



Mindfulness-based stress reduction: What processes are at work?

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Summary Mindfulness-Based Stress Reduction (MBSR) is a program that has been shown to be beneficial for clinical and non-clinical populations. While much attention has been paid to participants' outcomes, little work has been published concerning processes underlying improvements. Herein, women who had finished medical treatment for breast cancer completed questionnaires pre- and post-MBSR and were interviewed using focus group methodology such that quantitative and qualitative data were combined to explore potential mechanisms underlying changes. It was found that the Mindfulness Attention Awareness Scale was a useful process measure to assess changes in mindfulness and that the Coping with Health Injuries and Problems questionnaire was useful in documenting changes in palliative (self-care) coping over the course of the 8 week program. Moreover, the Sense of Coherence questionnaire suggested that the women viewed life as more meaningful and manageable following MBSR. Our findings fit with Shapiro et al.'s theory that, over time, participants in an MBSR program "reperceive" what they encounter in their daily experiences.

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Introduction

Mindfulness-Based Stress Reduction (MBSR), a clinical program developed over 25 years ago has gradually gained recognition as an important means of teaching people how to live their lives fully whether they are patients with chronic illness,¹ health professionals,² community members dealing with the stressors inherent in life,^{3,4} students,^{5,6} prisoners, or priests. Interest in MBSR has grown in

the clinical and the research communities.⁷ The literature is replete with articles documenting outcomes from observational studies, randomized clinical trials, as well as theoretical discussions pertaining to the construct "mindfulness", its impact on mental and physical health, as well as its measurement.⁸

Given that several review articles have been published with regard to the benefits associated with MBSR^{9–11} as well as potential mechanisms for change,^{10,12} herein the focus extends beyond outcomes in an attempt to comprehend what arises in between pre- and post-program assessments.

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Relatively little attention has been paid to process variables related to MBSR.¹³ That is, what changes during participation in the program? Do individuals become more mindful? Do they modify how they cope with stressors? Is their world view altered (e.g., Do they see life as more manageable)? Clearly, because the development of measures of mindfulness has lagged behind efficacy studies⁸ this remains to be established, as does the relationship between such changes and outcomes.¹¹ Moreover, while some researchers have documented practice (usually in terms of frequency and/or duration^{11,14}), the study of adherence to practice of various forms of meditation taught in MBSR is generally cursory.¹⁵ Furthermore, it is unknown if it is the quantity or quality of meditation practice that is instrumental in effecting changes.¹⁶ Importantly, it is likely that if and how one integrates mindfulness into daily life (i.e., “informal practice”) is critical to healing. This latter point is relevant to the choice of instruments used to measure mindfulness in that a tool that captures both “on and off the cushion” mindfulness is needed.

Researchers have reported data pertaining to adherence as it relates to the program’s core practices (body scan, yoga, sitting meditation).¹⁷ Some are based on retrospective reports that participants provide upon completion of the MBSR program using the University of Massachusetts Stress Reduction clinic follow-up questionnaire; others request that participants keep a diary of their practice.¹⁸ Thus far, this has been the main process variable addressed. Occasionally it has been related to outcomes; for example, Astin⁵ did not find a correlation between the reduction in psychological distress and time spent meditating in undergraduate students; but the average time of practice was only 30 min per day, 3.5 days per week which was considerably less than what was “prescribed” (45 min per day, 6 times per week). Specia et al.¹ employed the variable “number of sessions attended” and found that it was the best predictor of improvements in stress-related symptoms (accounting for 13.2% of the variance) in cancer patients.

As for measurement of “mindfulness”, there has been progress with regard to new approaches. Baer et al.¹⁹ developed the Kentucky Inventory for Mindfulness Skills; Brown and Ryan⁸ developed the Mindfulness Attention Awareness Scale (MAAS); Lau et al.²⁰ developed the Toronto Mindfulness Scale; Buchheld et al.²¹ developed the Freiburg Mindfulness Inventory; and Feldman et al.²² have developed the Cognitive Affective Mindfulness Scale. Each tool has its strengths and limitations.

