

# Mindfulness-based cancer recovery

## The development of an evidence-based psychosocial oncology intervention

by Linda E. Carlson, PhD, C Psych

### ABSTRACT

The use of mindfulness-based interventions has grown exponentially across health care, and particularly in the cancer arena. This paper reviews the key features of mindfulness and how it is often cultivated through formal meditation training programs. The history and development of our program of mindfulness-based cancer recovery (MBCR) is described, and the progression of our research program which began in the late 1990s, is summarized. Preliminary studies documented the efficacy of the program, for improving stress symptoms, anxiety, depression, mood and symptoms, such as fatigue and sleep problems. Later studies showed effects of the program

across a wide range of biomarkers, such as salivary cortisol, cytokines and blood pressure. Current randomized controlled trials pit the MBCR program against other active and empirically-supported treatments for a range of symptoms, from general distress to clinical insomnia. We are also testing alternative delivery strategies, such as online MBCR. Mindfulness-based interventions hold a great deal of promise for helping people with cancer cope across a broad range of symptoms and issues.

### Key words

Mindfulness, meditation, coping with cancer, psychological outcomes, stress.

### MINDFULNESS AND MINDFULNESS-BASED STRESS REDUCTION (MBSR)

Mindfulness is often defined as present-moment nonjudgmental awareness. This is contrasted to typical experience that may involve ruminating over events of the past, planning or worrying about the future, or analyzing and judging current experience. Mindfulness is both a way of being in the world, and a discrete practice. Mindfulness practice can take the form of formal meditation or informal practices, such as simply remembering to be present as one undertakes day-to-day tasks. The practice of mindfulness through formal meditation and informal practice ideally leads to a more mindful way of being in the world. This heightened sense of presence leads to a cascade of salutary effects that transfer across all life domains.

While mindfulness as a concept stems from Buddhist traditions of South and Southeast Asia, it has been secularized and brought to the West by a number of practitioners. Chief among these is Jon Kabat-Zinn, who created a secular hospital-based program in the 1970s that combined training in mindfulness with principles of stress reduction. Initially called the Stress Reduction and Relaxation Program, it is now widely known as Mindfulness-Based Stress Reduction (MBSR). Over the past 30 years, MBSR has been studied, refined and adapted to meet the needs of many medical and psychiatric populations. Training programs are widely available and over 2,500 scientific papers on mindfulness have now been published ([www.mindfulexperience.org/mindfo.php](http://www.mindfulexperience.org/mindfo.php)).

Traditional MBSR programs are 8 weeks long with approximately 2.5-hr weekly group sessions with up to 30 participants and one or two instructors. A 6-hr retreat takes

place typically between weeks 6 and 7. As the weeks progress, different forms of meditation are introduced, beginning with a body scan sensory awareness experience, progressing to sitting and walking meditations. Gentle Hatha yoga is incorporated throughout, as a form of moving meditation. Body-based exercises are considered essential in applying a holistic approach to mindful healing. Throughout the diverse practices runs a common thread of heightened mindful awareness and acceptance of all elements of current experience. Didactic instruction, as well as group discussion and reflection, problem-solving and skillful inquiry, are commonly applied teaching tools.

Research has shown a benefit from MBSR training across a range of psychiatric<sup>1</sup> and physical<sup>2</sup> conditions, and specific adaptations have been made to address depression relapse,<sup>3</sup> addictions,<sup>4,5</sup> and specific medical conditions such as our adaptation for cancer patients called Mindfulness-Based Cancer Recovery (MBCR).<sup>6</sup> Brain imaging and mechanistic studies are beginning to converge, showing effects of mind-

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fulness training on brain regions and psychological processes related to improvements in emotion regulation strategies, attention and social relationships.<sup>7</sup>

## APPLICATIONS FOR PEOPLE WITH CANCER

There are a number of difficult aspects of the cancer experience that are well-suited to an MBSR approach. Loss of control, uncertainty and constant change are three that stand out, and are often the most challenging aspects of coping with cancer. Typically, when psychologists talk about coping with life stressors, we distinguish between problem-focused and emotion-focused coping strategies. Problem-focused strategies are helpful when there is a discrete, controllable and solvable problem to address; these include things like breaking it down into manageable pieces and tasks, writing lists, doing one thing at a time, gaining more knowledge about how to do it, etc... However, for uncontrollable problems, this kind of approach is often futile. There may be some elements of cancer treatment which do require problem-focused coping, such as getting to appointments, scheduling treatments and rearranging other activities. However, often the more difficult elements of coping with cancer are dealing with the existential implications of this disease and a newly uncertain future. These issues don't require problem-solving, they require emotion-focused strategies. This is where mindfulness-based approaches stand out.

