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The effects of a mindfulness meditation-based stress reduction program on mood and symptoms of stress in cancer outpatients: 6-month follow-up

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Abstract The goals of this work were to assess the effects of participation in a mindfulness meditation-based stress reduction program on mood disturbance and symptoms of stress in cancer outpatients immediately after and 6 months after program completion. A convenience sample of eligible cancer patients were enrolled after they had given informed consent. All patients completed the Profile of Mood States (POMS) and Symptoms of Stress Inventory (SOSI) both before and after the intervention and 6 months later. The intervention consisted of a mindfulness meditation group lasting 1.5 h each week for 7 weeks, plus daily home meditation practice. A total of 89 patients, average age 51, provided pre-intervention data. Eighty patients provided post-intervention data, and 54 completed the 6-month follow-up The participants were heterogeneous with respect to type and stage of cancer. Patients' scores decreased significantly from before to after the intervention on the POMS and SOSI total scores and most subscales, indicating less mood disturbance and fewer symptoms of stress, and these improvements were maintained at the 6-month follow-up. More advanced stages of cancer were associated with less initial mood disturbance, while more home practice and higher initial POMS scores predicted improvements on the POMS between the pre- and post-intervention scores. Female gender and more education were associated with higher initial SOSI scores, and improvements on the SOSI were predicted by more education and greater initial mood disturbance. This program was effective in decreasing mood disturbance and stress symptoms for up to 6 months in both male and female patients with a wide variety of cancer diagnoses, stages of illness, and educational background, and with disparate ages.

Keywords Mindfulness meditation · Cancer · Psychological stress · Mood states · Group intervention · Stress reduction

Introduction

Emotional distress following receipt of a cancer diagnosis is common [14, 18, 57], with one-third of a large sample of surveyed cancer patients reporting significant depression or anxiety symptoms [66]. Within the population of cancer patients, there is a growing interest in mind-body medicine and complementary and alternative therapies, as well as a desire to act proactively and take the initiative in personal care [7, 17]. Fueled by the popular media (e.g. [50]) many patients hold a strong belief that they can control the course of their illness by

positive thinking, which, although controversial scientifically [23, 56], often serves to motivate them to seek psychosocial treatment. Many psychosocial interventions have been developed that have proven effective in treating cancer-related distress. These often incorporate multiple components, including behavioral, cognitive, and supportive-expressive techniques (for reviews see [21, 22, 28]). The convergence of these forces in cancer care has led to a high level of interest in mindfulness meditation as a technique for treating the distress inherent in the cancer experience [5, 10, 53].

Mindfulness meditation as a means of relaxation, reduction of psychological distress, and symptom control has a demonstrated utility across a spectrum of health care concerns. Quasi-experimental studies suggest that mindfulness meditation may be useful in the treatment of anxiety disorders [33], chronic pain [32], fibromyalgia [36, 57] and epilepsy [12]. In addition, randomized controlled studies have demonstrated beneficial effects on psoriasis lesions [35], hypertension [47] and, most recently, on reducing symptoms of stress and mood disturbance in cancer patients [53].

In a variety of mostly healthy samples of adults the practice of meditation has been associated with many physical benefits, such as decreases in heart rate [60, 62], slowed respiration [62], decreased blood pressure [47, 58, 65], lowered lipid levels [48], decreased levels of circulating stress hormones [30, 40, 58, 64], and enhanced immune function [27, 52]. Psychological effects have also been reported, including lowered levels of anxiety and stress [2, 30, 39, 63], less substance abuse [25], and better overall psychological health [2, 24, 64]. In this study we longitudinally followed a group of patients who initially completed our mindfulness meditation-based stress reduction program as part of a randomized clinical trial [53]. Here we report the findings of the 6-month follow-up assessment of mood and symptoms of stress and present a more in-depth analysis of the changes seen across various dimensions of mood and stress symptoms we also investigate predictors of change.

Methods

Subjects

A convenience sampling strategy was used to enroll patients to the study. Any patient having received a confirmed diagnosis of cancer at any time was eligible to participate. Demographics of the subjects at each time point are presented in Table 1.

Pre-intervention

Pre-intervention data were collected from 89 patients, who subsequently participated in the intervention program.

Post-intervention

At the time of completion of the program, 80 subjects completed the assessment. Reasons identified for participants leaving the study included being too ill, being in hospital or having relapsed, death before the completion of the study, and being too busy or working; several participants gave no reason for dropping out.

Six-month follow-up

Six months after each group had completed the intervention, 54 patients returned assessment forms: 10 men and 44 women.

Instruments

The primary outcomes of mood and symptoms of stress were measured by the Profile of Mood States (POMS) [42] and the Symptoms of Stress Inventory (SOSI) [38], respectively, which were described in our previous paper [53].

