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Loving-Kindness Meditation for Posttraumatic Stress Disorder: A Pilot Study

David J. Kearney,[1,2] Carol A. Malte,[3] Carolyn McManus,[4] Michelle E. Martinez,[5] Ben Felleman,[5] and Tracy L. Simpson[3,6]

[1]VA Puget Sound Health Care System, Department of Medicine, Seattle, Washington, USA
[2]Department of Medicine, University of Washington School of Medicine, Seattle, Washington, USA
[3]Center of Excellence in Substance Abuse Treatment and Education, VA Puget Sound Health Care System, Seattle, Washington, USA
[4]Swedish Medical Center, Department of Physical Therapy, Seattle, Washington, USA
[5]VA Puget Sound Health Care System, Seattle, Washington, USA
[6]Department of Psychiatry and Behavioral Sciences, University of Washington School of Medicine, Seattle, Washington, USA

Loving-kindness meditation is a practice designed to enhance feelings of kindness and compassion for self and others. Loving-kindness meditation involves repetition of phrases of positive intention for self and others. We undertook an open pilot trial of loving-kindness meditation for veterans with posttraumatic stress disorder (PTSD). Measures of PTSD, depression, self-compassion, and mindfulness were obtained at baseline, after a 12-week loving-kindness meditation course, and 3 months later. Effect sizes were calculated from baseline to each follow-up point, and self-compassion was assessed as a mediator. Attendance was high; 74% attended 9–12 classes. Self-compassion increased with large effect sizes and mindfulness increased with medium to large effect sizes. A large effect size was found for PTSD symptoms at 3-month follow-up ($d = -0.89$), and a medium effect size was found for depression at 3-month follow-up ($d = -0.49$). There was evidence of mediation of reductions in PTSD symptoms and depression by enhanced self-compassion. Overall, loving-kindness meditation appeared safe and acceptable and was associated with reduced symptoms of PTSD and depression. Additional study of loving-kindness meditation for PTSD is warranted to determine whether the changes seen are due to the loving-kindness meditation intervention versus other influences, including concurrent receipt of other treatments.

Self-criticism, rumination, and thought suppression are frequently associated with posttraumatic stress disorder (PTSD; Bennett & Wells, 2010), as is depression (Krupnick et al., 2008). There is evidence that self-compassion is negatively associated with self-criticism, rumination, thought suppression, anxiety, and depression, and positively associated with healthy psychological functioning, including life satisfaction and social connectedness (Neff, Rude, & Kirkpatrick, 2007). A small body of literature has assessed the role of self-compassion in PTSD. In a study of PTSD symptoms in university students, greater self-compassion significantly correlated with lower rates of avoidance symptoms, but not reexperiencing or hyperarousal (Thompson & Waltz, 2008). Compassionate mind training, which is designed to teach self-compassion, appeared promising in a small open trial of six traumatized individuals (Gilbert & Procter, 2006). Significant reductions in depression, self-criticism, anxiety, and shame were found over time, and the authors postulated that use of self-soothing techniques may be particularly helpful for people with a history of trauma (Gilbert & Procter, 2006). Many people with PTSD have long histories of traumatic experiences and have rarely felt safe or reassured. Pervasive feelings of shame and guilt are common in the setting of PTSD (Lee, Scragg, & Turner, 2001).

Loving-kindness meditation is a complementary and alternative medicine (CAM) approach that facilitates increased positive emotions through meditation exercises designed to develop feelings of kindness and compassion for self and others. Loving-kindness practice has its roots in the Buddhist tradition, but can also be applied as a nonreligious practice. The phrase loving-kindness derives from the Pali word *metta*, which can be translated as "love" or "loving-kindness," akin to the Greek word "agape." The words loving-kindness describe an emotional state that is not a feeling of sentimental love. Rather, it can be described as an unconditional friendliness, benevolence, and goodwill. In the Buddhist record, loving-kindness

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Correspondence concerning this article should be addressed to David Kearney, Seattle VAMC 111GI, 1660 S. Columbian Way, Seattle, WA 98108. E-mail: david.kearney@va.gov

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meditation was originally taught as a way of working with fear, which is the predominant emotional experience in PTSD. Indeed, one of the core features of PTSD is thought to be a phobic fear response to reminders of a traumatic event and to the memories associated with that event, which in conjunction with information processing problems, lead to pervasive fear and poor functioning (Foa & Riggs, 1993).