The mindfulness elements of accepting things as they are, turning towards rather than away from difficult emotional experience, and embracing change as a constant are helpful antidotes to these difficult realities. The emotion-regulation strategies practiced in mindfulness-based interventions help to prevent worry about the future and rumination over past events, and allow people to live more fully in the present moment, regardless of what lies ahead. The inevitability of loss, change and eventual death are helpful to face in general, but are both more challenging and more powerful for people directly facing a life threat like cancer. Acceptance in this context does not equate to "giving up" or not trying to treat one's illness as aggressively as one chooses; rather, it acknowledges the reality of the situation and allows a turning away from blame towards acceptance of the reality of loss and grief. It also provides energy and motivation for moving forward in life's journey, whatever the future holds.

## MBCR PROGRAM DEVELOPMENT

In 1996, Michael Speca, Maureen Angen and Eileen Goodey were working at the Department of Psychosocial Resources at the Tom Baker Cancer Centre in Calgary, Canada. They were trained in psychology and social work, and were learning how to apply their clinical skills and tools to people living with cancer. All three of them had personal practices of meditation and yoga, with similar foundations but different practices, which they each turned to when dealing with difficult personal struggles. They realized these tools may be similarly helpful for the people they were working with, and went on to develop and pilot a 7-week meditation and yoga program. It was based on similar principles of mindfulness and stress management as MBSR, combined with elements of their own personal prac-

tice. Patient feedback collected from the first groups indicated participants very much appreciated the program. Dr. Speca's group then applied for and secured a small amount of funding for the first study of its efficacy, a waitlist randomized controlled trial (RCT), which began in 1998.

In the meantime, I joined the team in 1997 as a predoctoral clinical psychology intern and was immediately taken with the program, as it fit with my own personal meditation and yoga practices and background in health psychology. I had seen Jon Kabat-Zinn give a talk in Montreal during my training at McGill University, and was familiar with his groundbreaking work and book, "Full Catastrophe Living."<sup>8</sup> I wanted to learn more, and we thought blending the program already started with lessons from Jon's many years of experience would be important. When I finished my internship in 1998, I received a postdoctoral fellowship to conduct full-time research in psycho-oncology at the Tom Baker Cancer Centre, with a focus on mind-body interventions. Hence, I was able to act as the research coordinator for the first study, continue to refine the research and clinical programs, and apply for more funding during subsequent years.

As we were applying for further research funding, in order to make the program more consistent with traditional MBSR, which was developing a strong evidence base for its efficacy, we added an extra week (from 7 to 8) and a weekend retreat, beginning with 3 hours but eventually expanding to match the 6-hour MBSR format. Our weekly group meetings were initially shorter than traditional MBSR, however, at 1.5 hrs, based on practical logistic concerns and the needs of our population. We decided to retain the shorter duration even though that meant modifying the program delivery to include less in-class reflection and practice than traditional MBSR. Home practice was maintained at 45 minutes per day (15 minutes yoga; 30 minutes meditation). As the program developed over the years, we adopted the name Mindfulness-Based Cancer Recovery (MBCR), acknowledging the roots of the program and also that its form and content were somewhat different, focusing on the challenges faced by people living with cancer and their supporters. We have since published a patient handbook that details the specifics of the MBCR program, including background on the cancer experience, mindfulness and stress reduction, and weekly program content, including guided meditations.<sup>6</sup>

## RESEARCH RESULTS

### Psychologic outcomes

The results of that first waitlist RCT surprised us. We had assessed the impact of the 7-week program in 89 patients with a variety of cancer diagnoses,<sup>9</sup> with outcomes focused on mood disturbance and stress symptoms. Patients in the MBCR program saw improvements of 65% on mood and 35% on stress symptoms compared to controls. They specifically reported less tension, depression, anger and concentration problems, and more vigour, as well as fewer physical manifestations of stress (e.g. tingling in hands and feet), cardiopulmonary symptoms of arousal (e.g. racing heart, hyperventilation), central neurologic symptoms (e.g. dizziness, faintness), gastrointestinal symptoms (e.g. upset

stomach, diarrhea), habitual stress behavioural patterns (e.g. smoking, grinding teeth, overeating, insomnia), anxiety/fear, and emotional instability compared to those still waiting for the program. After all participants completed the program (including those in the original waitlist), similar benefits were seen and maintained 6 months later.<sup>10</sup> In the combined group, more home practice was associated with greater decreases in overall mood disturbance, and the greatest improvements were seen on anxiety, depression and irritability. Overall effect sizes were very large and clinically significant. We figured we were really onto something.