Table 1 Demographic characteristics

Condition	Pre-intervention		Post-intervention		6-Month follow-up	
Gender (*n*)						
Male	17		16		10	
Female	72		64		44	
Total *N*	89		80		54	
Stage of cancer (*n*)						
1	17		12		12	
2	33		33		18	
3	19		16		14	
4	19		19		10	
Total *N*	88		80		54	
	Mean	SD	Mean	SD	Mean	SD
Age (years)	52.0	10.5	51.8	10.6	50.6	9.3
Education (years)	15.4	2.8	15.4	2.8	15.5	2.9
Duration of illness (years)	3.0	4.7	3.2	4.9	3.7	5.7

Ad hoc instruments used in the study included a form for recording the duration of each participant's daily meditation practice and a demographic data collection form, which are available from the authors upon request.

Procedure

The original study was conducted as a randomized, treatment-control trial. Patients were randomized to either the immediate intervention group or a waiting-list control group. The treatment group started the program within 2 weeks of randomization, while the control group waited, and all patients were re-assessed after the treatment group completed the program 7 weeks later. Thereafter, the program was offered to members of the control group, who were again assessed 7 weeks later, following their completion of the program. Six months after completing the program, all participants were re-assessed on the same criteria through mail-out questionnaires. The study began in January 1998, and was conducted in five treatment-control waves. The 6-month follow-up data on the final group were collected by December 1999, with the study running for a total of 2 years. The results of the randomized portion of the trial comparing the treatment and control groups have been published previously [53]. In this study, we grouped subjects from both the treatment and the waiting list conditions together to analyze their respective pre-intervention, post-intervention and 6-month follow-up scores, since all subjects received the same intervention program and were assessed at the same time periods relative to their participation in the program. This allows us to assess the impact of the intervention on all participants concurrently, regardless of treatment group status. It also increased the effective sample size and power of the study to detect changes and contributing sources of variance – a major objective of the follow-up study.

Intervention

Details of the intervention, including objectives, structure, components and content, have previously been described [53]. Briefly, our program was modeled on the Mindfulness-Based Stress Reduction program at the Stress Reduction and Relaxation Clinic at Massachusetts Medical Center as described by Kabat-Zinn [31]. It consisted of three primary components:
1. Theoretical material related to mindfulness, relaxation, meditation, yoga and the body-mind connection,
2. Experiential practice of meditation and yoga during the group meetings and home-based practice, and
3. Group process focused on problem-solving related to impediments to effective practice, practical day-to-day applications of mindfulness, and supportive interaction between group members.

In addition, we produced and provided to patients a booklet containing information pertinent to each week's instruction, including a bibliography for those wishing to pursue relevant themes in greater depth, and an audio-tape with a sensate focused body scan meditation on one side and a guided sitting meditation on the other. The intervention was provided over the course of seven weekly, 90-min group sessions with up to 15 participants each time. Patients were instructed to practice daily. Didactic, inductive and experiential modes of learning were employed to implement the intervention and convey the informational content.

Data analysis

All data analyses were conducted using the Statistical Package for the Social Sciences (SPSS), version 10.0, for PC in Windows NT.

Pre-intervention

Mean scores on the POMS, SOSI, and demographic variables were calculated for the complete sample. Gender, age, education, stage and duration of cancer were regressed onto POMS and SOSI total scores using stepwise multiple regression to determine any initial relationships between these variables.

Post-intervention

To evaluate the effects of the intervention, paired-samples t-tests were used to compare pre- and post-intervention scores on the POMS and SOSI subscales and total scores. Change scores were calculated for the POMS and SOSI subscales by subtracting the pre-scores from the post-scores, which enabled us to look at the magnitude of the changes that had occurred. For direct comparison of the magnitude of change on the different subscales on the POMS and the SOSI, change scores were standardized. Scale scores were first divided by the number of items summed to form each scale, resulting in standardized change scores on a 1–4 scale, which were then multiplied by 25, resulting in standard change scores on a 100-point scale. To determine where the most change had occurred, standardized change scores were compared using one-sample t-tests within subscales of the POMS and the SOSI, with systematic comparison of the magnitude of changes on each subscale. The influences of age, gender, number of years of education, stage and duration of illness, initial POMS and SOSI total scores, home meditation practice and attendance on the magnitude of change from pre- to post-intervention on the POMS and SOSI total scores were investigated using stepwise multiple regression techniques. Demographic variables were entered first, followed by disease variables, initial psychological variables and finally the study variables of practice and attendance.

Six-month follow-up

Raw and standardized change scores from post-intervention to the 6-month follow-up were calculated in the same manner as those from pre- to post-intervention. Paired-samples t-tests were used to compare post-intervention and 6-month follow-up raw scores to determine whether the benefits of the intervention had persisted over the follow-up period. Standardized change scores were compared within POMS and SOSI subscales using one-sample t-tests, subscale means being compared systematically with one another, to determine where the greatest magnitude of change occurred over the interim. Associations between age, gender, number of years of education, stage and duration of illness, home meditation practice and attendance, as well as initial and post-intervention POMS and SOSI total scores, and the magnitude of change from post-intervention to follow-up on the POMS and SOSI total scores were investigated using stepwise multiple regression techniques.