In loving-kindness meditation practice, a person sits quietly and calls to mind a particular person (e.g., a good friend) for whom they have positive regard, and silently repeats phrases of positive intention for that person. The phrases invoke a desire for safety, happiness, health, and ease or peace for them. Classically, four phrases are used, such as "may you be safe," "may you be happy," "may you be healthy," and "may your life unfold with ease" (Salzberg, 1995). The participant is asked to notice the feelings and thoughts evoked by the phrases. Next, the person brings to mind other individuals or categories of people, including oneself, a neutral person, and those who have caused difficulty or harm, changing the phrases as needed (e.g., "may I be safe" becomes "may you be safe"; Salzberg, 1995). Although loving-kindness meditation can be considered to be a form of practice that cultivates a mindful way of being, the repetition of phrases of positive intention, as taught in loving-kindness meditation, is distinct from mindfulness meditation practices, which typically involve bringing nonjudgmental attention to the breath, body, or other aspects of experience.

Increasing evidence supports loving-kindness meditation as a technique for enhancing positive emotions and health generally. Fredrickson, Cohn, Coffey, Pek, and Finkel (2008) randomized 139 individuals to loving-kindness meditation or a waitlist control, and found that those randomized to loving-kindness meditation reported greater positive emotions and were less depressed than the no loving-kindness meditation group, even though both groups reported a similar frequency of negative emotions. Positive emotions persisted after meditation sessions ended, and loving-kindness meditation practice produced an increase in positive emotions on subsequent days, regardless of whether the person practiced meditation on that day (Fredrickson et al., 2008). Other studies in support of loving-kindness meditation include a pilot study for chronic low back pain, which compared subjects who underwent loving-kindness meditation to standard care and found that those in loving-kindness meditation reported lower pain ratings, less anger, and less psychological distress (Carson et al., 2005). An additional study indicated that a single brief session of loving-kindness meditation training led to increased self-esteem and social connectedness relative to a control condition (Hutcherson, Seppala, & Gross, 2008), and another study found that three sessions of loving-kindness meditation led to the association of positive affect with previously neutral stimuli (Hunsinger, Livingston, & Isbell, 2012). Also, in a case series in which loving-kindness meditation was taught to people with schizophrenia, loving-kindness meditation appeared beneficial for persistent negative symptoms (Johnson et al., 2009).

Loving-Kindness Meditation as an Alternative Treatment for PTSD

The U.S. Department of Veterans Affairs (VA) has successfully disseminated evidence-based treatments for PTSD, including prolonged exposure (PE; Schnurr et al., 2007) and cognitive processing therapy (CPT; Karlin et al., 2010). Despite receiving treatment for PTSD, however, many people continue to experience persistent PTSD symptoms (Schottenbauer, Glass, Arnkoff, Tendick, & Gray, 2008), and other difficulties including disrupted interpersonal relationships, shame, and guilt (Lee et al., 2001). Consensus recommendations have advocated the need for further research on nontraditional delivery systems and group-based interventions for mental health conditions to significantly expand the availability of cost-effective therapies (Hollon et al., 2002). Loving-kindness meditation is designed to be delivered in a group format, thus reaching 12–15 patients at once rather than a single patient at a time as is typical with both PE and CPT (though the latter may be offered in small groups). Given the large number of veterans with PTSD, additional cost-effective treatments are needed to address residual symptoms and psychiatric comorbidity, such as depression.

Additionally, many patients would prefer to manage symptoms of anxiety and depression through means other than medications, and qualitative research among veterans suggests that dissatisfaction with reliance on prescription medications and neglect of social and spiritual aspects of health serve as motivating factors for use of complementary medicine modalities (Kroesen, Baldwin, Brooks, & Bell, 2002). The cultivation of positive emotions through loving-kindness meditation could be hypothesized to be particularly helpful for the constrictive symptoms characteristic of chronic PTSD, which can present as feelings of chronic alienation, emotional numbness, and deadness. Providing a technique through which positive emotions are repeatedly brought forward, as in loving-kindness meditation practice, might provide an innovative pathway to address these numbing and constrictive symptoms.

