Current Breast Cancer Reports (2018) 10:7–13
https://doi.org/10.1007/s12609-018-0263-1

PSYCHO-ONCOLOGY AND SUPPORTIVE CARE (E SHINN AND C FAGUNDES, SECTION EDITORS)

Mindfulness Interventions in Breast Cancer Survivors: Current Findings and Future Directions

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Published online: 25 January 2018

Abstract

Purpose of review The goal of this review is to provide an overview of current findings on mindfulness interventions (MIs) for use with breast cancer survivors. We highlight new research and identify several theoretical and conceptual issues worthy of further consideration.

Recent findings To date, randomized controlled trials have shown the efficacy of MIs in mitigating adverse psychological, behavioral, and biological outcomes in breast cancer survivors, at least in the short term and in comparison to usual care or wait list controls. Research is now moving towards evaluating the effectiveness of MIs, determining whether MIs produce lasting benefits, and identifying mechanisms of action.

Summary Preliminary research supports the feasibility and efficacy of MIs for use with breast cancer survivors. There are gaps in our understanding, however, of how and for whom MIs are most effective. Future research to enhance current methodologies is warranted.

Keywords Breast cancer · Cancer survivorship · Mindfulness · Mindfulness-based interventions

Introduction

Mindfulness involves bringing non-judgmental awareness to present moment experience, with an attitude of openness and curiosity [1]. Interventions have been developed to cultivate mindfulness through both formal and informal practice, and recent research supports the clinical utility of mindfulness interventions (MIs) in a variety of settings [2]. The use of MIs in cancer survivorship is of growing interest, with randomized controlled trials demonstrating beneficial effects on a variety of outcomes [3, 4]. Moreover, a growing number of cancer survivors report seeking alternative and complementary care [5], and qualitative research suggests breast cancer survivors find MIs both enjoyable and beneficial [6, 7]. The purpose of this review is to provide an overview of the use of MIs in breast cancer survivors, with a focus on trends, novel findings, and guidelines for future research. To this end, in the current research section, we present findings from randomized controlled trials conducted with breast cancer survivors and published within the last 5 years. Our discussion of mechanisms, however, draws from the broader mindfulness literature, as much of this research has yet to be translated to the context of cancer survivorship.

This article is part of the Topical Collection on *Psycho-Oncology and Supportive Care*

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Intervention Designs

In breast cancer research, the most commonly used MIs are mindfulness-based stress reduction (MBSR), mindfulness-based cognitive therapy (MBCT), Mindful Awareness Practices (MAPs), and mindfulness-based cancer recovery (MBCR). These therapeutic modalities are similar in many respects, with a few notable differences in dosage and content

[8–11]. Classes typically meet once per week for 6 to 8 weeks and include an introduction to the theoretical foundations of mindfulness, psychoeducation, and both formal (e.g., sitting/walking meditation) and informal (e.g., deliberate attention to daily tasks) experiential practice. At-home practice is encouraged, and participants are instructed to engage in 10 to 45 min of meditation per day. Though MIs are traditionally conducted face-to-face in group settings, recent research supports the feasibility and efficacy of online programs for use with breast cancer survivors [12, 13]. Indeed, this platform may be more accessible for some survivors, such as women with metastatic disease who report barriers to class attendance [6, 14].

Current Research on MIs in Breast Cancer Survivors

Psychological and physical sequela are common in breast cancer survivors [15]. Though most women evidence a decline in symptoms after treatment [16–18], a subset of women report long-term disturbances [19]. Mounting evidence suggests that MIs may mitigate negative psychological, behavioral, and physiological outcomes in breast cancer survivors, at least in the short-term.

