Weathering storms: a cohort study of how participation in a mindfulness-based stress reduction program benefits women after breast cancer treatment

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ABSTRACT

Introduction

A growing number of psychosocial interventions are being offered to cancer patients during and after their medical treatment. Here, we examined whether Mindfulness-Based Stress Reduction (MBSR), a stress management course, helps women to cope better with stress and illness once their breast cancer treatment is completed. Our aim was to understand how MBSR may benefit those who participate in the course.

Methods

Our cohort study enrolled 59 women in an 8-week MBSR program. They completed "before and after" questionnaires pertaining to outcomes (stress, depression, medical symptoms) and process variables (mindfulness, coping with illness, sense of coherence). Paired *t*-tests examined changes from before to after the MBSR course. Changes in mindfulness were correlated with changes in post-MBSR variables, and a regression analysis examined which variables contributed to a reduction in stress after program participation.

Results

Adherence to the program was 91%. Participants reported significant reductions in stress ($p < 0.0001$), depression ($p < 0.0001$), and medical symptoms ($p < 0.0001$), and significant improvements in mindfulness ($p < 0.0001$), coping with illness ($p < 0.0001$), and sense of coherence ($p < 0.0001$). Changes in mindfulness were significantly related to changes in depression, stress, emotional coping, and sense of coherence. Increases in mindfulness and sense of coherence predicted reductions in stress.

Conclusions

It appears that learning how to be mindful is beneficial for women after their treatment for breast cancer.

KEY WORDS

Stress management, breast cancer, meditation, MBSR

1. INTRODUCTION

The crisis of a cancer diagnosis and the difficulties associated with surgery, chemotherapy, and radiation are readily acknowledged, but less attention has been paid to the challenges confronting women who have already completed breast cancer treatment. It might be surmised that they feel relieved and ready to return to daily activities, but few realize how hard that return often is [1–3]. These women may need to sort out their priorities and interpersonal relationships. Perhaps they succeeded in harnessing their energy effectively to meet the demands of medical procedures and had the social support of the medical staff, family, and friends during treatment, but were then caught "off guard" with feelings of isolation and anxiety "once it was over."

The diagnosis and treatment of cancer is an acute aspect of illness appropriately treated in tertiary care; recovery, which demands confronting the chronic nature of the disease, does not have a set place in the health care system to facilitate that confrontation. The coping skills required in these two phases of illness are different, and women may find themselves struggling to deal with new, unexpected storms after treatment. The diagnosis and treatment of cancer might be considered to be similar to Selye's classic stress "alarm stage," with post-treatment as the "recovery" from an extremely stressful life experience.

When patients are "discharged" from medical care, they may be faced with many unresolved existential questions pertaining to the meaning of life and its manageability and comprehensibility [3]. Ruminations—that is, repetitive thoughts—about the past or future may clutter their minds; they may wonder whether stress contributed to their disease or worry about how returning to work might affect their health. Some may experience depression [4]—with its concomitant symptoms of low energy, insomnia, lack of appetite or sexual desire—and sadness. Women can

feel uncomfortable in their own bodies, which may be scarred, changed in shape or ability.

A psychosocial program titled Mindfulness-Based Stress Reduction (MBSR), designed at the University of Massachusetts Medical Center[5] for patients with chronic pain and other chronic illnesses, shows promise in helping women who have completed medical treatment for breast cancer to cope with the aftermath of that medical treatment[6–9]. In Canada, the psychosocial team at the Tom Baker Cancer Centre in Calgary, Alberta, has published numerous studies showing improvements in stress-related symptoms, mood, and quality of life in patients with various types of cancer and at various stages of disease[10–13]. What remains unclear are the underlying mechanisms for the benefits shown thus far.

Mindfulness-Based Stress Reduction differs from support groups in that information and advice concerning cancer are not provided *per se.* It also differs from group psychotherapy in that the instructor does not provide interpretations or encourage an exploration of past issues. For patients making the transition back into their "normal" lives, MBSR may help in several ways. Mackenzie *et al.*[14] conducted a qualitative study of effects of MBSR with a mixed group of cancer patients, noting five major themes:

- Openness to change
- Self-control through self-awareness
- Shared experience
- Personal growth
- Spirituality

Those findings underscore the idea that MBSR addresses the more existential issues that arise in people living with cancer.