We undertook an open pilot trial of loving-kindness meditation for veterans diagnosed with PTSD to assess the feasibility of loving-kindness meditation as an intervention, and to gather preliminary evidence on clinical outcomes. We hypothesized that loving-kindness meditation would be acceptable to veterans, and that as compared to baseline, self-report measures obtained after loving-kindness meditation participation would show enhanced self-compassion, enhanced mindfulness, and reduced symptoms of PTSD and depression. In addition, we hypothesized that increased self-compassion would mediate reductions in symptoms of PTSD and depression.

Method

A prospective, longitudinal follow-up study of veterans who took part in a 12-week loving-kindness meditation course as an adjunct to their usual care at a large, urban VA Hospital. The study was approved by the institutional review board and

research and development committees of the VA hospital. Written informed consent was obtained prior to participation. No monetary compensation was provided to study participants. The trial was registered with clinicaltrials.gov: NCT01607632.

Participants

Forty-two veterans with current PTSD (58.1% male; 81.4% Caucasian) were either self-referred or were referred by a health care provider (see Table 1; participant characteristics and other treatments received). Exclusion criteria included (a) a history of a psychotic disorder; (b) mania, or poorly controlled bipolar disorder; (c) borderline or antisocial personality disorder; (d) current suicidal or homicidal ideation with intent; and (e) active substance use disorder. All provider notes within 2–3 months prior to enrollment were reviewed to determine if any of the exclusion criteria were present. A structured psychiatric interview or other formal assessment was not performed.

Measures

Demographic characteristics were recorded using a written questionnaire. The number and type of lifetime traumatic events was assessed by the Life Events Checklist (Blake et al., 1995) to describe the study population and establish Criterion A for the PTSD diagnosis. The 17-item, semistructured PTSD Symptom Scale Interview (PSS-I; Foa, Riggs, Dancu, & Rothbaum, 1993) assesses the severity of PTSD symptoms. The nature and frequency of PTSD symptoms within the past month were recorded using a 4-point Likert scale. The PSS-I had good internal consistency in the current sample (Cronbach's $\alpha = .87$), and previously has been shown to have good test-retest reliability ($r = .80$; Foa et al., 1993), and to correlate closely with the Clinician-Administered PTSD Scale (Foa & Tolin, 2000).

Depression was assessed using the NIH-sponsored Patient-Reported Outcomes Measurement Information System (PROMIS; Fries & Krishnan, 2009). The version of the PROMIS measure utilized computerized adaptive testing. The Self-Compassion Scale (Neff, 2003) is a 26-item measure of self-compassion. The scale demonstrated excellent internal consistency in the current sample (Cronbach's $\alpha = .95$).

Two versions of the Compassionate Love Scale (Sprecher, 2005) were used to assess compassionate or altruistic love. Each scale is comprised of 21 items. The first version, Compassionate Love-Close Others, addresses compassion in relation to friends and family; the second version, Compassionate Love Scale-Humanity, inquires about compassion towards humanity in general. Both versions demonstrate excellent internal consistency in the current sample (Cronbach's $\alpha = .97$ for each measure).

The Five Facet Mindfulness Questionnaire (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006), comprised of 39 items, was used to assess mindfulness skills. The Five Facet Mindfulness Questionnaire is comprised of five subscales, each with good or excellent internal consistency in the current sample: Observing (Cronbach's $\alpha = .89$), describing (Cronbach's

Table 1
Participant Characteristics and Other Treatments Received

Characteristic	*n*	%
Gender		
Female	17	40.5
Age (Mean)	53.6	8.6
Ethnicity		
White	35	83.3
Black	3	7.1
Hispanic	1	2.4
Asian/Pacific Islander/Native American	1	2.4
Other	1	2.4
Religion		
Christian	25	59.5
None	14	33.3
Other	2	4.8
Buddhist	1	2.4
Living situation		
Own/rent	36	85.7
Homeless	3	7.1
Other	3	7.1
Marital status		
Married or committed partnership	16	38.1
Highest level of education		
12th grade (high school graduate)	6	14.3
Some college	10	23.8
College graduate	18	42.9
Postgraduate studies	8	19.0
Income		
Full-time employment	1	2.4
Part-time employment	5	11.9
VA service-connected pension	20	47.6
Unemployed	8	19.0
Prior participation in mindfulness-based stress reduction	22	52.4
Classes attended		
4 or less	6	14.3
5–8	5	11.9
9–12	31	73.8
Use of psychotropic medications at baseline		
Antidepressants	27	64.3
Benzodiazepines	16	38.1
Antipsychotics	8	19.0
Prazosin	17	40.5
Categories of mental health services utilized: No. (%) who utilized each modality during the study period		
Supportive individual therapy	21	50
Supportive group	17	40.5
Individual cognitive–behavioral therapy	6	14.3
Acceptance and commitment therapy	1	2.4
Cognitive processing therapy (one group, one individual)	2	4.8
Prolonged exposure	1	2.4
Addiction treatment	2	4.8
Medication management visit	30	71.4
Any mental health treatment	37	88.1

