Loving-Kindness Meditation for Chronic Low Back Pain

Results From a Pilot Trial

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*Purpose: Loving-kindness meditation has been used for centuries in the Buddhist tradition to develop love and transform anger into compassion. This pilot study tested an 8-week loving-kindness program for chronic low back pain patients. **Method:** Patients (N = 43) were randomly assigned to the intervention or standard care. Standardized measures assessed patients' pain, anger, and psychological distress. **Findings:** Post and follow-up analyses showed significant improvements in pain and psychological distress in the loving-kindness group, but no changes in the usual care group. Multilevel analyses of daily data showed that more loving-kindness practice on a given day was related to lower pain that day and lower anger the next day. **Conclusions:** Preliminary results suggest that the loving-kindness program can be beneficial in reducing pain, anger, and psychological distress in patients with persistent low back pain. **Implications:** Clinicians may find loving-kindness meditation helpful in the treatment of patients with persistent pain.*

Keywords: meditation; chronic low back pain; pain; anger; psychological distress

In recent years, the role of anger in the experience of persistent pain has received growing attention from researchers. Anger and resent-

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ment (e.g., toward self, spouse, health care providers, persons blamed for accidents leading to pain) appear to be salient features of many persons' chronic pain experiences (Burns, 1997; Burns, Johnson, Mahoney, Devine, & Prawl, 1996; Okifuji, Turk, & Curran, 1999). The growing recognition that unchecked anger and resentment can complicate the treatment of persistent pain has led to increased interest in identifying interventions that may modify these emotions (Carson, Keefe, et al., 2005; Fernandez & Turk, 1995; Greenwood, Thurston, Rumble, Waters, & Keefe, 2003).

The aim of this pilot study was to test the efficacy of a novel, positive emotion-oriented strategy—loving-kindness meditation—in reducing anger and improving the pain and adjustment of patients suffering from one of the most common and debilitating ailments in the United States: chronic low back pain (Waddell, 1998). Loving-kindness meditation is an approach to developing love and releasing negative emotions that has been widely used for centuries in the Buddhist tradition (Salzberg, 1995). This meditation strategy involves using silent mental phrases to direct feelings of love and kindness toward a loved one, toward oneself, toward a neutral person, toward someone who has caused you harm, and last, toward all living beings. Loving-kindness meditation thus differs substantially from mindfulness meditation, which involves simply attending, without judgment, to sensations, thoughts, emotions or other perceptions as they arise in the moment (Carson, Carson, Gil, & Baucom, 2004; Kabat-Zinn, 1990). Whereas uncontrolled studies have indicated that mindfulness meditation may be an effective adjunctive treatment for chronic pain (Kabat-Zinn, 1982; Kabat-Zinn, Lipworth, & Burney, 1985; Kabat-Zinn, Lipworth, Burney, & Sellers, 1986; Randolph, Caldera, Tacone, & Greak, 1999), no published studies have tested loving-kindness meditation's effects on chronic pain or any other condition or population.

The rationale for testing loving-kindness meditation in this population is that it may help produce an affective shift from more negative emotions to more positive emotions. Clinical observations suggest that the frequent practice of loving-kindness meditation is accompanied by a shift toward greater predominance of positive emotions, such as feelings of calm and joy, and a corresponding decrease in negative emotions like anger, anxiety, and sadness (Carson, Carson, Gil, & Baucom, in press; Salzberg, 1995). Given that theories of pain, such

as the gate control and neuromatrix models (Melzack, 1991), maintain that negative emotions such as anger can increase pain by altering descending and central modulation of neural inputs, and conversely positive emotions such as love and joy can decrease pain through the same mechanisms, a positive affective shift of this sort could be especially important in chronic low back pain patients.

Purpose

The purpose of this pilot study was to test the efficacy of a novel loving-kindness meditation intervention for chronic low back pain patients. We hypothesized that at posttreatment, patients in the loving-kindness meditation condition would demonstrate more improvement on standardized measures of pain, anger, and psychological distress than patients in the standard care control condition. Moreover, we hypothesized that treatment diaries kept by the intervention condition patients would reveal decreases in daily levels of pain, anger, and tension and that day-to-day time spent in loving-kindness practice would predict same-day or the following day's levels of pain, anger, and tension.