Because rumination can be a source of internal stress, it is logical that a reduction in this cognitive style may mediate the benefits of MBSR[15]. Jain *et al.*[16], in a randomized clinical trial of MBSR with nursing and medical students, supported that hypothesis: Those in the mindfulness training group showed significant reductions in rumination.

Mindfulness meditation is one means by which a person can learn to accept what is in the present moment, not to react in a conditioned way, and to cope effectively by facing rather than avoiding current physical states, emotions, and thoughts[17]. To sustain this means of relating to the self, others, and situations (and thus allowing for a greater sense of coherence to emerge), the MBSR program encourages daily meditation practice.

Starting in the fall of 2006 and continuing through the winter of 2009, we offered MBSR to women who had completed breast cancer treatment. Our aims were to provide a service to those patients and to understand the processes underlying the potential benefits that have been shown after MBSR participation[18]. Thus, to the psychosocial instruments, we added measures pertaining to coping with illness, mindfulness, and sense of coherence.

2. METHODS

2.1 Procedures

Our cohort study used posters, pamphlets, and e-mail distribution of flyers to recruit women from university-affiliated hospitals and community organizations. Patients were referred by staff at those hospitals, or they themselves called after hearing about the program from another source—for example, another participant in MBSR. In the weeks preceding the start of the program, each patient came to the McGill Programs in Whole Person Care office to complete questionnaires (administered on computer) and to be interviewed by the course instructor (PLD) or by a clinical psychology postdoctoral student (RHM). The interview determined eligibility, addressed the appropriateness of the program for the potential participant, and obtained written informed consent. The study was approved by the Faculty of Medicine Institutional Review Board at McGill University. At the end of the program, women were asked to complete the same questionnaires in the same manner and were interviewed again to discuss pre–post MBSR results and topics related to the program itself. This exit interview also served as a means to encourage continued practice of meditation and yoga.

2.2 Participants

Participants were recruited into the study starting in September 2006 and ending in January 2009. Women were eligible to enrol if they were 18 years or older and had completed medical treatment for breast cancer. Participants with concurrent psychiatric disorders (for example, borderline personality, alcoholism) were excluded, because meditation may be contraindicated for them or full participation in the program may not have been possible. If a woman was considered depressed, she was instructed to talk with her physician and to seek appropriate care. These women were admitted into the program if they had the necessary support and were deemed able to concentrate and practice the types of meditation taught in the program. No one declined to participate in the study.

Using a power analysis[19], the sample size needed to find a moderate-to-large effect size was determined. Results indicated that a sample of 50 subjects would be sufficient to detect a difference of 0.5 standard deviation between standardized means (moderate effect size) using *t*-tests for a one-tailed test at an alpha level of 0.05 and a power of 0.80, and that 38 subjects would be needed to detect a difference of 0.70 standard deviation between standardized means (large effect size) using regression analyses

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with 4 variables in the model at an alpha level of 0.05 and a power of 0.80.

2.3 Intervention: MBSR Program

The MBSR program (described in Kabat–Zinn[5]) was provided by the same instructor (PLD) to 5 different groups of 10–15 women per group, who met weekly for 2.5-hour classes over 8 consecutive weeks to learn mindfulness meditation and stress management techniques. Patients received a home practice manual and 4 compact discs created by the instructor to teach these meditation practices: body scan, sitting meditation, hatha yoga, and meditation involving visual imagery. The structured classes progressively taught means of coping with stress through meditation practice and dialogue about the practice in and out of the group meeting setting. Participants were asked to complete specific home practice exercises for 45–60 minutes daily. As the program progressed, they could select the type of home practice that was most beneficial for them. "Informal practice" (integrating mindfulness into daily activities) was also included in home assignments. Participation in a 6-hour silent retreat day, provided after week 6, was part of the program; the retreat consolidates what is learned throughout the program.