For example, the Toronto Mindfulness Scale cannot be used outside mindfulness training and the Freiburg Mindfulness Inventory is designed for experienced meditators and those attending meditation retreats. The research team in Calgary, Canada, in collaboration with Brown and Ryan,⁸ used the MAAS with 41 early-stage breast ($n = 32$) and prostate cancer ($n = 9$) patients who participated in a MBSR program.

It was hypothesized that changes in MAAS-measured mindfulness would predict pre- to post-MBSR changes in emotional distress and stress. The results showed that even though the MAAS scores did not change significantly from pre- to post-MBSR, increases in mindfulness predicted a decrease in psychological distress and a decline in stress and stress-related symptoms. This instrument thus shows promise with regard to use as a process measure.

Exploration of process in MBSR

We provided MBSR to 13 women who had completed medical treatment for breast cancer. They were recruited from two university affiliated hospitals, signed an Informed Consent form and agreed to participate fully in all aspects of the program at the pre-program individual interview. The average age was 54 years old (range = 37–70 years), all except two held university degrees. All but one had completed treatment for breast cancer within the past year or two; half had undergone all three types of treatment (chemotherapy, radiation therapy, surgery).

Our aim was to pilot test the use of process measures. We also ran focus group discussions with the women one month following the last class in order to ascertain their views on the program, mindfulness, and its application to their lives. Thus, we decided *a priori* to complement quantitative with qualitative data.

Quantitative data

The following questionnaires were administered before and after the MBSR program:

Outcome Measures

Center for Epidemiologic Studies Depression Scale (CES-D). This questionnaire is a screen for depression developed for use with community populations.²³ Scores can range from 0 to 60; a higher score indicates more symptoms consistent with clinical depression. For the population at large, a

score of 16 or more indicates a positive screen for depression. For patients with active disease (or chronic pain), usually the cut score is 19²⁴ given the overlap of some symptoms stemming from disease and those of depression (e.g., fatigue). This instrument was used for two reasons. First, it enabled the interviewer to probe, if the score was elevated, to ensure that the potential participant was able to engage in the program. MBSR has been shown to be useful when provided in the Mindfulness-Based Cognitive Therapy format for patients with a positive history of depression,²⁵ when they are in remission. Relatively little is known with regard to the appropriateness of MBSR for currently depressed patients.

Medical Symptom Checklist (MSCL). This checklist has been used by Kabat-Zinn and his colleagues. Many other researchers have adopted its use, facilitating direct comparisons across studies. Research has demonstrated consistently that post-MBSR, there are significant reductions in medical symptoms for patients with various medical conditions.^{1,26,27}

Perceived Stress Scale (PSS). This 10-item questionnaire taps into a person's sense that life events are overwhelming and not in their control.²⁸ The mean score for women in the community is 14. Given that the MBSR program aims to assist participants in reducing their reactivity to stress, it is desirable to measure participants' perception of stress prior to and after the program.

Process measures

Coping with Health Injuries and Problems (CHIP). This instrument was employed as a process measure in that we expected that there would be an increase in use of palliative strategies and decrease in use of emotional preoccupation post-MBSR. The CHIP, developed by Endler and Parker,²⁹ has four subscales; they are:

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

In one study, Endler et al.³⁰ reported the following mean (SD) scores for women ($N = 109$)

with cancer: Distraction = 27.5 (5.8); Palliative = 25.7 (5.2); Instrumental = 33.1 (4.5); Emotional = 23.6 (6.9).

Orientation to Life Questionnaire. The construct sense of coherence (SOC) refers to the global orientation of an individual, i.e., appraisals of the world, characterized by comprehensibility, manageability, and meaningfulness. Antonovsky³¹ proposed that SOC is a stress resistance-resource which protects from the detrimental effects of stressors on health and thus helps people maintain or improve their position on the health/disease continuum. It has three components:

- *Comprehensibility* refers to when the social world is interpreted as rational, understandable, structured, ordered, consistent, and predictable.
- *Manageability* is the extent to which an individual considers their coping resources to be available and adequate to deal with life's challenges.
- *Meaningfulness* concerns a motivational component that determines whether a situation is appraised as challenging and justifies making commitments.