Note. $N = 42$.

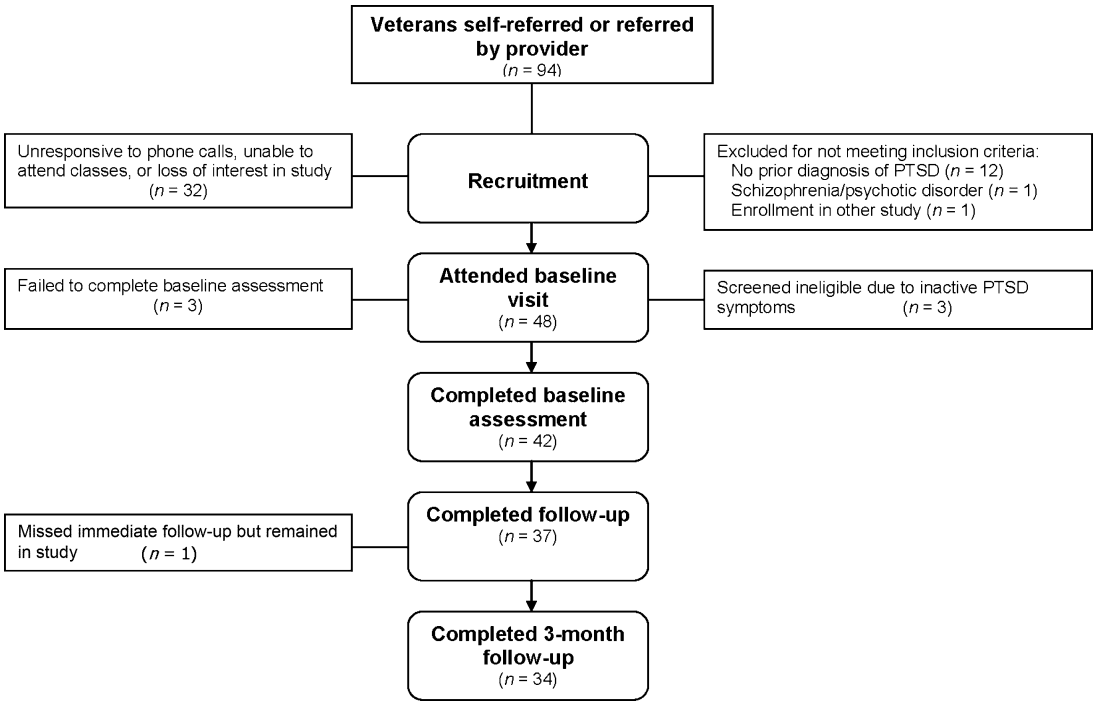

Figure 1. Participant flowchart from baseline to 3-month follow-up with reasons for exclusion or attrition.

α = .94), Acting with Awareness (Cronbach's α = .87), Nonjudging of Inner Experience (Cronbach's α = .93), and Nonreactivity to Inner Experience (Cronbach's α = .83). Items are rated on a 5-point Likert scale. The questionnaire has adequate convergent validity and incremental validity (Baer et al., 2008), and in the current sample had a Cronbach's α of .94 for total score.

Information about participants' medical history and medication usage was collected using the VA Computerized Patient Record System.

Procedure

After baseline assessment, participants took part in a 12-week loving-kindness meditation course. All participants continued their usual psychiatric and psychological care during the study, without intervention from the study team. Follow-up assessments were obtained immediately after treatment (post loving-kindness meditation) and 3 months post loving-kindness meditation (6 months after baseline; see Figure 1).