2.4 Outcome Measures

2.4.1 Perceived Stress Scale-10
Perceived stress, as measured by the Perceived Stress Scale–10 (PSS-10), served as the primary outcome measure. The 10-item PSS scale was developed to measure, for the preceding month, the extent to which respondents appraise situations in their life to be stressful[20,21]. Each item is scored from 0 to 4, producing a global score that ranges from 0 to 40. Higher global scores indicate greater perceived stress. The PSS, designed for use in community samples, has been shown to have good internal validity and test–retest reliability. The mean score for women in the community is 14.

2.4.2 Center for Epidemiologic Studies Depression Scale
The 20-item Center for Epidemiologic Studies Depression Scale (CES-D) screens for depression and was developed for use with community populations[22]. The total score ranges from 0 to 60, with a higher score indicating more symptoms consistent with clinical depression. For the population at large, a score of 16 or more is a positive screen for depression. The CES-D has very good psychometric properties, with good internal validity and test–retest reliability.

2.4.3 Medical Symptom Checklist
The Medical Symptom Checklist lists medical symptoms that the patient may have experienced in the preceding month. It includes physical symptoms (for example, gastrointestinal, respiratory, pain) and psychosocial symptoms (for example, anxiety, sexual). Post MBSR, clinical trials and cohort studies have consistently demonstrated significant reductions in medical symptoms for patients with various medical conditions[23,24].

2.5 Process Measures

2.5.1 Coping with Health Injuries and Problems
Coping with Health Injuries and Problems (CHIP), a 32-item self-report questionnaire developed by Endler and Parker[25] has 4 subscales:

- Distraction, which refers to the use of actions and cognitions that are aimed at avoiding preoccupation with the health problem
- Palliative, which refers to engaging in self-care activities to alleviate the unpleasantness of the situation
- Instrumental, which refers to focusing on task-oriented strategies to deal with illness (for example, get information, follow medical advice)
- Emotional, which refers to the extent of the focus on the emotional consequences of the health problem (for example, ruminate, get frustrated)

Endler et al.[26] reported these mean (± standard deviation) scores for women with cancer ($n = 109$): distraction, 27.5 ± 5.8; palliative, 25.7 ± 5.2; instrumental, 33.1 ± 4.5; emotional, 23.6 ± 6.9. The CHIP has good reliability and validity, and it is considered a psychometrically sound measure of response to illness, applicable across diverse patient populations.

2.5.2 Sense of Coherence
The 29-item Sense of Coherence (SOC) questionnaire assesses the extent to which a respondent views their internal and external environments as structured, predictable, and manageable[27]. The SOC assesses 3 subscales:

- Comprehensibility, which refers an interpretation by respondents that the social world is rational, understandable, structured, ordered, consistent, and predictable
- Manageability, which involves the extent to which respondents consider their coping resources to be available and adequate to deal with life's challenges
- Meaningfulness, which determines whether respondents appraise a situation as challenging and worth investing in or making a commitment to cope with

Respondents rate the SOC items on a 7-point Likert scale, with higher scores indicating greater degrees of comprehensibility, manageability, and meaningfulness. The SOC has good internal validity and good test–retest reliability. It has been used extensively

in the study of health and well-being [27]. In women, total scores on the SOC range from 100.50 ± 28.50 to 160.50 ± 17.10 [28].

2.5.3 Mindful Attention Awareness Scale

Brown and Ryan [29] developed the 15-item Mindful Attention Awareness Scale (MAAS) to measure mindfulness, defined as a present-centered attention to, and awareness of, accessible experiences (that is, internal and external events). It has been shown to be inversely related to rumination (mental preoccupation with the past or future), reported physical symptoms, and somatization [16]. Scores on the MAAS range from 1 to 6, with higher scores reflecting greater degrees of mindfulness. The average MAAS score for a community sample is 4.22 ± 0.63 [30].

One study [29] used the MAAS before and after a MBSR program for patients with cancer, finding that higher MAAS scores were related with less distress and fewer stress-related symptoms. The mean score of the MAAS for cancer patients ($n = 122$) was 4.08 ± 0.74. Compared with the score for individuals in the community, that score was half a standard deviation lower. Carlson and Brown [31] examined the psychometric characteristics of the MAAS with cancer patients and found that it was valid, with a single factor structure.