For data analysis, one sums the three subscales to obtain a total SOC score, as Antonovsky³¹ proposed that it is one construct. Kabat-Zinn³² interpreted increases in this construct as reflecting changes beyond symptoms; i.e., people's views regarding their sense of self and self-in-representation are transformed in a salutogenic direction.

Mindful Attention Awareness Scale (MAAS). Brown and Ryan^{8,33} developed the MAAS to reflect their view that mindfulness involves a present-centered attention to and awareness of all accessible events and experiences (i.e., internal and external events). We included the MAAS as a process measure given that the program teaches many different practices that are likely to increase mindfulness. It has been shown to be inversely related to rumination (preoccupation with the past and/or future), reported physical symptoms, and somatization.⁸

One study (cited in Brown and Ryan⁸) used this measure pre- and post-MBSR for patients with cancer. It was found that higher MAAS scores were related to less distress and stress-related symptoms. The mean (SD) score of the MAAS cancer patients ($N = 122$) was 4.08 (.74); this score was one-half a SD lower than individuals in the community. Carlson and Brown³⁴ have examined the psychometric characteristics of this measure with cancer patients and found that it was valid and has a single factor structure.

Results

Changes in outcome and process variables pre- to post-MBSR

To determine the magnitude of change experienced by women for each outcome and process variable, effect sizes (ES) were calculated.³⁵ To determine whether changes were statistically significant, paired *t*-tests (bearing in mind these statistics depend on the sample size) were used.

Table 1 presents the pre- and post-MBSR means and standard deviations (SD), with associated ES, *t*-statistics, and *p*-values. ES were in the small (0.20) to medium (0.50) range, with differences in scores being statistically significant for some variables. We found that women showed changes in the use of palliative coping (ES = −0.46) and mindfulness (ES = −0.52). However, the increase in the use of palliative coping was only marginally significant (*p* = 0.095). As expected, the women experienced decreases in perceived stress (ES = 1.17) and medical symptoms (ES = 0.73). Depressive symptoms also decreased with an ES of 0.57; yet this result did not reach statistical significance (*p* = 0.136).

MBSR Follow-up Questionnaire with regard to practicing meditation and yoga

When asked if they were still meditating following the MBSR course, all but 2 responded yes; five of

whom noted, “everyday”, six of whom noted, “three times or more per week”; duration varied from 30 min or more (*n* = 3), 15 to 30 min (*n* = 6), or less than 15 min per practice (*n* = 2). All but two indicated that they continued to practice yoga. All indicated that they used awareness of breath throughout the day (12 responded, “often”, one responded, “some of the time”).

Qualitative data and analysis

Two focus group meetings were facilitated by a health psychologist. Patients were asked six questions in the order presented in Table 2. Prior to question 3, patients discussed the stressors in their lives; this facilitated their focus on aspects of the program that helped them to deal with stressors. All six questions were developed following an initial consultation with the author. Patients were given approximately 15 min to discuss each question. All sessions were audio-taped, and later transcribed for data analysis. For the purpose of this paper responses to questions 1, 2, 3, and 6, are highlighted.

The interviews were transcribed verbatim, manually coded, and cross-verified by the moderator following a standard methodology described by Krueger.³⁶ Responses were first checked against notes taken during the focus groups. Second, the moderator read the transcripts in their entirety to get a sense of the entire group experience. Third, text responses were sorted, coded, and reviewed

Table 1 Impact of the MBSR program in women treated for breast cancer (*N* = 13).