Throughout the study period, adverse events were monitored, including need for hospitalization. Veterans were given contact information for the class instructors and study team and encouraged to report significant exacerbation of symptoms or adverse effects to the study coordinator or loving-kindness meditation teachers.

Intervention: Loving-Kindness Meditation. The loving-kindness meditation course followed the instructions for loving-kindness meditation as described by Salzberg (1995). During the 12 class sessions, the 12–15 participants in each group received instruction from experienced meditation teachers. The first two sessions focused on mindful breathing. The primary loving-kindness meditation practice began in Week 3, and involved sitting with closed or open eyes and bringing to mind various categories of beings—self and others. Participants were asked to silently repeat phrases of positive intention for the person brought to mind. Each class included opportunities for questions and discussion of their experiences integrating loving-kindness meditation into daily life. A typical class included 10 minutes of breathing meditation, 20 minutes of instruction, 30 minutes of loving-kindness meditation practice, 15 minutes of group discussion, and ended with 15 minutes of loving-kindness meditation practice. Each participant was provided with a loving-kindness meditation meditation CD and workbook to accompany the class. The curriculum is briefly summarized as follows.

Classes 1 and 2 focus on instructions in mindfulness meditation. Class 3 introduces loving-kindness meditation phrases. Loving-kindness meditation practice begins by bringing to mind a benefactor. While holding a benefactor in mind and repeating loving-kindness meditation phrases, participants are asked to notice whatever feelings arise as they hold this person in mind. Class 4 introduces loving-kindness meditation for self, with acknowledgment that loving-kindness meditation toward oneself is often difficult. Loving-kindness meditation toward benefactor and self is practiced in class. Class 5 introduces the concept of a beloved friend; this may be a person or an animal. Class 6 includes discussion of loving-kindness meditation practice toward self and a benefactor, and homework is assigned as

continued loving-kindness meditation toward benefactor, self, and a beloved friend. Class 7 introduces the concept of a neutral person—someone we do not strongly like or dislike. Class 8 introduces loving-kindness meditation for a difficult person: Participants are encouraged to choose a person for whom they feel some degree of anger, hatred, or lack of forgiveness (they are instructed at this stage to not choose the person who has caused them the most pain or suffering in their lives—while acknowledging that this is a suggested goal of loving-kindness meditation practice). Class discussion includes how practicing loving-kindness meditation does not mean a sentimental love for that person, as well as a discussion of anger—how it can serve the purpose of setting boundaries and can challenge injustice, but can also cause suffering for the person who holds anger as well as for the person who receives it.

Class 9 includes discussion of the difficulties often experienced while practicing loving-kindness meditation for a difficult person. Class 10 includes further discussion of loving-kindness meditation for a difficult person; loving-kindness meditation for groups is introduced. This practice involves loving-kindness meditation for dichotomous groups of people, and in class discussion includes a discussion of whether participants feel an affinity or sense of unease practicing for specific categories. Examples of groups are given, which include males/females, young/elderly, and veterans/nonveterans. Class 11 includes a discussion of loving-kindness meditation for groups, with an emphasis on whether participants noticed previously unrecognized biases. Walking loving-kindness meditation is introduced. Class 12 includes discussion of walking meditation and loving-kindness meditation for all beings is introduced. In class, practice involves loving-kindness meditation for self, friend, benefactor, neutral person, difficult person, groups, and all beings.

At the end of each class session, participants were given homework assignments that involved practicing what was taught in each class for 30 minutes per day at home, and to incorporate loving-kindness meditation in various ways in their day-to-day lives (i.e., repeating the phrases while waiting in lines, in traffic, etc.).

Data Analysis

Standardized mean differences (Cohen's *d*, with 95% confidence intervals [CIs]) from baseline to the follow-up time points were calculated for the constructs of interest. The proportion of participants who had reliable change (according to the reliable change index) in PTSD symptoms and depression was calculated at the post-loving-kindness meditation and 3-month follow-up time point (Jacobson & Truax, 1991; Monson et al., 2008).