Results

Subjects

Demographic characteristics of participants at each time are presented in Table 1.

Pre-intervention

Assessments were collected for 89 patients pre-intervention, 72 women and 17 men. Their average age was 52, and they had had an average of 15.4 years of education. They had been diagnosed with cancer an average of 3 years previously. Stage 2 cancer was the most common diagnosis, but roughly equal numbers of patients also had stages 1, 3, and 4 cancers. Breast cancer was by far the most common diagnosis ($n=39$), followed by ovarian cancer ($n=9$) and lymphoma ($n=9$). In total, 26 different types of cancer were represented in our sample.

Post-intervention

Post-intervention, 80 patients (89.9%) completed the assessment questionnaires, 64 women and 16 men. The average age in this sample was 51.8 years; again the patients had had an average of 15.4 years of education.

Six-month follow-up

At the 6-month follow-up, 54 patients (60.7%) returned the questionnaires by mail, 10 men and 44 women. These participants' average age was 50.6 years at study initiation and they had had an average of 15.5 years of education. To determine how representative of the original sample they were, the pre-scores on the POMS and SOSI between those who returned the 6-month questionnaires and those who did not were compared using independent samples t-tests. These pre-scores were not significantly different, with the mean POMS Total Mood Disturbance (TMD) scores of those who provided follow-up data at 34.2, as compared to 34.9 for those who did not provide follow-up data. Similarly, on the SOSI total score, the means were 95.6 for those who provided follow-up data, and 101.2 for those who did not. This indicates that the follow-up group was a representative sample of the original group in terms of initial mood disturbance and stress.

Mood scores

Mood scores on the POMS for each of the three assessment points are presented in Table 2.

Pre-intervention

Regression analyses indicated that of the variables entered, only the stage of cancer was predictive of initial pre-intervention POMS TMD score, with those patients who had a more advanced stage of cancer reporting lower total mood disturbance prior to beginning the program ($R^2=0.07$, $P<0.02$). Gender, age,

Table 2 POMS scores. Decreases in mood disturbance over time (pre- vs post-intervention)

	Pre-intervention	Post-intervention	6-month follow-up	Change pre- to post-intervention	Change post-intervention to 6 months	Standard change pre- to post-intervention	Standard change post-intervention to 6 months
Anxiety							
Mean	9.1	5.3***	5.2	−3.8	−0.1	−10.5	−0.4
SD	6.2	5.5	5.3	5.4	4.8	15.0	13.4
Depression							
Mean	13.7	9.0***	7.8	−4.7	−1.1	−7.9	−1.9
SD	9.8	9.0	7.3	7.6	7.4	12.6	12.3
Anger							
Mean	9.8	6.4***	5.8	−3.4	−0.7	−7.1	−1.4
SD	7.3	5.6	5.8	4.8	6.1	10.1	12.8
Vigor							
Mean	13.8	16.3**	18.5	2.5	1.9	7.8	5.8
SD	6.0	7.4	11.3	6.7	10.3	20.8	32.0
Fatigue							
Mean	11.4	9.6*	8.0	−1.8	−1.3	−6.4	−4.5
SD	6.3	5.8	6.3	6.6	6.0	23.7	21.6
Confusion							
Mean	5.6	3.6***	3.7	−1.9	−0.1	−5.1	−0.5
SD	5.4	4.7	5.5	4.1	4.1	15.0	14.6
Total mood disturbance							
Mean	35.7	19.0***	10.7	−18.1	−6.7		
SD	31.1	34.1	30.9	24.9	33.5		

*$P<0.05$; **$P<0.01$; ***$P<0.001$

education and duration of illness had no effect on POMS TMD pre-scores.
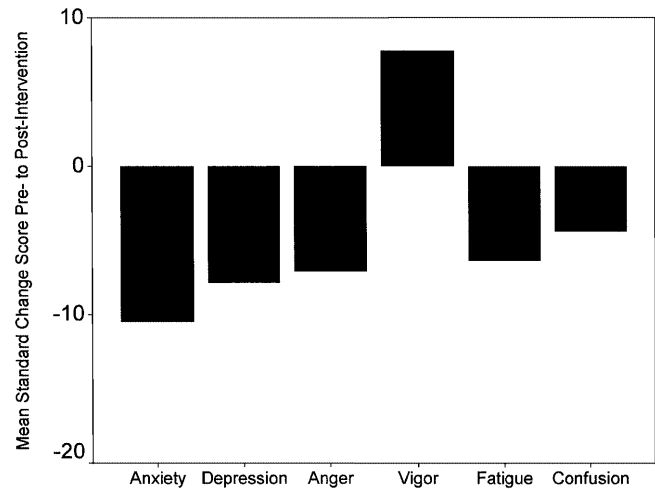
Post-intervention