2.6 Statistical Analyses

To determine whether changes in the outcome and process variables were statistically significant pre–post MBSR, paired-sample t-tests were performed. To assess the relative magnitude of the treatment effect for each outcome and process variable, effect sizes were calculated; for effect sizes, values of Cohen's d of 0.5 to 0.8 are considered to be medium, and values over 0.8 are considered to be large [19]. To calculate the Cohen's d effect size, the pre-MBSR mean was subtracted from the post-MBSR mean and divided by the pooled standard deviation of that variable. Next, correlation coefficients were computed to examine the associations between MAAS change scores and the remaining MBSR process and outcome change scores. Finally, we used a hierarchical regression that controlled for the effects of age and time since completion of treatment to predict the main outcome (PSS change score) using 2 process variables. Thus, the PSS change scores were first regressed on age and time since completion of treatment in Block 1, and then on the MAAS change score and the SOC total change score in Block 2. All statistical analyses were performed using the SPSS software package (version 11.0: SPSS, Chicago, IL, U.S.A.).

3. RESULTS

3.1 Participants

Figure 1 shows the participant flow. A total of 63 women provided written consent to enrol in the study
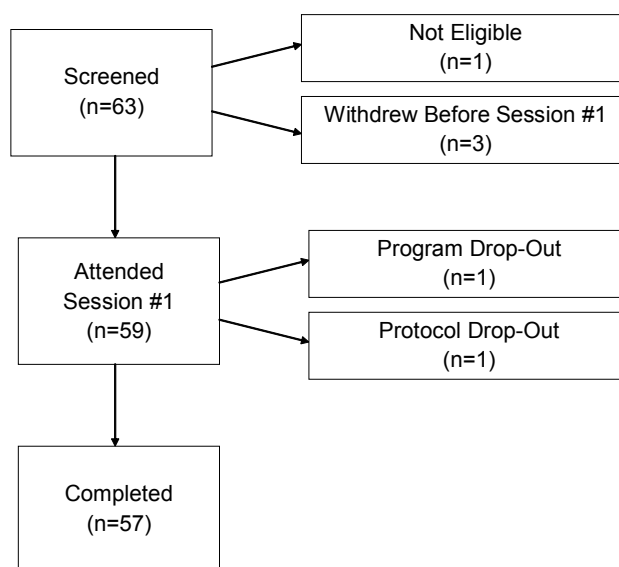

FIGURE 1   Participant recruitment and attendance. Program drop-out: One woman dropped out of the Mindfulness-Based Stress Reduction (MBSR) program but returned to provide post-MBSR data. Protocol drop-out: One woman dropped out of the study and did not return, thus failing to provide post-MBSR data.

and completed the screening interview. One woman failed to meet the eligibility criteria, and 3 withdrew (citing lack of time or scheduling conflicts) before the program commenced; thus, 59 women began the program. One woman dropped out after the 6th MBSR session, but returned to provide post-MBSR data (Program Drop-Out). Another woman dropped out of the study after the 2nd session and did not return, thus failing to provide post-MBSR data (Protocol Drop-Out).

Table I shows the participant demographics. Average age was 56.4 ± 10.2 years (range: 28–79 years). All had a high school education or above, and most women had presented with early-stage breast cancer (39/59, 66.1%). In 12 women (20.3%), cancer stage was unknown either because they did not know the stage ($n = 5$) or because they could not be reached after completion of the study for that information ($n = 7$). Time since completion of breast cancer treatment was, on average, 28.9 ± 58.8 months (range: 2–340 months).

3.2 Attendance

The average number of MBSR classes attended was 8.2 ± 1.13 (of 9); attendance was 90.9%. The mean number of hours attended was 23.84 ± 3.25 (of 26 hours in total).

3.3 Changes in Outcome and Process Variables Pre–Post MBSR

As seen in Table II, differences in scores reached statistical significance for most variables. Some outcome

measures showed significant change (decrease) after correction for multiple testing (Bonferroni correction with $\alpha = 0.05$ and 12 tests yielded a corrected $p = 0.0042$): depressive symptoms ($p < 0.0001$), perceived stress ($p < 0.0001$), and medical symptoms ($p < 0.0001$). Significant changes were also found in the process