We went on to investigate biologic effects of the interventions in a few studies (detailed below), but then came back to the fundamental question of how the program really works. To address this, we thought conducting in-depth interviews with people who had completed the program and continued to practice meditation would shed some light. So we interviewed nine cancer patients who had participated in the 8-week MBCR program and who continued to attend weekly drop-in MBCR sessions, for between 1 and 6 years.<sup>11</sup> With individual semistructured interviews and a focus group, five major themes were identified: 1) opening to change; 2) self-control; 3) shared experience; 4) personal growth; and 5) spirituality. The interviews were used to develop a specific theory of how MBCR worked for these people. In this theory, initial participation in the 8-week program was seen as only the beginning of an ongoing process of self-discovery, a slight shift in orientation that begins the growth process. Many described it as just the “tip of the iceberg.” At the time of diagnosis, patients felt isolated, scared and unsure of what to do. The MBCR program helped them to feel less isolated in their journey. It taught concrete tools for self-regulation and introduced new ways to look at the world. For them, this resulted in fewer stress symptoms and lower levels of mood disturbance. As practice progressed in the drop-in group, social support deepened as relationships further developed, and people began learning to be less reactive and exercise more diffuse self-regulation across a wider variety of life circumstances. Underlying this process was a theme of personal transformation, of feeling part of a larger whole. With this came the development of positive qualities of personal growth and positive health, often beyond mere symptom reduction. A growing spirituality of finding meaning and purpose in one’s life and feeling increasingly interconnected with others was part of this personal transformation. Qualities of gratitude, compassion and equanimity were described as a culmination of practice; interestingly, these larger pro-social outcomes are important elements of the original Buddhist philosophy the program stems from.

### Biologic outcomes

After our initial studies showing large psychologic effects, we wanted to see if the program could also be affecting biologic markers as well. So, we applied for and eventually received funding for a pre-post examination of the effects of the program on immune and endocrine markers in post-treatment breast and prostate cancer patients, and followed them up for a full year.

Results of the biomarkers study were also surprising and interesting, though difficult to interpret due to the lack of a comparison group. We looked at the counts of a number of lymphocyte subsets, including T cells and natural killer (NK) cells, and T and NK cell function in response to an immune challenge. Although there were no significant changes in the overall number of lymphocytes or cell subsets, T cell production of interleukin 4 (IL-4, an anti-inflammatory cytokine) increased when stimulated, while interferon gamma (IFN- $\gamma$ ) and NK cell production of IL-10 decreased.<sup>12</sup> This was consistent with a shift in immune profile from one that is typically associated with depressive symptoms to a healthier profile. Patterns of change in cytokines over one year of followup also supported a continued reduction in proinflammatory cytokines.<sup>13</sup>

Cortisol was also of interest to us because it is the primary hormone secreted under stress, and is dysregulated in a number of chronic conditions, including cancer. The slope of the diurnal pattern of change in cortisol levels seems to be an important indicator of overall health and regulation of the hypothalamic-pituitary-adrenal (HPA) axis; in fact, abnormal or flattened cortisol profiles have been related to both poorer psychologic functioning and shorter survival time in breast,<sup>14-17</sup> lung<sup>18</sup> and renal cell<sup>19</sup> cancers compared to those with steeper daily slopes. In this sample, cortisol profiles also shifted pre- to post-intervention, with fewer evening cortisol elevations found post-MBCR, and some normalization of abnormal diurnal salivary cortisol profiles.<sup>20</sup> Over the year of followup, continuing decreases in overall cortisol levels were seen, mostly due to further decreases in evening cortisol levels,<sup>13</sup> which would tend to support better sleep-wake patterns. This is significant, as higher cortisol levels, particularly in the evening, are considered to be an indicator of dysregulated cortisol secretion patterns and poorer clinical outcomes.

Measures of autonomic system function were also of interest to us, since cancer survivors are at high risk for cardiovascular disease due to the toxicity of cancer treatments. Therefore, we looked at the effects of MBCR on resting blood pressure and heart rate. We included a rough measure in the pre-post immune and endocrine study, and found systolic blood pressure (SBP) decreased significantly in these breast and prostate cancer patients.<sup>13</sup> We then included weekly home BP monitoring in another waiting list study of a group of 72 women with various forms of cancer. In this sample, SBP decreased over the course of the program for women with higher pre-morbid SBP compared to those in a waitlist group.<sup>21</sup> This is desirable because high blood pressure is the most significant risk factor for developing cardiovascular disease, and these women are already at increased risk due to their cancer treatments.

### Recent clinical trials

More recently, we have wanted to subject the MBCR program to some tougher and more specific tests of efficacy, and learn a bit more about alternative delivery modalities to meet the needs of underserved cancer patients. To those ends, we conducted three RCTs; MINDSET, I-CAN Sleep, and an online version of the program called eCALM.