To evaluate the effects of the intervention, paired-samples *t*-tests were used to compare pre- and post-intervention scores measured on the POMS TMD and subscales. The mean POMS TMD score showed a significant reduction ($t = 5.04$, $P < 0.001$), suggesting that the intervention was effective in reducing the mood disturbance experienced by the participants. Significant reductions in pre- to post-intervention scores were observed in the following POMS subscales: Anxiety ($t = 6.19$, $P < 0.001$), Depression ($t = 5.52$, $P < 0.001$), Anger ($t = 6.24$, $P < 0.001$), Fatigue ($t = 2.38$, $P < 0.05$) and Confusion ($t = 4.14$, $P < 0.001$). These reductions in scores correspond to reductions in mood disturbances on each of these subscales. There was a significant increase on the Vigor subscale ($t = -3.30$, $P < 0.001$), indicating that participants felt more energetic, and overall, participants achieved a 47% reduction in total mood disturbance on the POMS on completion of the intervention.

Standardized change scores are presented graphically in Fig. 1. The largest improvements occurred on the Anxiety subscale, followed by Depression, Vigor, Anger, Fatigue and Confusion. The improvement on Anxiety was significantly greater than the changes seen on Anger ($t = 2.98$, $P < 0.01$) and Confusion ($t = 3.30$, $P < 0.001$). The improvements on Anxiety, Depression, Vigor and Fatigue were not significantly different from each other.

Regression analyses indicated that total minutes spent in meditation were predictive of the POMS TMD change score, with more home practice being associated with a greater magnitude of improvement in mood ($R^2 = 0.08$, $P < 0.05$). Initial POMS TMD scores were also predictive of the overall change score, in that those with greater initial mood disturbance improved more over the course of the intervention ($R^2 = 0.20$, $P < 0.001$). Gender, age, education, stage of cancer, duration of illness and attendance had no significant effects on changes in mood scores.

Six-month follow-up

Paired-samples *t*-tests were used to compare post-intervention and 6-month follow-up mean POMS TMD and subscale scores to determine whether the benefits of the intervention had persisted over the follow-up period. All scores demonstrated shifts toward improvements in mood states in the period of time from post-intervention to 6-month follow-up, but none of these

Fig. 1 POMS subscale mean standardized change scores pre- to post-intervention. Change on Anxiety greater than changes on Anger ($P < 0.01$) and Confusion ($P < 0.001$)

improvements was significant. Nonsignificant reductions in scores indicating improved mood states were observed in the period between post-intervention and the 6-month follow-up for the mean POMS TMD (17.4 to 10.7) and the subscales for Anxiety (5.3 to 5.2), Depression (8.9 to 7.8), Anger (6.5 to 5.8), Fatigue (9.2 to 8.0) and Confusion (3.9 to 3.7). An increase in the Vigor subscale score (16.6 to 18.5) between post-intervention and 6-month follow up was observed, which also corresponds to an improvement in mood. Although none of these improvements in mood states observed in TMD and subscale scores was significant, it is noteworthy that there was no decline in the benefits of the intervention that were first observed after completion of the intervention.

The largest improvements occurred on Vigor, followed by Fatigue, with smaller changes on Depression, Anger, Confusion and Anxiety. The improvement on Vigor was significantly greater than that on Anxiety ($t = 2.85$, $P < 0.01$), Depression ($t = 2.27$, $P < 0.05$), Anger ($t = 2.43$, $P < 0.05$) and Confusion ($t = 2.56$, $P < 0.05$), and the improvement on Fatigue was significantly greater than that on Anxiety only ($t = 2.17$, $P < 0.05$).

Regression analysis on the POMS TMD change scores between post-intervention and follow-up found that the best model included both post- and pre-intervention POMS TMD scores, and gender ($R2 = 0.49$, $P < 0.001$). Higher POMS scores both pre- and post-intervention and female gender predicted greater improvement between post-intervention and follow-up ($P < 0.05$). There were no effects of age, education, stage or duration of cancer, practice or attendance on mood change scores post-intervention to follow-up.

Table 3 SOSI scores. Fewer symptoms of stress over time (pre- vs post-intervention)