METHOD

This study used a two-group randomized controlled design. The protocol for the study was approved by the Duke Institutional Review Board. Prior to the study, informed consent was obtained from all patients. Patients were recruited from the Pain and Palliative Care Clinic at Duke University Medical Center and from surrounding communities via advertisements placed in local newspapers.

Sample

Participants for this study were 43 adults with lower back pain that was chronic (i.e., present for at least 6 months). Patients were excluded if they had significant cognitive impairments, acute suicidality or homicidality, pending disability/legal claims, or concurrent treatment for major medical disorders that may have affected their pain or disability (e.g., chronic obstructive pulmonary disease). The mean age of the sample was 51.1 years (range = 26-80); 61% of the participants were female; 63% were Caucasian and 35% were African

American; 49% were married, 16% were divorced or separated, 7% were widowed, and 28% were single; 2% had not completed high school, 21% had graduated from high school, 51% had attended college, and 26% had attended graduate school. The average pain duration for the sample was 148.46 months ($SD \pm 116.21$), and 21% were recipients of disability benefits.

Procedures

After signing informed consent forms, patients completed a pretreatment battery of questionnaires (described below). Patients were randomly assigned to either the loving-kindness meditation intervention condition or the standard care control condition. Assignments were generated by an individual not involved in the study using a random number table. Assignments were concealed in envelopes that were not opened until the patient was randomized. Patients again completed the battery of questionnaires at posttreatment and at 3 months follow-up. In addition, patients in the treatment condition kept daily treatment diaries while they were receiving the intervention, which were collected each week when sessions were convened. The research assistant collecting battery data was kept blind with regard to patient condition assignments. Patients received $30 compensation each time they completed one of the three battery evaluations.

Loving-Kindness Meditation Program

The intervention included 8 weekly 90-minute group sessions (4-8 patients per group) conducted at the Duke Pain and Palliative Care Clinic. Sessions were jointly led by a clinical psychologist and a health educator who both had extensive experience in practicing and teaching loving-kindness meditation. The average attendance rate at sessions was 90% (range = 63% to 100%). To ensure consistency in delivering the intervention, a manual was developed to delineate the treatment and provide detailed session guidelines to be followed by the interveners. Intervention sessions were supplemented with written materials and audiotapes.

The overall aim of the intervention was to facilitate a positive affective shift in patients. The daily practice of loving-kindness meditation was the primary means for this end. As employed in this study, loving-kindness practice initially involved patients (a) recalling a

time when they felt a very positive feeling of connection with a loved one, (b) letting go of the content of this memory while remaining focused on the actual feelings of love and kindness elicited in the present moment by the memory (this affective focus is distinct from the cognitive focus more typical of loving-kindness practice; e.g., Salzberg, 1995), and (c) employing silent mental phrases to direct these positive feelings, as best as possible, toward the loved one (i.e., may this person be at ease/content/happy/safe and secure) and then toward oneself, and (d) during the final minutes of the meditation, patients were asked to rest with attention to any feeling of love that remained from the practice. Across several weeks, this exercise was gradually extended to include directing positive feelings toward a neutral person (e.g., postman, store clerk); toward a person who harmed the patient or was a source of difficulty for them in the past in some way, and who they felt they could forgive to some extent (e.g., disrespectful former boss, dismissive former health care provider; perpetrators of sexual or physical abuse were explicitly excluded); and last, toward all living beings.

Along with in-session practice of loving-kindness meditation, the protocol included didactic presentations (e.g., gate control model of pain, unhealthy effects of long-held anger and resentment), group exercises (e.g., consideration of forgiveness as a gradual process that does not necessarily require any further contact with the offender but rather is done to release oneself from the grip of anger and resentment that has continued to affect one's well-being), group discussions (e.g., experiences of practicing loving-kindness meditation and applying it to their daily lives), and supplementary practices (e.g., body scan exercise that encourages patients to accept their bodies as they are and feel gratitude for what their bodies have enabled them to accomplish in life). Home assignments encouraged patients to spend 10 to 30 minutes daily practicing audiotape-guided loving-kindness strategies on their own.