TABLE I   Participant ($n = 59$) demographics

Variable	Value
Age (years)	
Mean	56.4±10.2
Range	28–79
Time since completion of	
breast cancer treatment (months)	
Mean	28.9±58.8
Range	2–340
Years of education [n (%)]	
High school leaving	7 (11.9)
College degree	13 (22.8)
Undergraduate degree	26 (44.1)
Master's degree	9 (15.3)
Doctorate	4 (6.8)
Cancer stage [n (%)]	
Stage 0	2 (3.4)
Stage 1	17 (28.8),
Stage 2	20 (33.9).
Stage 3	2 (3.4)
Stage 4	6 (10.2)
Unknown	12 (20.3)

measures of distraction coping (increased, $p < 0.001$); emotional coping (decreased, $p < 0.0001$); and mindfulness, comprehensibility, meaningfulness, and total sense of coherence (all increased, all $p < 0.0001$).

Correlation coefficients were computed to examine the associations between MAAS change scores and the changes in process and outcome variable from pre- to post-MBSR. Using the Bonferroni approach to control for type 1 error across the 36 correlations, a p value of less than 0.0014 was required for significance.

The results of the correlation analyses revealed several statistically significant correlations (see Table III). Most notably, increases in mindfulness scores were related to reductions in stress ($p < 0.0001$), depression ($p < 0.0001$), and emotional coping ($p < 0.0001$) and to increases in total sense of coherence ($p < 0.0001$).

Hierarchical regression was then performed to predict the main outcome (PSS change score) using 2 process variables. As shown in Table IV, the results of the hierarchical linear regression analyses, with age and time since completion of treatment forced into the model as covariates, revealed that neither of these potential confounders predicted a reduction in stress $F_{2,56} = 0.814$, $p = 0.449$. However, when, in the next step, the model included the MAAS change score and the SOC total change score, the model reached significance, accounting for 43.7% of the adjusted variance in the prediction of the change in stress: $F_{4,56} = 11.858$, $p < 0.0001$.

4. DISCUSSION

As occurred in studies pertaining to the benefits of MBSR for patients with other types of chronic illness [32],

TABLE II   Impact of the Mindfulness-Based Stress Reduction program on outcome and process measures ($n = 57$)

Variable	Mean score		Difference	d	t	p
	Pre-program	Post-program		Value	Value	Value
Outcome measures						
Depression	16.30±9.91	10.26±7.56	6.04	0.57	4.25	0.0001
Perceived stress	17.95±6.05	14.07±6.17	3.88	0.64	4.83	0.0001
Medical symptoms	19.77±12.08	11.96±7.99	7.80	0.77	5.46	0.0001
Process measures						
Mindful awareness	3.91±0.82	4.35±0.68	0.44	−0.77	−5.59	0.0001
Distraction coping	26.23±5.49	28.25±5.75	2.02	−0.47	−3.51	0.001
Palliative coping	23.72±4.39	24.25±3.94	0.53	−0.14	−1.08	0.286
Instrumental coping	33.68±5.07	33.21±5.67	0.47	0.13	1.00	0.320
Emotional coping	22.91±7.07	19.84±6.66	3.07	0.54	4.07	0.0001
Comprehensibility	42.74±8.89	46.67±6.80	3.93	−0.54	−3.96	0.0001
Manageability	47.89±7.80	49.67±6.19	1.77	−0.27	−1.96	0.055
Meaningfulness	42.93±7.32	46.18±6.72	3.25	−0.62	−4.62	0.0001
Sense of coherence (total)	133.56±19.61	142.51±15.08	8.95	−0.52	−4.51	0.0001

Bonferroni correction = α/n, where $\alpha = 0.05$ and n = number of tests (12) = 0.00417.

TABLE III   Correlations between change in mindfulness and change in other Mindfulness-Based Stress Reduction outcome and process measures