Psychological Outcomes

Cancer diagnosis and treatment represent an acute threat to mortality and can elicit distress. In early-stage breast cancer survivors, MIs have been shown to reduce negative psychological states, such as stress [20, 21], anxiety [22–25], depressive symptoms [20, 22, 23, 25], and fear of recurrence [24, 26]. These findings are consistent with the broader literature on MIs in cancer patients and survivors [3, 27] and other clinical populations [28, 29]. Whether these effects are sustained over time, however, is unclear, as follow-up periods vary (ranging from 1- to 12- months post-intervention) and results to date are mixed [e.g., 20, 22, 23]. Further, evidence suggests that participation in MIs promotes enhanced quality of life and well-being in breast cancer survivors [22, 30]. In particular, MI participants report gains in positive psychological states, such as feelings of meaning and purpose [20, 25], positive affect [20], spirituality [25], and self-kindness [31], with evidence that these effects persist over time [20, 25]. Outcomes such as these may be particularly influential over the longer term as the experience of positive emotions can further catalyze acquisition of personal resources [32] and engender a self-perpetuating cycle of well-being. Of note, results presented here come from trials utilizing usual care [22–24] and wait-list controls [20, 30, 31], with only two using an active comparator control, namely supportive-expressive therapy [21] and nutrition education [25].

Behavioral Outcomes

Fatigue, pain, cognitive complaints, and sleep disturbances are among the most commonly reported side effects in cancer survivors [33–36] and may persist for months or years after successful treatment [19, 37, 38]. Preliminary evidence supports the use of MIs in minimizing persistent cancer-related side effects. In some trials, MIs have shown beneficial effects on cancer-related fatigue [20, 24, 39], menopausal symptoms [20], sleep disturbance [20, 40, 41], pain [30], and somatic burden [42]. However, results are mixed, particularly for sleep disturbance and pain. In one study, for example, women randomized to MBSR for breast cancer (MBSR[BC]) exhibited greater improvements in objective measures of sleep efficiency and disturbance relative to usual care controls but did not differ on subjective measures of sleep quality [41]. In another study of primarily breast cancer survivors who met the criteria for insomnia, cognitive-based therapy (CBT) was more effective than MBCR, though both produced favorable outcomes [43]. Similarly, though several studies have examined the effect of MIs in pain reduction [20, 24, 39, 44], only one demonstrated beneficial effects [30]; these effects were specific to pain intensity and not to other measures of pain severity or interference. Of note, results on sustained effects in studies with post-intervention follow-ups are mixed [20, 22, 44, 45] and, as noted above, most of these trials utilized usual care [24, 39, 40, 42] or wait-list controls [20, 30].

Biological Outcomes

Conceptual models suggest that MIs alter physiological stress response pathways, including the hypothalamic-pituitary-adrenal axis and autonomic nervous system and, in turn, alter immune processes [46, 47]. Studies with breast cancer survivors provide preliminary support for this model, with trials producing alterations in cortisol profiles [21], indices of autonomic function [48], and immune parameters [20, 49].

Our lab has focused primarily on inflammatory pathways, as these are implicated in both tumor growth and progression [50] and the etiology and persistence of cancer-related behavioral symptoms [51]. In a recent study with younger breast cancer survivors, we found that women randomly assigned to a 6-week MAPs program evidenced post-intervention alterations in functional genomic markers of inflammation and indications of reduced proinflammatory signaling relative to wait-list controls [20]. Interestingly, reductions in circulating markers of inflammation, namely the proinflammatory cytokine interleukin-6 (IL-6), were only observed in women who reported the most practice. This is consistent with the broader literature on MIs in both healthy and clinical populations, in which reductions in circulating markers of inflammation are either very small or not observed [46]. Conversely, several studies find alterations in functional genomic markers of

inflammation following MIs [52, 53]. Though future research is needed, this suggests that gene expression may be a more sensitive measure for detecting alterations in inflammatory pathways following psychosocial interventions [46].

Lastly, interest in biomarkers of aging has grown in recent years and may be particularly relevant for long-term health in cancer survivors [54]. Telomeres, DNA-protein caps at the end of each chromosome, and telomerase, an enzyme critical for telomere conservation and maintenance, are two of the most commonly studied aging biomarkers. Only two studies, to date, have examined effects of MIs on these biological parameters among breast cancer survivors. In a study of 142 early-stage breast cancer survivors, Lengacher et al. [55] found that women who completed (MBSR[BC]) evidenced greater telomerase activity when compared to a usual care control group both directly after and at 6-weeks post-intervention. No difference in telomere length was observed. In a separate study, Carlson et al. [56] found that women in both the mindfulness group and the active comparator group, supportive-expressive therapy, showed stability in telomere length from pre- to post-intervention, whereas women in a stress-management control condition evidenced a trend towards shortening. Taken together, these studies provide some preliminary support for the impact of MIs on cellular aging, though future research is needed to both validate the observed relationships and elucidate their importance to clinically significant outcomes, such as cancer recurrence.