Mediation analyses were conducted to determine if change in self-compassion (as measured by the Self-Compassion Scale) mediated changes in outcomes (PTSD symptoms and depression). Mediation analyses were performed with ordinary least squares regression, using techniques recommended for within-subject designs (Judd, Kenny, & McClelland, 2001). Time point (baseline vs. follow-up) was used as the treatment condition. To assess mediation due to a variable (Self-Compassion Scale) that varies between treatment conditions, the *Y* difference in outcomes (PTSD symptoms, depression) was regressed on both the *X* (Self-Compassion Scale) sum and the *X* (Self-Compassion Scale) difference (Judd et al., 2001). According to this framework, if there is an overall treatment effect on *X* and the *X* difference predicts the *Y* difference, mediation of the treatment effect in *Y* by *X* is indicated. The portion of the mean treatment effect not mediated through *X* (i.e., the magnitude of the residual treatment difference in *Y,* over and above mediation due to *X)* was estimated by centering *X* sum and determining the intercept in the regression equation, with 95% CIs (Judd et al., 2001). All analyses were conducted using Stata 11 (StataCorp LP, 2009).

Results

Compliance with the intervention was high; 36 of 42 (86%) attended five or more classes, and 31 of 42 (74%) attended 9–12 classes. Additionally, compliance with the research protocol was high; 37 of 42 participants (88%) provided data at the posttest and 34 of 42 participants (81%) provided data at 3-month follow-up.

Three participants were hospitalized for psychiatric reasons during the study period. The first participant was hospitalized for 5 days during Week 2 of the loving-kindness meditation course for depression and suicidal ideation with intent. He attended the weekly loving-kindness meditation course while hospitalized, attended 10 of 12 loving-kindness meditation class sessions, and was discharged after supportive care and adjustment of medications. He had a history of longstanding depression and suicide attempts in the past, but denied suicidal ideation with intent at the time of the baseline evaluation. A second participant was hospitalized for 15 days during the fifth month of the study for worsening PTSD symptoms, without suicidality. He had a history of longstanding, severe PTSD and prior inpatient admissions for PTSD symptoms. He was discharged after supportive care and adjustment of medications. A third participant was hospitalized during the fourth month of the study for 8 days, for worsening depression with psychotic features and suicidal ideation. She was discharged after medication adjustments and supportive care. In the above three cases, the participants were encouraged to continue their mindfulness or loving-kindness meditation practices as part of the discharge planning by the inpatient psychiatric teams. No participants withdrew during the loving-kindness meditation intervention period due to reported worsening of PTSD symptoms.

Effect Sizes for Mindfulness, Self-Compassion, and Clinical Outcomes

Table 2 shows the correlation among study measures at baseline. Table 3 shows mean scores and effect sizes for the measures at

Table 2
Baseline Correlations Among the Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11
1. PSS-I	–										
2. SCS	−.42**	–									
3. PROMIS-depression	.37*	−.72***	–								
4. FFMQ-Nonreactivity	−.18	.66***	−.66***	–							
5. FFMQ-Observing	−.12	.44**	−.41**	.33*	–						
6. FFMQ-Act with Awareness	−.15	.69***	−.53***	.44**	.54***	–					
7. FFMQ–Nonjudging	.08	.38*	−.46**	.37**	.15	.41**	–				
8. FFMQ-Describing	.02	.25	−.09	.12	.57***	.28	.04	–			
9. FFMQ total	−.08	.67***	−.59***	.59***	.78***	.75***	.60***	.64***	–		
10. CLS-Close Others	.06	−.25	.27	−.12	.18	−.19	−.22	−.02	−.10	–	
11. CLS-Humanity	−.01	−.04	.08	.07	.14	−.03	.01	.00	.06	.74***	–

Note. $N = 42$. PSS-I = PTSD Symptom Scale-Interview; SCS = Self-Compassion Scale; PROMIS = Patient-Reported Outcomes Measurement Information System; FFMQ = Five Facet Mindfulness Questionnaire; CLS = Compassionate Love Scale.
*$p < .05$. **$p < .01$. ***$p < .001$.

each assessment point, with comparison to baseline. There was a large effect size for self-compassion (Self-Compassion Scale) found at both the immediate posttest and 3-month follow-up. There was no reliable effect on compassion for close others or humanity (Compassionate Love Scales) over time. Mindfulness skills (Five Facet Mindfulness Questionnaire subscales and total score) increased with medium to large effect sizes at both time points, except that at the post loving-kindness meditation time point, there was no reliable effect for nonjudging.