All sessions were audiotaped for purposes of supervision. A random selection was checked for treatment integrity as described by Waltz, Addis, Koerner, and Jacobson (1993). Adherence to the specific elements of the intervention (e.g., assigning loving-kindness home practice) and treatment competence (e.g., rapport with group members) was assessed by a licensed clinical psychologist with experience in teaching loving-kindness meditation as well as cognitive-behavioral therapy (CBT) coping skills (e.g., progressive muscle relaxation). Therapist behaviors were judged to adhere to protocol on

97% of rated items, and the mean competence rating was 5.0 out of a potential range of 1.0 to 5.0.

Usual Care Condition

Patients in this condition received the routine care provided through their medical outpatient programs. These patients did not attend group sessions for training in loving-kindness meditation techniques.

Instruments

For all patients, a battery of questionnaires was administered before and after the intervention and 3 months later. In addition, patients in the loving-kindness meditation condition only kept daily treatment diaries while participating in the intervention.

Pain scales. Pain was assessed using the McGill Pain Questionnaire (MPQ; Melzack, 1975). This questionnaire yields two global scores: the Pain Rating Index and Pain Intensity. The Pain Rating Index is the sum of the rank values of the words chosen from 20 sets of qualitative words, each set containing two to six adjectives that describe the sensory, affective, and evaluative properties of pain. Patients were asked to check the one adjective in each word set that best describes their pain. Sensory, Affective, and Evaluative subscales of the questionnaire were also derived from these word scorings. Pain Intensity is rated on a scale from 0 (*none*) to 5 (*excruciating*). Previous research has provided strong support as to the validity of this instrument (Melzack & Katz, 1992).

Usual pain and worst pain. The Brief Pain Inventory (BPI) is a measure developed by Cleeland (1989) that asks patients to rate pain on a 10-point scale from 1 (*no pain*) to 10 (*pain as bad as it can be*). Patients were asked to make two ratings: usual pain during the past week and worst pain during the past week.

Anger. The State-Trait Anger Expression Inventory-II (STAXI-II) was used to measure individuals' anger (Spielberger, 1999). This 57-item self-report inventory measures the experience and expression of anger, using 4-point Likert-type items ranging from 1 to 4. The 15-item State Anger scale measures the intensity of angry feelings at the

time of test administration, whereas the 10-item Trait Anger scale assesses individual differences in the disposition to experience states of anger. The Anger Expression In, Anger Expression Out, Anger Control In, and Anger Control Out scales each contain 8 items. Anger Expression In items measure how frequently angry feelings are suppressed or inhibited, and Anger Expression Out items measure how frequently the individual expresses anger toward other people or objects in the environment. Anger Control In items assess the frequency with which an individual attempts to control angry feelings by calming down, whereas Anger Control Out items assess attempts to control the outward expression of anger. In testing the State Anger and Trait Anger scales, Spielberger reported good internal consistency, with alpha coefficients ranging from .82 to .90. Alpha coefficients for the anger expression and control scales were slightly lower (.73 to .86).

Psychological distress. The Brief Symptom Inventory (BSI) was used to assess psychological distress because of its well documented reliability and validity, and sensitivity to change (Derogatis & Melisaratos, 1983). Participants were asked to rate the extent to which they had been bothered by 53 symptoms during the past week using a scale ranging from 0 (*not at all*) to 4 (*extremely*). This inventory measured nine symptom dimensions: anxiety, hostility, depression, somatization, obsessive-compulsive, interpersonal sensitivity, phobic anxiety, paranoid ideation, and psychoticism. The Global Severity Index, a weighted frequency score based on the sum of the ratings of all items, was used as a measure of overall Psychological Distress (Piersma, Boes, & Reaume, 1994). This index has a reported alpha of .85 (Derogatis & Melisaratos, 1983).