	Change in variable scores				
	Pre-program	Post-program	Difference	Effect Size	<i>t</i> (<i>p</i> -values)
	Mean SD	Mean SD			
<i>Outcome & Process</i>					
CES-D [*]	19.77 (12.54)	12.62 (9.29)	7.15	0.57	1.60 (0.136)
CHIP [†] -Distraction	24.92 (4.52)	26.08 (7.10)	−1.16	−0.26	−0.92 (0.378)
CHIP-Palliative	23.69 (4.05)	25.54 (3.86)	−1.85	−0.46	−1.81 (0.095)
CHIP-Instrumental	35.85 (3.67)	35.0 (3.56)	0.85	0.23	1.09 (0.296)
CHIP-Emotion	22.23 (9.12)	20.85 (7.47)	1.38	0.15	0.78 (0.451)
PSS [‡]	20.62 (5.28)	14.46 (5.92)	6.16	1.17	3.17 (0.008)
MAAS [§]	3.98 (.87)	4.43 (.73)	−0.45	−0.52	−2.51 (0.028)
Medical symptoms	23.08 (13.34)	13.38 (8.11)	9.70	0.73	2.09 (0.059)
SOC Total	127.69 (15.76)	134.85 (16.8)	−7.16	−0.45	−1.43 (0.179)
SOC-Comprehensibility	39.44 (7.20)	42.54 (4.79)	−2.77	−0.38	−1.19 (0.259)
SOC-Manageability	46.92 (7.33)	48.38 (7.61)	−1.46	−0.20	−0.58 (0.571)
SOC-Meaningfulness	41.00 (8.07)	43.92 (8.23)	−2.92	−0.36	−1.78 (0.100)

Note: ^{*}CES-D = Center for Epidemiologic Studies-Depression Mood Scale; [†]CHIP = Coping with Health Injuries and Problems; [‡]Perceived Stress Scale; [§]MAAS = Mindful Attention Awareness Scale; ^{||}Orientation to Life Questionnaire (Sense of Coherence).

Table 2 Focus Group Interview Questions.

- 1 Tell me about your experience of the Mindfulness-Based Stress Reduction (MBSR) program
- 2 Explain to me how you used the MBSR program to cope with your illness
- 3 What was it about the MBSR program that helped you deal with the stressors in your life?
- 4 Tell me about aspects of the MBSR program that were most helpful to you
- 5 Tell me about aspects of the MBSR program that were most problematic to you
- 6 Explain to me what role mindfulness plays in your current life

through a continuous process of comparing data segments to other data segments across the groups, looking for similar or repeated ideas. The final step involved conceptualizing ideas as themes for each question. LaPelle's³⁷ method of analysis that employs Microsoft Word to transcribe, sort, and code the data was employed.

Identifying focus group themes

All patients who had completed the MBSR were invited to participate; 12 women provided written consent and were scheduled for a focus group session. In total, eight out of the 13 patients took part in the focus group session. Despite the small number of participants, themes recurred across the two sessions; these are presented in the following sections. Words included in brackets [] and italicized are those of the participants and were selected to highlight the themes identified.

Q1: Acceptance

When asked to describe their experiences with MBSR, participants largely spoke about their journey towards acceptance. Acceptance tended to occur through two processes. The first understanding that things are not necessarily how one wishes them to be.

This was eloquently described by one participant [*“What it has really given me is an understanding what it means to live in the present... It's helping me be more aware of the way things are... not as you wish things to be or how they were in the past”*]. The other process involved taking care of the self [*“It told me that I'm important... to take care of myself... I wish I had learned about this way before, even before my cancer”*].

By caring for the self, participants realized that they were as deserving of happiness as anyone else, i.e., they accepted themselves [*“the program helped me stabilize myself and...enjoy time that I had for myself and not feel guilty”*].

Q2: Regaining and sustaining mindful control

Participants spoke candidly about applying what they learned to regain and to sustain mindful control of their lives.

With regard to coping with illness, one woman stated, [*“I wish that I'd been part of this program at the beginning of my journey and not the end of my journey because it really taught me good coping skills, and while I was going through the cancer experience, I did not realize at the time that I was not coping. I was existing, I was going through the process without really...um... sitting back to think about my emotional well being.”*]

For some, the skills acquired were used to change attitudes [*“When I deal with everyday normal life with its ups and downs, many times I catch myself doing a mini meditation or breathing, so I cool it... the situation does not change, but I handle it better”*]. For others, the program enabled them to be more focused and aware of a potential loss of control [*“When I see some, feel some signs, I just stop and say, well do something for it”* AND *“... I always felt like I had ants in my body...do, do, do, do and go, go, go, go, you know... and I do not do this anymore.”*]. Participants spoke about being more mindful when eating, doing yoga, etc.