	Pre-intervention	Post-intervention	6-month follow-up	Change pre- to post-intervention	Change post-intervention to 6 months	Standard change pre- to post-intervention	Standard change post-intervention to 6 months
Peripheral manifestations							
Mean	7.0	5.5**	7.2	−1.5	1.2	−5.4	4.4
SD	4.9	4.5	5.0	4.3	5.1	15.3	18.0
Cardiopulmonary							
Mean	12.2	9.1***	9.8	−3.1	0.4	−5.2	0.6
SD	8.3	7.9	7.7	6.8	6.9	11.3	11.5
Central neurological							
Mean	2.0	1.6	1.7	−0.3	0.2	−1.7	0.8
SD	2.0	1.9	2.0	1.8	1.9	9.1	9.5
Gastrointestinal							
Mean	8.6	7.2*	6.1	−1.4	−1.0	−4.0	−2.8
SD	5.3	5.9	5.2	5.0	4.9	13.8	13.5
Muscle tension							
Mean	11.5	8.8***	10.6	−2.7	1.6	−7.6	4.5
SD	7.0	6.4	7.6	6.1	7.2	16.8	19.9
Habitual patterns							
Mean	19.7	15.5***	16.3	−4.2	0.0	−7.0	0.0
SD	9.0	8.6	9.5	7.1	8.3	11.9	13.9
Depression							
Mean	9.3	6.3***	5.9	−3.1	−0.7	−9.5	−2.1
SD	6.5	5.1	4.6	5.5	5.1	17.2	15.8
Anxiety/fear							
Mean	10.6	8.1***	8.3	−2.5	−0.3	−5.6	−0.6
SD	6.0	5.5	5.7	5.1	6.1	11.5	13.9
Emotional irritability							
Mean	9.0	6.1***	6.5	−2.9	−0.3	−9.1	−0.8
SD	5.8	4.2	4.5	4.6	4.0	14.4	12.6
Cognitive disorganization							
Mean	8.5	7.4**	7.1	−1.2	−0.7	−4.16	−2.5
SD	4.1	4.1	4.3	3.4	3.6	12.14	12.9
Total score							
Mean	96.7	75.3**	78.2	−24.5	−0.6		
SD	43.9	42.3	43.7	34.7	37.8		

$*P < 0.05$; $**P < 0.01$; $***P < 0.001$

Stress scores

Stress scores on the SOSI are presented for all three time periods in Table 3.

Pre-intervention

Regression analyses indicated that both gender and level of education predicted initial SOSI total scores, with women ($R^2 = 0.16$, $P < 0.001$) and those with higher education ($R^2 = 0.09$, $P < 0.01$) more likely to have higher stress scores upon study entry.

Post-intervention

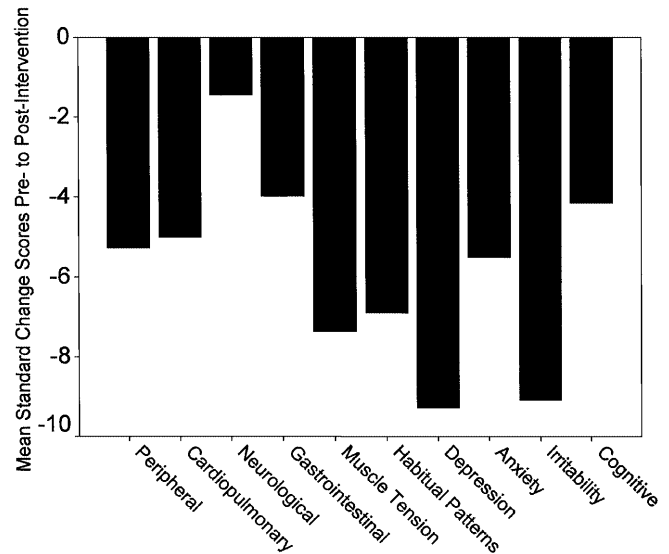Paired-samples t-tests were used to compare pre- and post-intervention SOSI total and subscale scores to evaluate the effectiveness of the intervention. The mean SOSI total score showed a significant reduction ($t = 3.63$, $P < 0.001$), representing a decrease in stress symptoms over the course of the intervention. Significant reductions in pre- to post-intervention scores were observed in the following SOSI subscales: Peripheral Manifestations ($t = 3.13$, $P < 0.01$), Cardiopulmonary ($t = 4.13$, $P < 0.001$), Gastrointestinal ($t = 2.57$, $P < 0.012$), Muscle Tension ($t = 4.02$, $P < 0.001$), Habitual Patterns ($t = 5.26$, $p < .001$), Depression ($t = 4.95$, $P < 0.001$), Anxiety ($t = 4.32$, $P < 0.001$), Emotional Irritability ($t = 5.62$, $P < 0.001$), and Cognitive Disorganization ($t = 3.05$, $P < 0.005$). These reductions in scores correspond to reductions in symptoms of stress experienced by participants specific to each of these subscales. A reduction in the pre- to post-intervention score was also observed on the Central Neurological subscale (2.0 to 1.6), but this reduction was not statistically significant. The participants achieved a 22% mean reduction in total symptoms of stress as measured by the SOSI on completion of the intervention.