Daily pain, anger, and tension. While participating in the intervention, patients in the loving-kindness condition completed a daily treatment diary as a global prospective measure of pain, anger, and tension. These three variables were rated on 0-100 scales in which higher scores reflected greater amounts. Similar 0-100 scales are extensively used in clinical settings to measure subjective phenomena such as global affect, pain, and fatigue (Cella & Perry, 1986). Each variable was rated twice on each day: pre-practice, recorded just prior to completing the day's loving-kindness audiotape-guided home assignment; and post-practice, recorded immediately after completing the assignment. Intervention participants also recorded how

many minutes were spent in completing the day's assignment. Diaries were collected on a weekly basis from patients when they presented for intervention sessions.

Treatment credibility. Prerandomization expectations with regard to the intervention were measured by a credibility questionnaire, adapted from Borkovec and Nau's (1972) format, which was completed by all patients based on a description of the program provided during the initial study interview.

FINDINGS

Because of the preliminary nature of this study, outcome analyses were based on data from only those who completed the study (Carson et al., 2004). Outcomes were evaluated by two distinct sets of procedures. Standard regression models were employed for questionnaire measures, and multilevel models were applied to daily treatment data.

Equivalency of Conditions

A series of regression and chi-square analyses determined that randomization procedures resulted in roughly equal groups at baseline in terms of demographic characteristics, treatment credibility, and most outcome variables. However, the two groups were significantly different in their pretreatment means of four anger-related dependent variables. The intervention group was significantly lower on Trait Anger, $F(1, 42) = 6.73$, $p = .01$; and Anger Expression Out, $F(1, 42) = 6.44$, $p = .02$; but significantly higher on Anger Control In, $F(1, 42) = 10.15$, $p < .01$; and Anger Control Out, $F(1, 42) = 9.03$, $p < .01$.

Attrition analyses also showed differential effects. Prior to the posttreatment evaluation, patients in the intervention group were significantly more likely to drop out (13 of 31 discontinued, leaving 18) than those in the control group (5 of 30 discontinued, leaving 25), $b = 1.28$, $p = .04$. Other predictors of drop-out prior to the posttreatment evaluation were education, with less educated patients more likely to drop out, $b = -.87$, $p < .01$; and disability status, with patients receiving disability benefits more likely to drop out, $b = 1.21$, $p = .05$. Education and disability status did not interact with treatment condition

in predicting drop out. Between the posttreatment and follow-up evaluations, attrition was approximately equal in the two groups (2 of 18 discontinued in the treatment group versus 4 of 25 in the control group). There were no significant predictors of drop-out during this period.

Because the multiple effects of a small pilot sample, accumulated attrition, and the need to control for baseline differences would have resulted in very limited power for between-groups repeated measures analyses of outcomes, analyses of variance were performed separately within each group, first comparing pre to post changes, and then pre to follow-up changes. Pre and post means for questionnaire measures are displayed in Table 1 (please contact the corresponding author for follow-up means).

Pre-Post Tests

Tests of within-group pre-post changes revealed several findings. Despite low power ($n = 18$), significant reductions were observed in Pain Intensity (MPQ), $F(1, 17) = 5.67, p = .03$; Usual Pain (BPI), $F(1, 17) = 5.04, p = .04$; Psychological Distress (BSI), $F(1, 17) = 6.17, p = .02$; and Anxiety (BSI), $F(1, 17) = 4.64, p = .05$, along with a trend toward reduction in Hostility (BSI), $F(1, 17) = 4.06, p = .06$. In the corresponding control group tests ($n = 25$), no significant changes were observed on any measures.

Pre to Follow-Up Tests

Tests of within-group pre to follow-up changes indicated continued significant improvements in the intervention group ($n = 16$) on a variety of measures. Reductions were observed in Usual Pain (BPI), $F(1, 15) = 9.37, p < .01$; Worst Pain (BPI), $F(1, 15) = 4.67, p = .05$; Evaluative Pain (MPQ), $F(1, 15) = 7.17, p = .02$; Psychological Distress (BSI), $F(1, 15) = 5.03, p = .04$; Anxiety (BSI), $F(1, 15) = 4.34, p = .05$; Hostility (BSI), $F(1, 15) = 4.31, p = .05$; and Phobia (BSI), $F(1, 15) = 5.77, p = .03$. Trends were also present in the intervention group for improvements in the Pain Rating Index (MPQ), $F(1, 15) = 3.50, p = .08$; Affective Pain (MPQ), $F(1, 15) = 4.00, p = .06$; and State Anger (STAXI-II), $F(1, 15) = 3.38, p = .09$. Again, in the corresponding control group tests ($n = 21$), no significant changes were observed on any measures.