A large effect size was found for reduction in PTSD symptoms at both time points. For depression, at the post loving-kindness meditation time point, the 95% CI for effect size included zero, whereas at 3 months depressive symptoms declined with a medium effect size. When changes according to the reliable change index were calculated, at post loving-kindness meditation, 38.9% of veterans had reliable change in PTSD symptoms, and at 3-months 43.2% had reliable change in PTSD symptoms. For depression, at post loving-kindness meditation, 16.7% of veterans had reliable change in depressive symptoms, and at 3-months, 10.8% had reliable change in depressive symptoms.

Change in self-compassion, as measured by the Self-Compassion Scale, significantly mediated changes in PTSD symptoms (PSS-I) between baseline and post loving-kindness

Table 3
Mean Summary Scores and Standardized Mean Differences With 95% Confidence Intervals

	Pretreatment		Posttreatment				3-Month follow-up			
Outcome	*M*	*SD*	*M*	*SD*	*SMD*	95% CI	*M*	*SD*	*SMD*	95% CI
PSS-I	35.4	8.1	28.1	11.4	−0.75	[−1.21, −0.29]	26.9	11.0	−0.89	[−1.35, −0.42]
Self-Compassion Scale	13.7	4.2	17.1	4.3	0.80	[0.34, 1.26]	17.8	4.7	0.92	[0.46, 1.39]
PROMIS-Depression	63.4	7.8	60.5	10.0	−0.33	[−0.77, 0.12]	59.3	9.1	−0.49	[−0.94, −0.03]
FFMQ										
Nonreactivity	16.8	4.7	20.1	5.3	0.66	[0.20, 1.12]	20.3	4.7	0.74	[0.28, 1.21]
Observing	24.7	7.3	29.0	6.7	0.61	[0.16, 1.07]	28.5	6.3	0.55	[0.10, 1.01]
Act with Awareness	20.7	5.6	24.3	6.5	0.60	[0.14, 1.05]	24.8	7.0	0.65	[0.19, 1.11]
Nonjudging	22.3	8.3	25.7	8.2	0.41	[−0.04, 0.86]	26.2	8.0	0.48	[0.02, 0.93]
Describing	21.8	8.2	26.3	8.9	0.53	[0.07, 0.98]	25.8	8.4	0.48	[0.03, 0.94]
Total	106.3	22.9	125.3	25.2	0.79	[0.33, 1.25]	125.6	25.8	0.80	[0.33, 1.26]
Compassionate Love Scale										
Close Others	108.8	28.4	110.5	27.9	0.06	[−0.38, 0.50]	113.0	24.3	0.16	[−0.28, 0.60]
Humanity	87.6	31.5	94.2	27.7	0.22	[−0.22, 0.66]	90.8	26.5	0.11	[−0.33, 0.55]

Note. $N = 42$. SMD = standardized mean difference; CI = confidence interval; PSS-I = PTSD Symptom Scale-Interview; PROMIS = Patient Reported Outcomes Measurement Information System; FFMQ = Five Facet Mindfulness Questionnaire.

Table 4
Test for Mediation by Change in Self-Compassion

Measure	Test	Baseline to posttreatment β	95% CI	*p*-value	Baseline to 3-month follow-up β	95% CI	*p*-value
PSSI	Test for mediation	−1.30	[−2.36, −0.24]	.018	−0.76	[−1.27, −0.25]	.005
	Test for residual differences	−0.41	[−0.85, 0.02]	.061	−0.27	[−0.56, 0.01]	.061
PROMIS- Depression	Test for mediation	−0.92	[−1.57, −0.28]	.007	−0.88	[−1.39, −0.38]	.001
	Test for residual differences	−0.12	[−0.41, 0.17]	.409	−0.08	[−0.25, 0.08]	.302

Note. Self-compassion was measured by the Self-Compassion Scale. PSS-I = PTSD Symptom Scale-Interview; PROMIS = Patient Reported Outcomes Measurement Information System.

meditation and baseline and 3-months post loving-kindness meditation (Table 4). Residual differences in PSS-I scores were marginally significant (baseline to post loving-kindness meditation: $p = .061$; baseline to 3-month follow-up: $p = .061$). Likewise, change in self-compassion-mediated changes in depression scores (PROMIS) between baseline and post loving-kindness meditation and baseline and 3-months post loving-kindness meditation. Residual differences in depression scores were not significant.