Standardized change scores on the SOSI subscales are presented in Fig. 2. The greatest change occurred on the subscale of Depression, followed by Emotional Irritability, Muscle Tension, Habitual Patterns, Anxiety, Peripheral Manifestations, Cardiopulmonary, Cognitive Disorganization, Gastrointestinal, and Central Neurological. The improvement on the Depression subscale was significantly higher than the change on all other subscales ($P < 0.05$) except Muscle Tension, Habitual Patterns and Emotional Irritability. Emotional Irritability improved significantly more ($P < 0.05$) than all scales with lower change scores except Muscle Tension and Habitual Patterns; Muscle Tension improved more than Central Neurological, Gastrointestinal and Cognitive Disorganization (all $P < 0.05$), and Habitual Patterns improved more than Central Neurological and Cognitive Disorganization symptoms (all $P < 0.05$).

Regression analyses indicated that of the predictor variables studied, level of education was significantly associated with changes in total SOSI scores pre- to post-intervention, such that those with higher education improved the most ($R^2 = 0.07$, $P < 0.05$). The POMS TMD pre-score was also predictive, where those with higher initial mood disturbance scores improved most on stress symptoms ($R^2 = 0.09$, $P < 0.01$).

Fig. 2 SOSI subscale mean standardized change scores pre- to post-intervention. Depression and Emotional Irritability both had significantly greater change scores than Central Neurological (both $P < 0.001$), Gastrointestinal (both $P < 0.01$), Cognitive (both $P < 0.001$), Cardiopulmonary (both $P < 0.01$), Peripheral Manifestations (both $P < 0.05$) and Anxiety (both $P < 0.05$). Muscle Tension showed a greater change than Central Neurological ($P < 0.001$), Gastrointestinal ($P < 0.05$), and Cognitive ($P < 0.05$). Habitual Patterns showed a greater change than Central Neurological ($P < 0.001$), and Cognitive ($P < 0.05$)

Six-month follow-up

To determine whether the benefits of the intervention had persisted over the follow-up period, paired-samples *t*-tests were used to compare post-intervention and 6-month follow-up SOSI total and subscale scores. Several subscale scores, as well as the total score, demonstrated small shifts toward reductions in the amount of stress experienced in the period of time between post-intervention and 6-month follow-up, but none of these reductions was significant. Reductions in scores were observed between post-intervention and 6-month follow-up for the mean SOSI Total Score (78.8 to 78.2) and in the subscales for Gastrointestinal (7.1 to 6.1), Depression (6.6 to 6.0), Anxiety (8.6 to 8.3), Emotional Irritability (6.8 to 6.5) and Cognitive Disorganization (7.8 to 7.1). No change was observed in the Habitual Patterns subscale (16.3 to 16.3). Some subscale scores demonstrated a shift toward increases in the amount of stress experienced in the period of time between post-intervention and 6-month follow-up. However, none of these increases in levels of stress was statistically significant either. Increases in scores were observed between post-intervention and 6-month follow-up for the following SOSI subscales: Peripheral Manifestations (5.9 to 7.2), Cardiopulmonary (9.4 to 9.8), Central Neurological (1.5 to 1.7), and Muscle Tension (9.0 to 10.6). Although slight reductions in the

levels of stress were observed in some of the SOSI subscales, and slight increases in stress were observed in other SOSI subscales, the SOSI total score reflected a small reduction in total levels of stress experienced by participants. The nonsignificance of these fluctuations suggests that the beneficial effects of reducing levels of stress observed on completion of the intervention endured for at least 6 months following the intervention. The changes on Muscle Tension and Peripheral Manifestations were significantly higher than on all other scales (all $P < 0.05$), while the changes on the other eight subscales were not significantly different from each other.

Regression analyses showed that the only predictor of the change on SOSI total scores between post-intervention and follow-up was the SOSI post-score ($R^2 = 0.10$, $P < 0.05$), such that the higher the stress score post-intervention, the more the improvement to follow-up. No other predictors were significant.

Discussion

The results of this pre- to post-intervention study indicated that this 7-week mindfulness-based stress reduction program was effective in decreasing levels of mood

disturbance and symptoms of stress in this heterogeneous group of cancer patients, and that these improvements were maintained 6 months later. The most improvement occurred on subscales measuring depression, anxiety and anger (emotional irritability on the SOSI). This is striking, since these are among the most frequently reported psychological symptoms identified as problematic for cancer patients, with over one-third of a randomly selected sample of cancer patients from three centers meeting diagnostic criteria for Adjustment Disorder with Depressed or Anxious Mood, and an additional 7% diagnosed with a Major Depressive Disorder [14]. Reported rates of depression have ranged from 1% to 53%, depending on the population of patients and the diagnostic criteria used [13], but adjustment disorder is common [41], with an average prevalence across studies of about 25–30% [49]. If this program proves effective in treating cases of adjustment disorder in cancer patients, as suggested by these results, it will prove to be a valuable addition to the clinical tools available for the treatment of cancer-related distress.