TABLE 1
**Pre and Post Means and Standard Deviations of Study Participants on Questionnaire Measures**

| | Intervention (n = 18) | | | | Control (n = 25) | | | |
| | Pre | | Post | | Pre | | Post | |
Variable	M	SD	M	SD	M	SD	M	SD
Pain Rating Index (MPQ)	27.61	13.28	24.50	13.81	22.08	11.80	20.44	13.85
Pain Intensity (MPQ)	2.33	1.08	2.00	.77	1.88	1.09	1.78	.79
Sensory Pain (MPQ)	15.67	8.51	14.44	8.47	12.80	7.59	12.64	9.19
Affective Pain (MPQ)	3.39	2.91	2.28	2.54	2.28	2.56	2.12	2.26
Evaluative Pain (MPQ)	2.61	1.38	2.61	1.61	2.40	1.55	2.08	1.26
Usual Pain (BPI)	5.61	2.25	4.86	1.88	5.24	1.98	5.14	2.04
Worst Pain (BPI)	7.11	1.81	6.78	2.16	7.20	2.10	6.48	2.10
State Anger (STAXI-II)	17.61	4.50	18.00	5.48	18.36	7.18	17.76	5.47
Trait Anger (STAXI-II)	14.28	2.89	14.39	3.15	17.36	4.40	17.24	5.50
Anger Expression In (STAXI-II)	16.51	4.73	16.50	4.88	16.80	3.93	15.96	4.33
Anger Expression Out (STAXI-II)	12.28	2.93	11.67	2.38	14.80	3.40	14.08	2.78
Anger Control In (STAXI-II)	27.50	4.85	26.44	5.18	22.84	4.64	23.64	4.94
Anger Control Out (STAXI-II)	27.44	4.27	27.00	4.77	23.12	4.91	24.04	4.50
Psychological Distress (BSI)	.74	.67	.57	.61	.79	.62	.70	.54

Daily Data Analyses Within Treatment Group

Multilevel modeling is an advanced methodology for integrating data from multiple levels of sampling, such as this study's two levels (within-persons and between-persons). Multilevel models are particularly advantageous in analyzing data sets with many repeated measures, such as daily diary records (Carson et al., 2004; Schwartz & Stone, 1998). By preserving the rich detail in each individual's full data set, multilevel models allow for a sensitive independent determination of day-to-day interrelated happenings for each patient, as well as aggregation of individual estimates for reliable results for the average patient. Multilevel models also allow for strict control for potential confounds, such as serial autocorrelation in measurements, and the effect of between-person differences. For a more complete description of the multilevel equations reported herein, please contact the author.

Treatment effects. To examine treatment effects on daily variables, models tested whether patients' average pre-practice levels (i.e., before loving-kindness meditation practice that day) of Daily Pain, Anger, and Tension variables changed significantly as they progressed across the course of treatment (Affleck, Zautra, Tennen, & Armeli, 1999; Carson et al., 2004). Results showed significant improvements in Daily Anger ($b = -.214$, $t = -2.98$, $p < .01$) and Daily Tension ($b = -.388$, $t = -3.62$, $p < .01$). Estimated values of Daily Anger declined from 19.84 on the first day of the intervention to 9.58 on the last day (52% decline). Likewise, Daily Tension declined from 41.01 on the first day of the intervention to 22.36 on the last day (45% decline).

