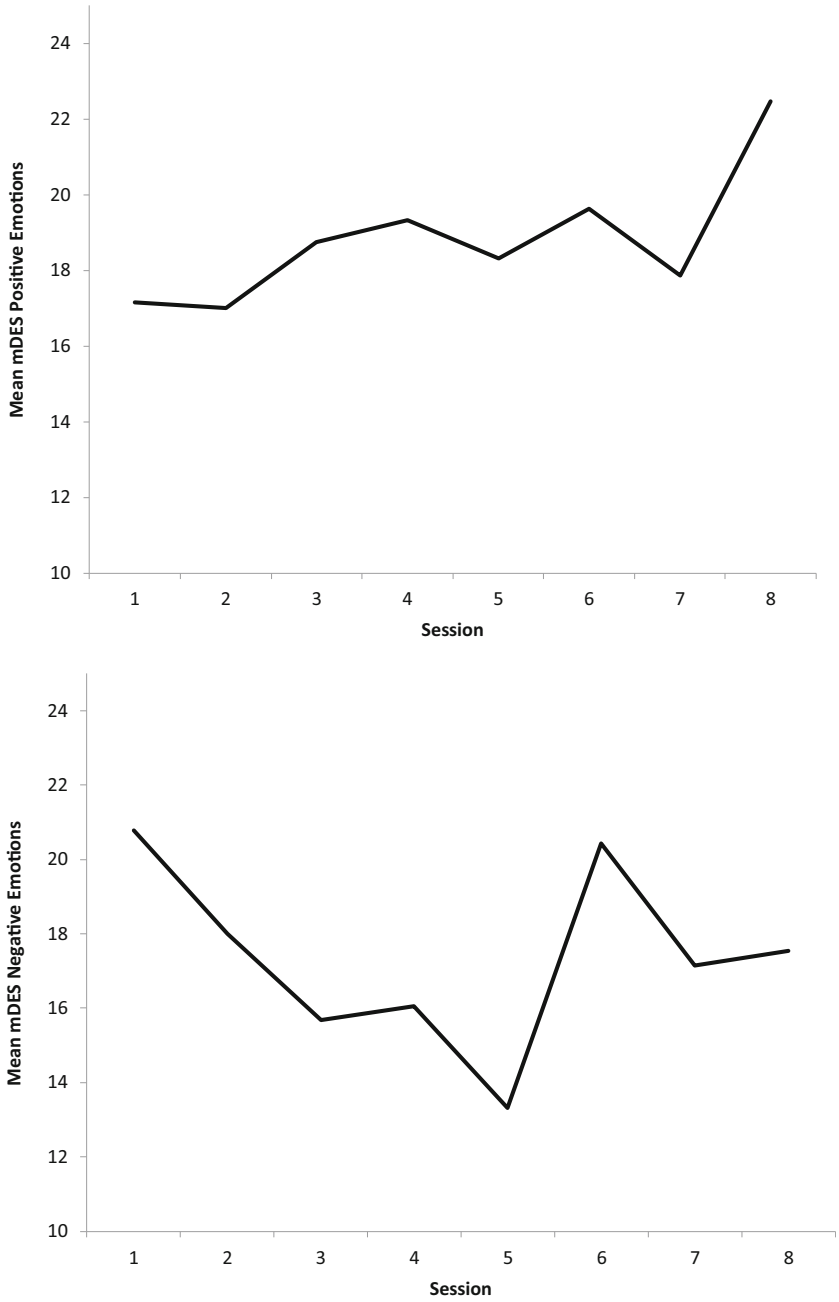

Fig. 3 Change in positive and negative emotions over the period of the group. *Note:* mDES: Modified Differential Emotions Scale. Sessions 9 and 10 are not depicted because the very small sample size in those sessions (n = 2) creates a misleading visual

weekly emotion measure. Qualitative data, however, suggest that participants experienced a greater sense of calm because of the intervention. Thus, it is possible that the set of positive emotions measured by the mDES (i.e., joy, gratitude, contentment, interest, hope, pride, amusement, inspiration, awe, love) were relatively less impacted than a sense of peace and calm. In the future, considering emotional arousal and valence dimensionally, as suggested by in the circumplex model of emotions (Russell 1980), may be helpful in better understanding the emotional impact of CM. Kearney et al. (2014), for example, found some differences in terms of activated and unactivated emotions using the Circumplex Measure of Emotion in their open trial of LKM for PTSD. It is also possible that change in positive emotion did not occur within the timeframe measured within this study but may become evident with continued practice. Longer-term follow-up may be important in terms of understanding the nature of emotional change associated with compassion meditation practice.