Q3: Taking responsibility for what could change

Participants saw possibilities for change. They offered examples of when taking responsibility led to feeling better about themselves. Participants referred to being mindful of what was in their power to change while acknowledging limitations. This tended to carry the added advantage of not feeling guilty when a given situation remained unchanged [*“I was trying to change the things that were stressing me, but it was like a losing battle so I had to change me”*]. Participants described having a better perspective of things and living in the moment, which made it easier for them to cope with the stressors in their lives [*“It allowed me to have a better perspective on the job and I think the question of living in the present and being able to step back and look at things and really figure out what are the priorities”* AND *“...it helps you turn off the automatic pilot”*].

Q6: Spirit of openness and connectedness

Participants spoke as much about the direct role of mindfulness in their current life as they did about its diffused impact. Whether they were able to pin point its impact or not, they expressed a spirit of openness in the sense that they remained aware during everyday events. [*"I got tools how to deal with my stress, how to sit down and peacefully breath"*].

Among those participants who described the role of mindfulness as being pervasive, it was clear that they endeavored to be watchful of how events and circumstances influenced their lives [*"It's changed my mindset completely. I'm much more conscious all the time of what I'm doing and why I'm doing it, and even if it's not right, at least I'm conscious"*].

Mindfulness, in general, infused courage [*"I won't give myself another alternative. I will fight whatever has to be dealt with. I will handle it"*] AND [*"It's kind of a courage in myself and I think to go on to the future and enjoy everyday"*].

Also worth noting was that participants felt that the group experience was an important aspect of the program [*"I also felt that the group experiences was very helpful for me... this is powerful in a group... and I don't think it would have been the same thing if I had done it with just one person"*]. There was a sense of a collective whole, a shared bond that transcended individual suffering. As one participant put it, "We are all sisters. I consider us sisters". They were open to each other.

Discussion

Our intention was to gain some insight into *the processes* underlying the benefits often reported following participation in an MBSR program. We used two methodologies to enrich our understanding as one informs the other and vice versa. The quantitative data indicate that the participants became more mindful, took better care of themselves, and tended to view life as more meaningful and manageable. Moreover, they reported a reduction in stress and in their medical symptoms.

These questionnaire-based findings were echoed in the focus group discussions. The women described weaving awareness of the present moment into their everyday lives. They spoke of feeling worthy of living their lives as fully as possible. They noted that they were better equipped to respond rather than react to stressors. At a deeper level, they came to an acceptance of what is. This latter point was not captured in the quantitative data.

The women's words suggest that the instruments we used to assess process were appropriate. Mindfulness on the MAAS increased; the women spoke of

being more mindful in their everyday lives. Palliative coping increased; the women described taking better care of themselves. SOC increased; they articulated how being mindful enabled them to be present to life's beauty and to manage its challenges.

When comparing our quantitative process findings with those reported in the literature, first we note that the only other work examining mindfulness with a clinical population, to our knowledge, was carried out in Calgary, Canada.

In that study with cancer patients there was not an increase in mindfulness (measured with the MAAS) from pre- to post-MBSR. Our results regarding SOC, which tended to increase over time, are similar to those reported by Weissbecker et al.³⁸ who provided MBSR to women with fibromyalgia and found that SOC increased following the program. However, Majumdar et al.,³⁹ working with a German sample of mixed diagnosis patients, did not find a change in SOC pre- to post-MBSR. Scores for that sample showed an increase of 3.5 points, whereas herein there was an increase of 7.2 points.

As for others' work regarding changes in coping, Astin et al.⁴⁰ study with fibromyalgia patients showed a reduction in catastrophizing on the Coping Strategies subscale. The women in the present study did not initially score high on the emotional preoccupation coping subscale (which is similar to catastrophizing); therefore, it is not surprising that scores did not decrease over time (i.e., we observed a floor effect). As for other potential cognitive mechanisms explored, Jain et al.⁴¹ in a randomized clinical trial comparing MBSR, relaxation training, and a wait-list control group, found that those who were in the MBSR group evidenced a significant reduction in rumination and distraction compared to the control group. Furthermore, the reduction in psychological distress found at post-MBSR was mediated by a reduction in rumination.