Length of loving-kindness practice and daily outcomes. On 98% of days ($SD = 4\%$), intervention patients reported spending some time practicing loving-kindness meditation. On average, they reported practicing for 20.8 minutes per day ($SD = 6.3$). Analyses examined whether the number of minutes spent in loving-kindness exercises on a given day predicted reductions (pre- to post-practice) in Daily Pain, Anger, or Tension for the same day, or for the following day. A significant effect for practice time was indicated for same-day Pain ($b = -.154$, $t = -3.35$, $p < .01$). As illustrated in Figure 1, the more time patients were engaged in loving-kindness meditation, the greater was their decrease in pain that day. In addition, results showed that greater
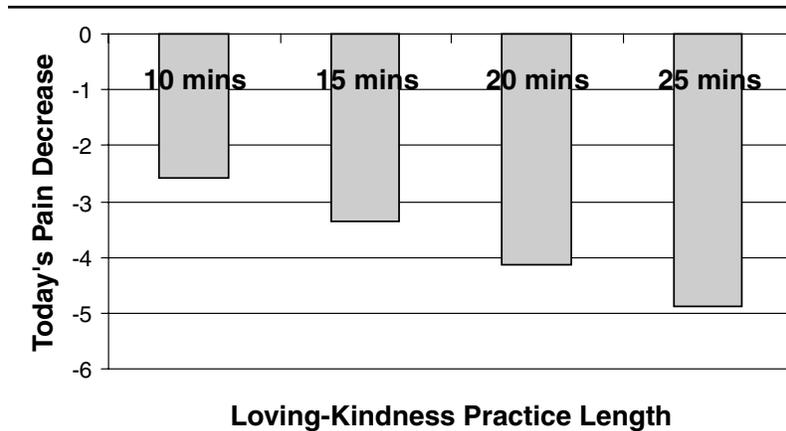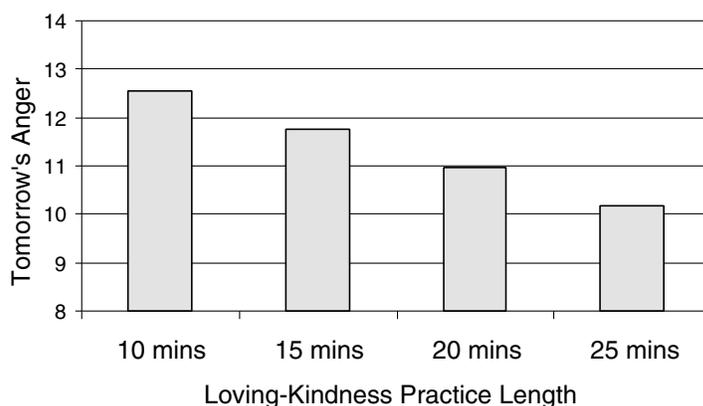
Figure 1:   **Plot Illustrating the Relationship Between Length of Loving-Kindness Practice and Same-Day Difference Scores in Pre-Practice to Post-Practice Daily Pain**

$p < .01$.

loving-kindness practice on a given day predicted improvement in Daily Anger on the next day ($b = -.157$, $t = -2.60$, $p < .01$). As seen in Figure 2, the more time patients put into loving-kindness practice, the lower their anger was the following day. A trend for next-day Daily Tension to be lower was also found ($b = -.151$, $t = -1.68$, $p = .09$).

DISCUSSION

In this pilot study, a novel, loving-kindness meditation intervention was tested in a sample of patients having chronic low back pain. As hypothesized, our findings indicated that the intervention was helpful in improving patients' pain and psychological adjustment. Moreover, a dose/response relationship was observed for patients' day-to-day length of loving-kindness practice. Patients who practiced longer with loving-kindness meditation were much more likely to experience lower pain at the end of practice that day and less anger on the following day. Although loving-kindness meditation has been in use for several millennia and is practiced at present by many thousands of individuals in the United States and worldwide, heretofore no published studies have reported on its treatment effects. This

Figure 2: **Plot Illustrating the Relationship Between Length of Loving-Kindness Practice and the Following Day's Pre-Practice Daily Anger Score**

$p < .01$.

study provides some of the first, tentative evidence for its potential efficacy in a population of persons having persistent pain.