Similarly, our measures of social connectedness and self-compassion were apparently unchanged by group participation. Although the power is lower for these tests than for measures collected weekly, mean values,

Table 2 Social connectedness and self-compassion over the study period

	Pre-intervention *M (SD)*, $n = 36$	Post-intervention *M (SD)*, $n = 23$	$F(1,22)$
SCS-SF self-kindness	5.61 (1.72)	5.52 (1.38)	0.02
SCS-SF common humanity	5.58 (1.76)	6.17 (1.37)	1.20
SCS-SF mindfulness	6.53 (1.90)	6.56 (1.27)	0.58
SCS-SF self-judgment	5.89 (2.07)	5.70 (1.87)	0.30
SCS-SF isolation	5.02 (1.63)	5.22 (1.62)	0.12
SCS-SF over-identified	5.58 (1.95)	5.39 (1.97)	0.44
SCS-R	70.25 (6.36)	69.48 (7.17)	2.28

All repeated measures ANOVAs failed to reach significance

SCS-SF Self-compassion Scale, short form, *SCS-R* Social Connectedness Scale Revised

which changed very little, do not suggest that we simply lacked power to detect change. Our qualitative data suggest that participants were beginning to change in terms of the way that they think about themselves and others but that such changes would take time. Further, social connectedness reflects one's social network; once attitudes about others change, it likely takes time additional time to change one's relationships. It is possible that different measures (e.g., of empathy or social bias) may better reflect this early change than did the measures we used. Another possibility would be to offer continuing practice to allow changes to consolidate, which was a request of several of the participants who completed the entire program.

The question remains as to what led to the large effect size decreases in PTSD and depression that we observed over the course of the groups. It is always possible that non-specific factors, such as group cohesion (Ellis et al. 2014) or hope (Gilman et al. 2012), led to improvements. Although the data should be interpreted with caution due to the small sample size, it appears that much of the change occurred in the first 3 weeks when meditation was being taught but the contemplative work about compassion had yet to be presented. This raises the possibility that the general meditation skills, such as mindfulness, could be leading to the observed improvement. This would be consistent with work by Owens et al. (2012), who linked improvements in acting with awareness to decreased PTSD symptoms. We did not observe a change in the abbreviated mindfulness measure that was used in this project, however, so more thorough assessment may be useful in the future. Finally, qualitative data suggest that the group may have improved emotion regulation, as people described being less likely to be triggered and more able to let things go. This possibility, too, is worth investigating as we try to understand the psychological mechanisms at work.

In summary, this trial provides strong proof of concept evidence for the use of CM to support recovery among Veterans with PTSD. A diverse sample of Veterans enrolled in the program and provided productive feedback about the groups. We found large effect size changes in symptomatology, but a randomized trial is needed before drawing conclusions.

Limitations

The nonrandomized design of this study leaves open the possibility that observed changes are due to other factors, such as the passage of time, social support or nonspecific aspects of the intervention. The small sample size and self-selection into the trial are also significant limitations. The observed symptom change is based on self-report measures; in future studies these should be complemented by clinician administered tools, as is the gold standard in PTSD trials. Weekly symptom assessment is standard for PTSD treatment; nonetheless, the frequency of use of these tools may influence participant responding. Future studies should include alternative measures before and after treatment. Finally, the treatment manual was modified over the course of this study, so the results reflect application of the general approach by our therapist rather than application of a manualized approach; this issue should be addressed in future studies.

Author Contributions AJL: designed and executed the study, assisted with the treatment development, and wrote the paper. PC: conducted meditation groups and assisted with treatment development. SH: collected and analyzed qualitative data and assisted with treatment development. TH: assessed fidelity to CBCT and assisted with treatment development. SG: analyzed quantitative data and contributed to the writing of the paper. RG: acted as the research assistant and assisted with treatment development. ME: assisted with treatment development. LN: developed CBCT and assisted with treatment development.

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Compliance with Ethical Standards

Conflict of Interest Drs. Lang, Casmar, Hurst, Golshan and Essex and Ms. Good declare no conflict of interest. Dr. Negi and Mr. Harrison have a copyright for CBCT®.

Ethical Approval IRB approval for this study was provided by the IRB of the VA San Diego Healthcare System. All procedures performed in this study involving human participants were in accordance with the ethical standards of the Institutional Review Board and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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