As for other qualitative work, Shapiro et al.² asked health professionals in their program, "What effects did the MBSR program have on your life?" Examples of responses, similar to those provided by women in our program were: "The most meaningful thing to me was looking into myself and becoming aware of just how important I am to me." AND "...I am more mindful of the beauty in nature and in each person I come in contact with." Majumdar et al.³⁹ conducted a brief telephone interview with patients ($N = 21$) and described similar themes, e.g., an enhanced sense of their responsibility towards their own health and disease. For instance, a patient stated, "I began living my life more

consciously, for example, in regard to how I coped with stress. I started to take a little time in situations to ask myself, how do I want to deal with this? How am I reacting to my environment?" Patients noted that they were able to transfer course elements into their daily lives.

Recently Mackenzie et al.⁴² used an individual semi-structured interview format to identify self-perceived effects of the MBSR program with nine cancer patients who continued to practice meditation in a "drop in" group and then they conducted a focus group with seven of the nine interviewees as well as three MBSR teachers. They found five major themes: opening to change, self-control, shared experience, personal growth, and spirituality. Some of these themes were identified herein. Importantly, these themes are consistent with the theory pertaining to mechanisms of mindfulness proposed by Shapiro et al.¹²

These authors posit that a meta-mechanism may be at work whereby "reperceiving"¹ develops over time. This may underlie benefits evident from MBSR. There are three elements to this theory: intention, attention, and attitude. With regard to intention, an individual's reason for practicing mindfulness meditation may change over time. First, the individual may seek to improve self-regulation (i.e., deal well with stressors, experience less depression, anxiety, pain, etc.); then, the individual may wish to explore the Self (i.e., "Who is this 'I' sitting here meditating?"); at some point, the individual may seek self-liberation (i.e., "dis-identifying", becoming free from the sense of being a separate self). As for attention, this refers to being aware, in the present moment, of internal and external experiences. Finally, attitude or the qualities one brings to attention are critical. Being kind to oneself, opening to experience, accepting of what is, cultivating patience, and not striving to achieve anything in particular are examples of helpful attitudes in the practice of mindfulness meditation.

With regard to intention, one way to determine this with the participants of MBSR is to examine the three goals set prior to its commencement. Here are some examples of goals set by women in our group: reduce anxiety, decrease denial of disease, decrease negative thinking, take time for myself, increase relaxation, sleep better, improve my sex life, reduce stress, and learn more about myself. For the most part, these goals would fit in the first category of self-regulation. In some cases these

goals shifted following the program towards self-exploration; examples are: be honest with myself, listen mindfully, being rather than doing. Other goals stated following the program that do not fit neatly into the theory were: get more out of relationships, get involved in community work, and have compassion for others. These attest to an increased awareness of being connected to others and wishing to engage with others in a meaningful way.

It may be worthwhile to examine Shapiro et al.'s theory regarding the three axioms of "reperceiving" explaining the transformation observed in some participants of MBSR in the light of the themes we and others have identified when listening to participants' voices. The women's intentions were reflected in their wish to regain a sense of control of their lives, following medical treatment. They were concerned that stress may contribute to recurrence and that by learning how to deal with stressors better they may be less vulnerable. They noted that they learned to be attentive in the present moment. As for attitude, the women became kinder towards themselves and allowed the group process expand their sense of connectedness. They accepted themselves and what life presented to them with more equanimity.

We conclude by noting that our sample size was small (similar to other studies with qualitative data) and these results are only suggestive of the importance of examining process variables. Also, a longer follow-up period may reveal whether these changes endured. Currently there is much discussion regarding defining and operationalizing mindfulness.⁴³ While these topics are being explored, it may be useful to test out different measures and methodologies in order to begin to understand why this program is helpful for diverse populations interested in coping better with the stress inherent in being alive. The combination of quantitative and qualitative data promotes an in-depth examination of these issues.

Conflict of Interest Statement

None.

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¹"Reperceiving" can be described as a rotation in consciousness in that what was previously "subject" becomes "object"¹² (p. 378).

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