Variables	Mindful awareness	Depression	Perceived stress	Medical symptoms	Distraction coping	Palliative coping	Instrumental coping	Emotional coping	Sense of coherence (total)
Depression	−0.517[a]	—	0.712[a]	0.616[a]	−0.345	−0.057	−0.134	0.419[b]	−0.683[a]
Perceived stress	−0.514[a]	0.712[a]	—	0.569[a]	−0.429[b]	−0.084	−0.256	0.411[b]	−0.635[a]
Medical symptoms	−0.273	0.616[a]	0.569[a]	—	−0.422[b]	0.032	−0.069	0.434[b]	−0.561[a]
Distraction coping	0.287	−0.345	−0.429[b]	−0.422[b]	—	0.104	0.161	−0.419[b]	0.567[a]
Palliative coping	0.141	−0.057	−0.084	0.032	0.104	—	0.265	0.081	0.035
Instrumental coping	0.210	−0.134	−0.256	−0.069	0.161	0.265	—	−0.047	0.144
Emotional coping	−0.506[a]	0.419[b]	0.411[b]	0.434[b]	−0.419[b]	0.081	−0.047	—	−0.517[a]
Sense of coherence (total score)	0.541[a]	−0.683[a]	−0.635[a]	−0.561[a]	0.567[a]	0.035	0.144	−0.517[a]	—

[a] $p < 0.0001$.
[b] $p < 0.001$.
Bonferroni correction = α /n, where α = 0.05 and n = number of tests (36) = 0.0014.

TABLE IV   Hierarchical regression analysis results for Perceived Stress Scale–10 change score

	R	R^2	Adjusted R^2	Sum of squares	F Change	Significance F Change	df	Mean square	F
Regression[a]	0.171	0.029	−0.007	60.158	0.814	0.449	2	30.079	0.814
Residual				1995.983			54	36.963	
Total				2056.140			56		
Regression[b]	0.691	0.477	0.437	980.833	22.261	0.000	4	245.208	11.858[c]
Residual				1075.307			54	20.679	
Total				2056.140			56		

[a]   Predictors: time since completion of breast cancer treatment, age.
[b]   Predictors: time since completion of breast cancer treatment, age, sense of coherence total change score Mindfulness-Based Stress Reduction (MBSR), Mindful Attention Awareness Scale (MBSR) change score.
[c] $p < 0.001$.

we found that the women in our study experienced reductions in stress, depression, and medical symptoms. With regard to perceived stress, their scores were above and below the norm pre- and post-MBSR respectively. Lengacher et al.[7] used the same stress measure and found that breast cancer patients randomized to a MBSR program who completed more meditation practice had larger reductions in perceived stress than did those who practiced less. In the present study, the group mean for depressive symptoms were at the "cut-off for case status" pre-MBSR and were below that level post-MBSR. As in other reports[24], medical symptoms were reduced.

With regard to process variables, mindfulness increased significantly from pre- to post-MBSR. That finding differs from the findings of Brown and Ryan[29] and Witek–Janusek et al.[33] who failed to find changes over time using the same questionnaire. Be that as it may, Carlson and Brown[31] reported that higher levels of mindfulness were related to lower levels of mood

disturbance and stress both before and after MBSR in 122 cancer outpatients. [We examined correlations for mindfulness with depression and stress pre–post MBSR and found the same result (data not shown).] Notably, increased mindfulness was one of the predictors of reductions in stress.

Sense of coherence (total SOC score) increased significantly over time. Only one other group, Shapiro et al.[34], used this measure in an investigation of MBSR with breast cancer patients. In their randomized clinical trial with repeated measures taken at baseline, 1 week, 3 and 9 months post MBSR, no changes were evident. However, Weissbecker et al.[35] reported significant increases in sense of coherence in a randomized clinical trial of MBSR for patients with fibromyalgia, a chronic pain condition. Their means for the total SOC score pre- and post-MBSR were similar to ours [pre-MBSR: 130.51 in the treatment group, 132.42 in the control group for patients with fibromyalgia (Weissbecker), and 133.56 in our group; post-MBSR:

139.54 in the treatment group, 130.08 in the control group for patients with fibromyalgia (Weissbecker), and 142.51 in our group]. Furthermore, Weissbecker *et al.* [35] found a positive, significant association between meditation practice and sense of coherence.