Discussion

In this initial pilot study, we found that veterans with PTSD were willing to take part in a loving-kindness meditation intervention. Moreover, we found that as compared to baseline, measures obtained after loving-kindness meditation demonstrated increased self-compassion and mindfulness skills. In addition, a large effect size was found for reduction in PTSD symptoms 3 months post loving-kindness meditation ($d = -0.89$), and a medium effect size was found for reduction in depressive symptoms at 3 months follow-up ($d = -0.49$). Mediation analyses showed evidence of mediation by self-compassion for reductions in PTSD symptoms and depression. Overall, this initial experience suggests that loving-kindness meditation appears safe and acceptable to veterans with PTSD, and in a nonrandomized design, reductions in symptoms of PTDS and depression, as well as enhanced self-compassion and mindfulness skills were seen over time.

The high rate of compliance with the loving-kindness meditation course provides preliminary support for the acceptability of loving-kindness meditation among veterans; larger studies are needed to confirm these findings. The apparent acceptability of loving-kindness meditation is consistent with the larger body of literature on CAM-use among veterans, which indicates that veterans use CAM at high rates (Baldwin, Long, Kroesen, Brooks, & Bell, 2002; Micek et al., 2007). Dissatisfaction with reliance on prescription medications and neglect of social and spiritual aspects of health have been identified as factors leading to CAM-use among veterans (Kroesen et al., 2002) and likely played a role in the high rate of compliance found in our pilot trial of loving-kindness meditation.

Loving-kindness meditation is postulated to represent another form of teaching mindfulness and acceptance. Recently, there has been increased interest in mindfulness and acceptance-based approaches to PTSD (Kearney, McDermott, Malte, Martinez, & Simpson, 2012a, 2012b; Kimbrough, Magyari, Langenberg, Chesney, & Berman, 2010; Niles et al., 2012; Orsillo & Batten, 2005; Walser & Westrup, 2007), though data from large-scale randomized controlled trials are lacking. A commonly cited operational definition of mindfulness is "the awareness that emerges by way of paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment" (Kabat-Zinn, 2002, p. 732). Mindfulness instructions encourage an approach-oriented attitude, rather than avoidance, of distressing thoughts and feelings, which for people with PTSD, may have the potential to lead to reductions in avoidance behaviors over time (Vujanovic, Niles, Pietrefesa, Schmertz, & Potter, 2011). Whereas traditional mindfulness practices are thought to facilitate acceptance through nonjudgmental observation of the breath, thoughts, emotions, and bodily sensations, the use of personally meaningful phrases setting the intention of safety, happiness, health, and ease for oneself and others appears to constitute a viable alternative that merits further evaluation.

This study has a number of limitations. The most significant limitation is the lack of a control arm, which precludes conclusions regarding a causal association between participation in the loving-kindness meditation intervention and changes seen in outcome measures. The improvement in measures might be due to regression to the mean, the natural history of disease, or nonspecific effects of participation in a group rather than specific effects of loving-kindness meditation. We measured self-compassion, and showed a significant increase in self-compassion over time, as well as evidence that self-compassion mediates improvement in symptoms of PTSD and depression. We also measured mindfulness skills, and found mindfulness skills increased over time. Randomized controlled trials (with sufficient power to employ structural equation modeling), however, are needed to assess if self-compassion, mindfulness skills, or other factors mediate clinical improvement. An additional limitation is that our study was performed in a predominantly Caucasian veteran population, over half of whom previously

participated in mindfulness-based stress reduction, and the results may not generalize to other populations. Participants were allowed to self-refer in this study, which could have led to selection bias, which in turn could also limit the generalizability of the findings. Most participants (88%; Table 1) received other forms of mental health care, which could influence the outcomes. Of note, the study population was approximately 40% women, which is a larger proportion than most clinical trials in a VA population, suggesting that loving-kindness meditation might be particularly acceptable to female veterans. The duration of follow-up (3 months) performed in our study was also relatively short. Longer term follow-up studies are needed to assess the durability of any improvements seen. Despite these limitations, the findings of this initial open trial pilot study warrant investigation of loving-kindness meditation in a randomized controlled trial for people with PTSD.

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