Mechanisms of MIs

MIs are multimodal, encompassing a variety of experiential meditative practices that target different psychological processes, including enhanced attention and awareness, relaxation, acceptance of negative emotions and sensations, and cultivation of positive states of mind [1, 47, 57, 58]. To advance the science of mindfulness, it is critical to identify specific mechanisms that underlie the beneficial effects of MIs. Doing so will also provide an opportunity for researchers and clinicians to refine these interventions and improve their effectiveness and efficiency [59].

An abundant literature on theory of mindfulness suggests a variety of mechanisms, including reduced reactivity to stress [60], a shift in perspective ("decentering") [57, 60], improvements in emotion regulation [58, 61], enhanced body awareness and attention regulation [58], and increased ability to positively reappraise adversity and stress [62]. In the broader mindfulness literature, the strongest empirical evidence is for reduced cognitive and emotional reactivity, less repetitive negative thinking, and increased mindfulness [63]. This is consistent with several trials conducted with cancer survivors, with evidence for decreased repetitive negative thinking—including fear of recurrence [26] and rumination [31]—and increased mindfulness [31, 64] mediating intervention effects on distress. Of note, interpretation of mindfulness as a mediator is complicated by the complexity of the construct and variations in available measures. For example, measures of mindfulness that emphasize attention and awareness have less evidence for mediation [e.g., 65] than measures that also incorporate relevant emotion-regulation components, such as acceptance and non-reactivity [e.g., 31, 45, 61]. Work from our lab suggests that another emotion-regulation strategy, self-kindness, may play a stronger role in reducing depressive symptoms than either mindfulness or rumination among younger breast cancer survivors [31] and is an important mechanism to consider in future research.

While not typically considered in theoretical models of mindfulness, social support may also be an important mechanism of mindfulness interventions. In a recent multisite RCT for distressed breast cancer survivors, increased social support mediated effects of MBCR, but not supportive-expressive therapy, on distress [65]. This suggests that sense of community, which can be cultivated by MIs, is an important and overlooked mechanism. Indeed, in qualitative feedback from participants in our own trials, women reported that they appreciated simply being among others who shared similar concerns and experiences, while not being obligated or expected to specifically discuss cancer.

Together, this body of literature highlights a handful of key mechanisms thought to underlie effects of mindfulness therapies, with several supported in studies with breast cancer survivors. It is also possible that some mechanisms may be more relevant to certain outcomes. For example, reduced reactivity and improved emotion regulation are well-suited to addressing depressive symptoms, while increasing attention and awareness may be particularly important in addressing cancer-related cognitive difficulties. Further, mechanisms that are not tied to mindfulness theory may also play an important role. These could include components of the intervention, such as instructor experience [29, 66] and group dynamics [67], as well as social support [65]. Thus, it is critical that this type of research continue so that we can better understand the mechanisms that are relevant for specific outcomes, and for specific populations.

Future Directions

Preliminary evidence supports the efficacy and feasibility of MIs for use with breast cancer survivors. However, gaps remain in our understanding of how and for whom MIs work, and future research is needed to enhance current methodologies.

There is growing interest in the mechanisms through which MIs work to improve health and well-being; however, these are often not assessed in clinical trials with cancer patients and

survivors. Randomized controlled trials that carefully consider mechanisms of action will both advance the science of mindfulness and aid our ability to tailor interventions for use with breast cancer survivors. Specific mechanisms identified in the broader literature, such as reduced emotional reactivity, increased emotion regulation, and decreased repetitive negative thinking [63], for example, warrant further study in breast cancer survivors. Moreover, given the promising yet preliminary research on biological parameters, such as inflammatory signaling [20] and biological aging [55, 56], future studies in breast cancer survivors should consider the role of physiological processes as both potential mediators and clinically relevant outcomes. There is also emerging research in the broader mindfulness literature on the role of neural mechanisms [58, 68]; however, these studies have yet to be conducted in breast cancer survivors. Ultimately, rigorous trials with long-term follow-ups will enhance our understanding of how these processes affect change in long-term health and well-being.