The mean pre-post effect size for improvements in pain outcomes (Pain Intensity, Usual Pain) in the intervention group was .42, and the corresponding effect size for psychological outcomes (Overall Psychological Distress, Anxiety, Daily Anger, Daily Tension) was .51. These values are very similar to the .42 effect size for improvement in physical health variables, and .50 effect size for psychological variables, reported for pre-post comparisons in a recent meta-analysis of mindfulness meditation interventions (Grossman, Niemann, Schmidt, & Walach, 2004). Comparable effect sizes for CBT for chronic pain patients—.33 for pain, and .41 for mood/affect (other than depression)—have been reported for the somewhat more stringent test of comparing treatment versus wait-list control groups in a recent meta-analysis (Morley, Eccleston, & Williams, 1999).

Beyond demonstrating the effects of the loving-kindness intervention, this study marks the first time multilevel modeling has been applied to outcome analyses in a chronic pain population. These multilevel results showed that loving-kindness brought about significant improvements in day-to-day anger and tension. It is important that these findings were obtained by first calculating independent estimates for each intervention participant and then aggregating them to

derive reliable results for the average patient—thus avoiding the problem of overlooking the effect of individual differences, as in standard regression approaches. Moreover, the advantages offered by this statistical approach were particularly well suited for the analysis of real-time processes that have strong causal implications. The tangible day-to-day effect of loving-kindness was highlighted by the finding that greater practice on a given day produced lower pain at the end of practice that day, as well as improved levels of anger on the following day. Further studies could profit from using daily data collection to examine hypothesized therapeutic processes (e.g., increased feelings of love and kindness), as well as how patients' pain and emotional reactivity interactively affect one another (e.g., would same-day or next-day anger become more resilient to the negative effect of a high pain episode).

The intervention approach we tested, with its reliance on the loving-kindness meditation strategy, stands in strong contrast to standard CBT methods for pain management. Most CBT strategies are targeted at modifying cognitive factors (e.g., expectations, beliefs) or behavioral factors (e.g., activity level, home environment) that affect pain (Waters, Campbell, Keefe, & Carson, 2004). Herein, conversely, the primary aim was to intensively employ an affectively focused technique to produce a positive shift in emotional factors that also influence pain (Greenwood et al., 2003). According to patients' anecdotal reports, loving-kindness meditation appeared to lend itself well to this process. For example, a businessman who had initially described himself as "totally cut-and-dry" in relationship to others remarked near the end of the intervention, "I never knew it was possible to have such space in my heart for others." In a similar vein, a professional woman who used to quickly lose her temper when dealing with her debilitated aging mother reported by the end of the intervention, "When I enter her room now, I can feel myself soften."

One limitation of this intervention was that, early in treatment, some patients expressed ambivalence about the value of engaging in this novel, positive-emotion-oriented approach to improving their pain and well-being. This led to difficulty in retaining these patients in the loving-kindness condition. Given these concerns, modification of the intervention protocol is called for, perhaps by adding an initial component such as motivational interviewing (Rollnick & Miller, 1995) to augment patients' receptivity and readiness to participate in the loving-kindness program.

Several additional limitations of this study should be noted. The generalizability of our findings is restricted by the small sample and reliance on heuristic comparisons of within-group analyses. Another limitation comes from baseline differences in anger variables, although post-hoc analyses we performed showed that improvements in the intervention group cannot be attributed to baseline differences. To clearly establish the efficacy of loving-kindness meditation, a large, well-powered trial is needed, perhaps using a randomization scheme stratified on anger scores. Further methodological improvements for such a study could include control for nonspecific factors (e.g., comparison with an educational program would control for attention from therapists) and supplementation of self-report data by other types of measures (i.e., observational, psychophysiological, and even physiological). Further studies also can test more refined hypotheses of how loving-kindness operates (e.g., affective vs. cognitive changes), analyze predictors of treatment outcome (e.g., whether loving kindness is more relevant for certain patients), and expand research to other pain populations (e.g., cancer-related pain).

In conclusion, the findings of this study provide preliminary support for holistic nurses and other health professionals to integrate the use of loving-kindness meditation into their treatment of patients having persistent pain, especially those with anger-related issues. To this end, clinicians will likely be more effective in employing this method with their patients if they first gain some personal experience in its practice (e.g., see Salzberg, 1995) rather than attempt to use it in a purely prescriptive fashion.

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