The MINDSET study directly compared two active group interventions for cancer support in over 270 distressed breast cancer survivors: MBCR and Supportive Expressive Therapy (SET) vs a minimal-intervention control condition (a one-day stress management seminar). While MBCR has a strong evidence base, as summarized herein, SET has also been empirically validated as psychologically effective for both early-stage and metastatic breast cancer patients<sup>22-25</sup> across outcomes such as depression, trauma symptoms, pain and social support. Similarities between interventions are the group format, size, structure and contact hours. However, the two treatment modalities are quite distinct in their content, focus and theoretical underpinnings, with the focus of SET on group support and emotional expression. Hence it's likely that outcomes from the two interventions may differ across specific dimensions of psychosocial wellbeing and stress-related biomarkers. Besides being a tougher test of specificity by using another active intervention, we also powered the study to detect moderator effects of factors such as baseline anxiety, emotional suppression and repression, and personality characteristics. The idea was that certain personality types may prefer or respond better to one or the other interventions. For example, perhaps people who habitually suppress emotions would benefit from learning how to express difficult emotions in a supportive environment. In addition, we asked the women before they were assigned to a condition which group they were hoping to get. That way we could look at the effect of being randomized to a preferred or non-preferred intervention on outcomes.

To summarize the findings, women in the MBCR group improved the most on outcomes of stress and mood disturbance, having less anxiety and depressive symptoms compared to both the SET group and the stress management control group.<sup>26</sup> Women who were more neurotic preferred either SET or MBCR over the one-day seminar, but more conscientious women preferred the didactic seminar to unstructured support groups. The most preferred treatment (by over half of participants) was MBCR, and those who got their preferred treatment (regardless of what it was) improved more on quality of life. Preference seemed to be a much more powerful predictor of outcome than individual personality traits. This begins to tell us something beyond what can be learned from classic RCT designs – preference matters. Treatment credibility and expectancy for benefit are likely important components in harnessing the power of the individual to produce meaningful change.

In another head-to-head comparison trial, we also tried something novel — not telling participants what the treatment was until they were already enrolled. In the I-CAN Sleep study,<sup>27</sup> cancer survivors with clinical insomnia signed up for a non-drug study of behavioural methods for improving sleep. They were not told what the two interventions were, but were randomly assigned to either MBCR, which from our earlier studies we knew had promise for treating sleep problems,<sup>28</sup> or Cognitive Behavioural Therapy for Insomnia (CBT-I), the gold-standard treatment for insomnia. This is a very tough test of efficacy for MBCR, and was designed as a non-inferiority trial to test whether the novel treatment for sleep (MBCR) was *as good as* the gold standard. Results

showed clinical efficacy for each intervention, but in fact CBT-I resolved sleep difficulties more quickly than MBCR. Our thoughts now are that an adaptation which includes elements of mindfulness training combined with CBT-I might be an even better approach for treating pervasive sleep disorders in cancer survivors.

One final example of stretching the boundaries of traditional service delivery is a study we've done providing MBCR online.<sup>29</sup> Because the goal of the study was to offer MBCR to people living in rural and remote areas and who otherwise didn't have access to face-to-face groups, we couldn't directly compare in-person to online versions. What we did was conduct a waitlist RCT comparing those in the online program to a group randomly assigned to wait for the next online program. Our primary interest was in whether people would sign up, and if they would complete the program and get much benefit. The program was offered through a website called emindful.com, which already offered online MBSR and had a platform where people used webcams and microphones to connect to live online groups. The participants attended each week at a set time, like an in-person group, and could see and interact with the instructor and the other participants in the online classroom. We enrolled 62 people and 83% of those completed the program — similar completion rates to in-person programs, which typically have dropout rates of about 20%. All participants said the program either met (40%) or exceeded (60%) their expectations and all said they would recommend the program to other cancer patients.<sup>30</sup>

## Summary and conclusions

In summary, we've been fortunate in our clinical research program to have developed, refined and tested a mindfulness-based program to help cancer patients cope and thrive through one of the most difficult challenges any person faces. We've used a combination of qualitative interviews, pre-post test designs and larger and more sophisticated RCTs to answer tougher questions of differential efficacy for treating specific symptoms and problems. We've investigated the possible impact on biomarkers that may be important in cancer progression, and looked at questions of service delivery options for underserved patients.

Despite this range of applications, many questions remain uninvestigated. For example, does MBCR help people at the end of life<sup>31</sup> and, if so, in what way? What motivates people to take the course, and why do some people flourish while others drop out? What motivates taking up and continuing formal meditation practice? Can mindfulness-based interventions be applied to other specific symptoms and problems, such as pain control in cancer? What adaptations of the MBCR program would need to be made for a pediatric oncology population,<sup>32</sup> and would such an application be helpful? Would similar programs be helpful for caregivers of kids with cancer,<sup>33</sup> or support persons of adults with cancer?<sup>34</sup> We and others have begun to touch upon some of these issues, but much remains to be explored. This area of research and clinical application continues to be a rich territory for enhancing our understanding of the process of adaptation to life-threatening and chronic illness, and many exciting opportunities abound. 

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