Moving forward, researchers should also consider the utility of comparative-effectiveness trials [69]. To date, trials with breast cancer survivors, including those conducted in our lab, have used wait-list or treatment as usual controls. However, it may be more useful to compare MIs to established therapeutic modalities to both examine the added benefits of MIs and determine which individuals respond favorably to different treatments. Indeed, this approach is already in use, with comparator trials examining the efficacy of MIs against established therapeutic modalities, such as supportive-expressive therapy in breast cancer survivors [21] and CBT in patients with chronic pain [70] and insomnia [43]. These trials are well-positioned to examine moderators of treatment effects and provide insight into what approaches work best and for whom. Our group, for example, is particularly interested in age as a potential moderator given that younger breast cancer survivors, relative to older survivors, report both greater distress [33, 71, 72] and more interest in CAM therapies [73]. Other studies suggest that MIs are more effective in distressed breast cancer survivors [23, 24]. This is consistent with the broader literature, which suggests that mindfulness-based therapies are most effective for individuals with pre-existing vulnerabilities. In adults diagnosed with rheumatoid arthritis, for example, patients with a history of recurrent depression benefited more from a mindfulness intervention than from CBT [74]. Similarly, history of childhood trauma has been shown to moderate effects of MIs [75, 76]. Further research on pre-existing vulnerability and other potential moderators in breast cancer survivors will facilitate the deployment of targeted interventions, with the goal of moving towards a more individualized medicine framework.

Promoting adherence to home-based practice and advocating long-term meditative habits is another challenge. In trials with breast cancer survivors, participants who report more time spent practicing mindfulness often report better outcomes [20, 22, 30, 44]. Little is known, however, about what promotes some individuals to engage in meditative practice outside of group meetings or why some participants continue to cultivate mindfulness even after the end of the intervention. Current theory suggests that individual motivation to continue mindfulness practice may change over time and deciphering individual *intentions*, or reasons for engaging in meditative practice, may be of value [57]. For instance, a breast cancer survivor may initially self-select into a mindfulness intervention to reduce stress but, over time and with the evolution of practice, her intention may shift. Booster sessions, implemented as a follow-up to the primary intervention, offer one potential means to promote long-term practice and maintenance of intervention effects. Indeed, these sessions may offer an opportunity for participants to discuss changes in motivations for practice, as well as ongoing barriers and strategies for maintenance. Use of booster sessions has evidenced favorable outcomes in other clinical populations [77, 78], though results are not always consistent [79].

Finally, much of the current research on MIs in breast cancer survivors has focused on women diagnosed with early-stage breast cancer, with the exception of a few non-randomized trials [6, 14] and several studies in mixed patient populations [27, 45, 64]. Women diagnosed with metastatic disease warrant further study, as metastatic breast cancer represents an acute threat to one's survival and can elicit significant distress [80]. However, recruitment of women with metastatic disease may be more difficult [14], and these women may experience more barriers to attendance [6, 14]. Similarly, most of the women represented in the current research are White, college educated, and partnered [81]. Future research is needed in more diverse socioeconomic and sociocultural samples, first, to determine if MIs are effective across diverse populations and, second, to identify barriers to administration in hard-to-reach populations. The use of online platforms for dissemination may prove useful in reaching a diverse pool of participants, including women with metastatic disease, as well as for individuals who are geographically isolated, have greater functional limitations, or prefer not to attend group sessions. Aspects of the online intervention, however, should be carefully considered, especially given current research on the benefits of group dynamics [65, 67].

Conclusions

MIs are a promising intervention for use with breast cancer survivors, though further research is warranted to establish best practices for use. Research conducted in the past 5 years has demonstrated that MIs reduce negative psychological states, such as stress and depressive symptoms, and enhance positive psychological states, such as well-being and self-compassion. Further, MIs may influence biological processes that are highly relevant in cancer survivorship. Future research

in these areas, particularly in regards to inflammatory processes and neurobiological underpinnings, will further refine our understanding of the extent to which these therapies are relevant for long-term health. Moreover, greater accessibility of MIs will potentially broaden their scope and efficacy to promote greater well-being in populations that are challenging to recruit or have barriers precluding attendance at in-person meetings. In sum, promoting both the science of mindfulness and refinement of current methodologies will generate possibilities for the use of MIs to promote enhanced health and well-being in the millions of women living with a history of breast cancer.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no competing interests.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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