Our findings are also consistent with other investigations of similar meditation-based interventions with different medical populations. Kabat-Zinn and colleagues have successfully treated anxiety disorders with mindfulness-based stress reduction [33, 43], and our finding of large decreases in anxiety levels over time supports their results. Using meditation to treat disorders with a psychosomatic component such as psoriasis, chronic pain, and hypertension has also proven successful [32, 35, 47]. Kaplan et al. [36] found a 65% improvement in pain symptoms and an approximately 60% improvement in sleep and fatigue levels from pre- to post-intervention in a sample of patients with fibromyalgia, an illness which has psychosomatic components. A study of patients diagnosed with hypertension demonstrated reductions in both systolic and diastolic blood pressure as a result of participating in a daily meditation program, and the magnitudes of these changes were approximately twice that seen in progressive muscle relaxation [47].

Changes that might have been expected to occur on the SOSI based on the physiology of meditation would include those associated with decreased sympathetic nervous system arousal, such as decreases in the cardiopulmonary symptoms of rapid respiration and heart rate, decreased muscle tension and fewer gastrointestinal symptoms [29, 58]. However, the greatest decreases in our sample occurred on the more cognitive subscales of depression and irritability/anger. The literature detailing the psychological rather than physiological benefits of meditation contains reports of decreases in depression symptoms and enhanced psychological well-being in cancer patients [61], in patients with anxiety disorders [33] and in healthy populations [2, 24,

26]. It is of interest to note that several groups have begun investigating meditation as an adjunctive component of more cognitive-behaviorally based programs designed to treat major depressive disorder [59] and alcohol abuse [46]. The addition of a meditative component enhanced the effectiveness of the programs in treating depression and anxiety symptoms. Our study seems to indicate that the program is most effective at improving cognitive-based symptoms of stress, although we did also see improvements of a smaller magnitude over time on muscle tension and cardiopulmonary symptoms.

Female gender was associated with higher stress scores upon enrollment into this study. It has been reported in the literature than women do tend to experience more anxiety about cancer diagnosis and treatment than men [4, 6, 9], but an equal number of large studies have found no gender differences in anxiety levels among cancer patients [8, 14, 57]. Women in general have higher prevalence rates for most anxiety and somatoform disorders than men [1], and may tend to endorse symptoms of stress at a higher rate than men [37]. Men, on the other hand, may underreport anxiety and other psychiatric symptoms and, thus, are more frequently diagnosed with substance abuse and antisocial disorders [1]. Different methods of coping with distress are often evidenced by the two genders [45]. Our finding may be reflective of this gender difference in symptom reporting.

Education was also a factor in predicting both initial stress scores and improvement pre- to post-intervention, in that those who were more highly educated reported more symptoms of stress initially, and improved more frpm pre- to post-intervention. It is often the case with anxiety that intellectualizing, instead of dealing directly with threatening feelings, is a prevalent form of coping [44]. Patients with anxiety disorders may use predominantly rational, intellectual defensive coping mechanisms, trying to reason themselves out of their fears rather than dealing with the emotions that have been aroused. Major objectives of the mindfulness meditation program include increasing the individual's awareness of their propensity to analyze, evaluate, and project into the future and to shift attention to direct and immediate perception of ongoing experience [31]. It is possible that more highly educated patients, who may theoretically be presumed to use intellectualizing coping methods preferentially, may benefit the most in terms of stress reduction by learning to apply this new way of moving through the world. They may also be more practiced or adept at learning new material in the format utilized, which includes didactic components. Alternatively, they may be more familiar with or open to accepting the ideas and techniques taught in the mindfulness instruction. The association between education and stress symp-

toms requires further evaluation before conclusions can be drawn about possible underlying causes.

Patients' stage of cancer was initially associated with mood disturbance, in that a more advanced stage of cancer corresponded to less mood disturbance, contrary to what may have been expected based on other surveys (reviewed in [49]). This was unrelated to duration of illness. It may be that those patients with a more advanced stage of cancer had already been forced to deal with existential issues around death and dying that patients with an earlier stage of illness found easier to avoid. Through this process, they may have come to a place of relative equanimity that was reflected in less mood disturbance. This surprising finding is one that it may prove fruitful to investigate further in future studies.

There are many potential sources of distress for people diagnosed with cancer. These include the fearful anticipation of death, pain, and suffering upon learning of the diagnosis, undergoing taxing treatment regimens, the difficulty of coping with life changes and day-to-day realities of living with illness and treatment, and adjusting to the inherent uncertainty and uncontrollability of the illness [54]. In addition, patients often have to confront existential issues, such as trying to make sense and meaning of the illness in their life and confronting issues around death and dying [3]. It is these latter existential concerns that are often the most difficult for patients. Excessive anxiety and distress result when patients' sense of predictability and control are threatened. Being diagnosed with cancer and the accompanying implicit life threat undermine life strategies that rely excessively on future-oriented, goal-directed behaviors as a source of purposefulness and meaning in life. It is in this context that mindfulness meditation-based stress reduction can assume an especially meaningful role for cancer patients [34]. Indeed, studies have shown that the practice of meditation is superior to simply inducing the relaxation response, in terms of both the physiological and psychological response [15, 47].