Antonovsky [27] purported that sense of coherence is a stable disposition, but that notion has been challenged [36,37]. Indeed, major life stressors, such as diagnosis and treatment of cancer, could be events that affect a person's views about life meaning, for better or for worse. The MBSR, program designed to help patients reduce stress and cope better with illness, has the potential to affect SOC by enabling patients to reappraise stressors, to acquire adaptive coping skills, and to find meaning through the experience of having cancer. Antonovsky [27] purports that individuals with high SOC scores are more flexible when stressful events occur—they are more aware of their emotions and feel less threatened by them. The fact that an increase in total sense of coherence predicts reductions in stress supports this idea. Furthermore, individuals with a high sense of coherence manage tension better, which can positively affect their health status [27]. This hypothesis is supported by the reductions in medical symptoms found in the present study (as well as by the significant correlation between changes in SOC scores and changes in medical symptoms) and the reductions in stress-related symptoms consistently reported by the Carlson group in Calgary.

Garland [38] published a theoretical article about how mindfulness may lead to stress reduction. Our data fit with the notion that being mindful enables a "reappraisal" of stressors (for example, seeing illness as an opportunity for growth rather than as a threat) and inhibits the use of maladaptive coping strategies (for example, worry). Garland called this process "decentering," which is defined as the capacity to observe thoughts and feelings without identifying with them. Depressed patients have been shown to increase their capacity to "decenter" from "depressogenic" thoughts after Cognitive–Behaviour Therapy and after Mindfulness-Based Cognitive Therapy [39,40], a variant of MBSR designed for patients with a history of recurrent depression. The significant post-MBSR reductions in depressive symptoms found in the present study are consistent with the findings of others. In fact, a score of more than 15 was seen in 26.3% of our cohort post-MBSR as compared with 45.6% pre-MBSR.

In line with the notion that MBSR helps patients to cope better with illness, distraction and emotional coping were the two coping styles that changed significantly.

The distraction score measures engagement in activities that prevent the mind from dwelling on illness (that is, avoidance is not measured *per se*). Thus, program participants had more opportunity to engage in other meaningful aspects of life. More engagement does not mean that they "forgot about it all" (that is,

the cancer experience); rather, the change in score reflected a change toward being a person rather than a patient and not allowing illness to intrude on life.

The emotional coping score measures rumination about illness and feeling overwhelmed by symptoms or the aftermath of treatments. Mindfulness meditation encourages people to let go of those preoccupations by seeing the impermanent nature of internal (thoughts, feelings, bodily sensations) and external events (treatment starts, treatment ends). The MBSR program teaches patients to respond rather than to react to events in the present moment. For example, if a person feels pain, breath can be used to help relax muscles. The practice of yoga can be used to regain strength and stamina and to accept the body as it is now. A body scan can be used to relieve insomnia [34] (a common problem after cancer treatment). In line with this reasoning, Grossman *et al.* [41] found that women with fibromyalgia were better able to cope with pain both immediately after MBSR and 3 years later. The significant correlation found between increases in mindfulness and decreases in emotional coping suggest that these two processes were helpful for the women in our study, at least in the short term.

Only a few other studies of MBSR have included a measure of coping. Tacon *et al.* [42] used the Problem-Focused Styles of Coping questionnaire and found significant reductions in reactive and suppressive coping in 30 women with breast cancer. Witek–Janusek *et al.* [33] administered the Jalowiec Coping Scale, which measures the use and efficacy of various coping behaviours. Effectiveness of 2 of 8 subscales, "optimistic" (that is, positive outlook) and "supportant" coping (that is, use of support systems) were significantly higher in women randomized to the MBSR group than in women randomized to the control group. However, that measure is not as specific to coping with illness as the one we used is.

Thus, although the design of the present study does not allow for a conclusion that the positive effects are directly attributable to participation in MBSR, our results are similar to those from randomized clinical trials that can make that claim [7,11]. Sample size restricted the number of variables that we could enter into the regression analyses, and thus we entered only those variables that, theoretically, were the logical choice. Moreover, we were cognizant of the interrelationship between variables and took those interrelationships into account in the selection of variables for the regression analysis. Other limitations of the present study include its lack of a control group and long-term follow-up, and the narrow range of participants (for the most part, highly educated Caucasian women), both of which affect external validity.

It appears that people who are open to this type of program, with mindful meditation as a main component, can learn how to cope better with stress and the aftermath of illness. Thus, in breast cancer

patients discharged from medical treatment, MBSR may fill a health service gap, possibly allowing these patients to learn to navigate and stay afloat in what may seem to be the large and small waves of their transformed lives.

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