The question arises as to what it is about meditation that may contribute to these differentially greater effects? Testimonials from some of our patients may help to shed light on these existential phenomena:

– In times of pain, when the future is too terrifying to contemplate and the past too painful to remember, I have learned to pay attention to right now. The precise moment I was in was always the only safe place for me. Each moment, taken alone, was always bearable. In the exact now, we are all, always, all right.

This quote exemplifies the practice of moment-to-moment mindful awareness, and the benefit that this patient was able to take from living her life in a mindful manner. Others have discussed the more spiritual aspects of the experience and finding a place of peacefulness:

– We are body, mind and spirit. I used to live too much in the mind. Meditation gave me relaxation and space to get to know myself better and to trust myself more intuitively.
– As a cancer patient, I have a constant fear. The practice of meditation helps me to calm down my emotional disturbance, and leads me to a state of peacefulness.
– The meditation helped me focus on the present and reduce my fear of the future, which primarily was that I would die. I have learned there are ways to live within stressful situations / events / conditions and find an island of peacefulness.

The ability to face the future and the fear of death with peaceful equanimity was a theme that many patients talked about in their course feedback. Contemplation of the future from a safe place in the present separates the meditative experience from the more intellectual cognitive-behavioral and physiologically-focused relaxation therapies. Future phenomenological or qualitative research elucidating these themes may be beneficial in guiding our understanding of the nature of change that occurs as a result of the meditative experience.

With this type of design, pre- to post-intervention without a control group, it is not possible to conclude that the cause of improvement over time was participation in the program. Other potential explanations, such as regression towards the mean, maturation, and natural history of the illness, must also be considered. The possibility of regression as an explanation is supported by the finding that initial POMS TMD scores were predictive of change scores post-intervention and at the 6-month follow-up. This indicates that those participants who were most distressed at the onset improved the most. This could be interpreted as meaning that our program helped those people who needed it the most, or, alternatively, that their high scores would have resolved over the interim without any intervention. Nonetheless, if our intervention only served to hasten the recovery process, that in itself would be a worthwhile objective. However, the argument that regression can explain our results is tenuous, given that the published findings from the treatment vs waiting-list control group phase of our study demonstrated benefit in the treatment group that was significantly and substantially greater than any naturally occurring changes in the control group over the same time period [53]. Given that cancer patients' distress levels are often greatest soon after diagnosis, the relatively long mean latency between initial diagnosis and enrollment in our program (3 years) also is also an

argument against a regression-based explanation for our patients' improvement.

Compared with other studies that have also used the POMS to assess improvement in group interventions, our patients improved as much or more. Fawzy et al. [19] found a reduction of 26 points (42%) on the POMS TMD score after melanoma patients participated in a 6-week multimodal group psychosocial intervention, while Cunningham et al. [11] found a similar improvement post-intervention in breast cancer patients, also of 26 points, but representing a 71% improvement due to lower initial distress levels. A more recent study of a 12-session cognitive-behavioral intervention for metastatic breast cancer patients found only a 9.4-point improvement on the TMD, but because initial scores were lower than in our sample that change still represented a 41% improvement from baseline [16]. Thus, our finding of a 47% reduction in total mood disturbance compares favorably with previous research. It is also interesting to note that most improvement occurred over the initial 7 weeks of the program, with little additional improvement over the subsequent 6 months. Unfortunately, we did not measure the degree to which participants continued to practice meditation after the intervention, which may have been a factor in continuing improvement. As well, the measures chosen focused on negative mood states, following a deficit model, and did not assess possible positive outcomes that may have been associated with the intervention and continued practice of mindfulness.

The program we offered proved beneficial overall, even though the participants were a wide range of ages, and had a variety of diagnoses and range of severity of their illness. This suggests that population heterogeneity does not preclude utilization of this intervention; an important distinction to note at a time when homogeneity of support groups is becoming more the norm (e.g. [20, 55]). However, it is likely that self-selection of participants in our study resulted in a sample of cancer patients who were well motivated to pursue new learning and to adhere to practice recommendations. Thus, the generalizability of the findings may be limited with respect to motivational factors, but the results show that the program can be beneficially offered to those who show a desire to participate.

In summary, as evidenced by this study, this program of mindfulness-based stress reduction effectively reduced total mood disturbance and specific symptoms of anxiety, depression, anger, fatigue and confusion. These benefits persisted over the 6-month follow-up period. This occurred in a diverse population of cancer outpatients with a variety of diagnoses and stages across a wide spectrum of ages for both genders. It also enhanced feelings of vigor in this population, and decreased a wide variety of symptoms of stress, particularly depression and anger. Predictors of changes in mood and stress symptoms were evaluated. The diversity in the sample strengthens the generalizability of these findings, and future research may be beneficially applied to pinpointing the most effective aspects of the intervention and helping to distinguish its effects from those of other programs utilizing similar techniques.

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