

Review

# What is the evidence for the use of mindfulness-based interventions in cancer care? A review

Christina Shennan<sup>1\*</sup>, Sheila Payne<sup>2</sup> and Deborah Fenlon<sup>3</sup>

<sup>1</sup>Cancer Help Ltd., Croston House, Garstang, Lancashire, UK

<sup>2</sup>International Observatory on End of Life Care, Lancaster University, Lancaster, UK

<sup>3</sup>Macmillan Research Unit, University of Southampton, Southampton, UK

\*Correspondence to:

International Observatory on  
End of Life Care, Division of  
Health Research, Lancaster  
University, Lancaster, LA1  
4YT, UK. E-mail:  
christinashennan@talktalk.net

## Abstract

**Objective:** The aim of this paper is to present and critically appraise the evidence for the use of mindfulness-based interventions in cancer care.

**Methods:** Systematic review methods were used. A thorough search of relevant major and specialised electronic databases was made and unpublished and ongoing work was also identified. Both qualitative and quantitative studies were eligible for inclusion. Information about aims, design, participant sample, measures, findings and intervention details were extracted from each study.

**Results:** Thirteen research papers and four conference abstracts published since 2007 were identified which met the criteria, reporting five different types of mindfulness intervention. The 13 papers composed of three randomised control trials, two non-randomised control trials, five pre and post-test designs and two qualitative studies. Studies report significant improvements in anxiety, depression, stress, sexual difficulties, physiological arousal and immune function or subjective benefits across all interventions. Methodological limitations were identified. Diversity in study designs and interventions makes comparisons between studies difficult. Some mindfulness interventions may have a place in acute treatment and palliative care.

**Conclusion:** Mindfulness approaches are a promising intervention in cancer care, potentially across the cancer trajectory. Further qualitative research and research into different styles of mindfulness delivery are recommended.

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**Keywords:** cancer; oncology; mindfulness; MBSR; MBCT

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## Introduction

It is well documented that cancer is frequently accompanied by psychological suffering, that is often long lasting [1]. After the initial stress of a diagnosis of cancer or a relapse of cancer, 10–20% of patients go onto to develop psychiatric disorders of depression and anxiety; that adds to the suffering of the patient, family and friends [2]. Macmillan Cancer Support's Worried Sick report of 2006 found that more than 45% of patients with cancer said that the emotional effects of cancer were more difficult to deal with than the physical or practical effects [3]. A growing number of people with cancer are using complementary therapies, including meditation, as a way to improve psychological health [4,5]. NICE guidance suggests that psychological interventions should play an integral part of support offered to cancer patients. One of the rapidly emerging influences in the field of health care is mindfulness [6]. This paper aims to explore the evidence for the use of mindfulness interventions in cancer care.

## What is mindfulness and why is it relevant to health?

Mindfulness is a complex concept that it is difficult to define precisely [7]. Mindfulness is rooted in the tradition of Theravada Buddhism and vipassana or 'insight' meditation [8] and includes both formal and informal meditation practices. The literature refers to mindfulness both as the engagement in mindfulness meditation practice and as a state of awareness that practice helps us to cultivate. 'Mindfulness is the seed and the fruit that enables us to live fully in each moment' [9] (p. 14). Operational definitions of mindfulness all include the idea of moment to moment present awareness, with an attitude of non-judgment, acceptance and openness [10–13]. Kabat-Zinn has also suggested that intention, or the why of practice, is an integral part of the mindfulness whole [14]. One theory is that these three corner stones of mindfulness, namely, intention, attention and attitude, lead to a shift in our relationship to experience defined as

*reperceiving*; a shift in perspective that allows us to be deeply with our experience, rather than identify with it, or overlay it with conscious or unconscious commentary [15]. The ability to stand back from thoughts and to be with experience is highly relevant in a health context. Depression and anxiety are fuelled by engagement in worry and rumination; experiential avoidance that is common to chronic pain conditions, as well as to anxiety and depression, causes further suffering and is linked to psychopathology [16]. Living in the moment, non-judgmentally, has particular resonance for many cancer patients, who can have anxious thoughts about past life style decisions, as well as about future illness and treatment [17].

## Background

Mindfulness has been integrated into several treatment approaches, the foremost of which are Dialectical Behaviour Therapy (DBT), Acceptance and Commitment Therapy (ACT), Mindfulness Based Stress Reduction (MBSR) and Mindfulness Based Cognitive Therapy (MBCT) [18]. MBSR and MBCT are among the interventions employed by studies in this review.

### MBSR

MBSR is a group programme that teaches formal and informal mindfulness practices, which has demonstrated effectiveness in treating chronic pain and health conditions [19–23]. Typically, MBSR is an 8-week programme of weekly two and a half-hour sessions with one full retreat day, and daily home practice, accommodating class sizes of 20–30 participants with mixed medical conditions [24]. Core components include practices of the body scan, sitting meditation, walking meditation and mindful movement. It has an attitudinal framework of kindness, curiosity and willingness to be present, which are embodied in the teacher [25].

### MBCT

MBCT combines MBSR with aspects of cognitive therapy. Originally developed to prevent relapse/recurrence for people in remission from major depression [26], MBCT programmes are being tailored for other specific conditions. [25]. MBCT shares the same attitudes, structure and core components of MBSR and introduced the mini meditation, or 3-minute breathing space [27]. Class sizes are smaller and participants have similar disorders, for which there is an underpinning formulation, which is shared with participants [28].

## Mindfulness in oncology

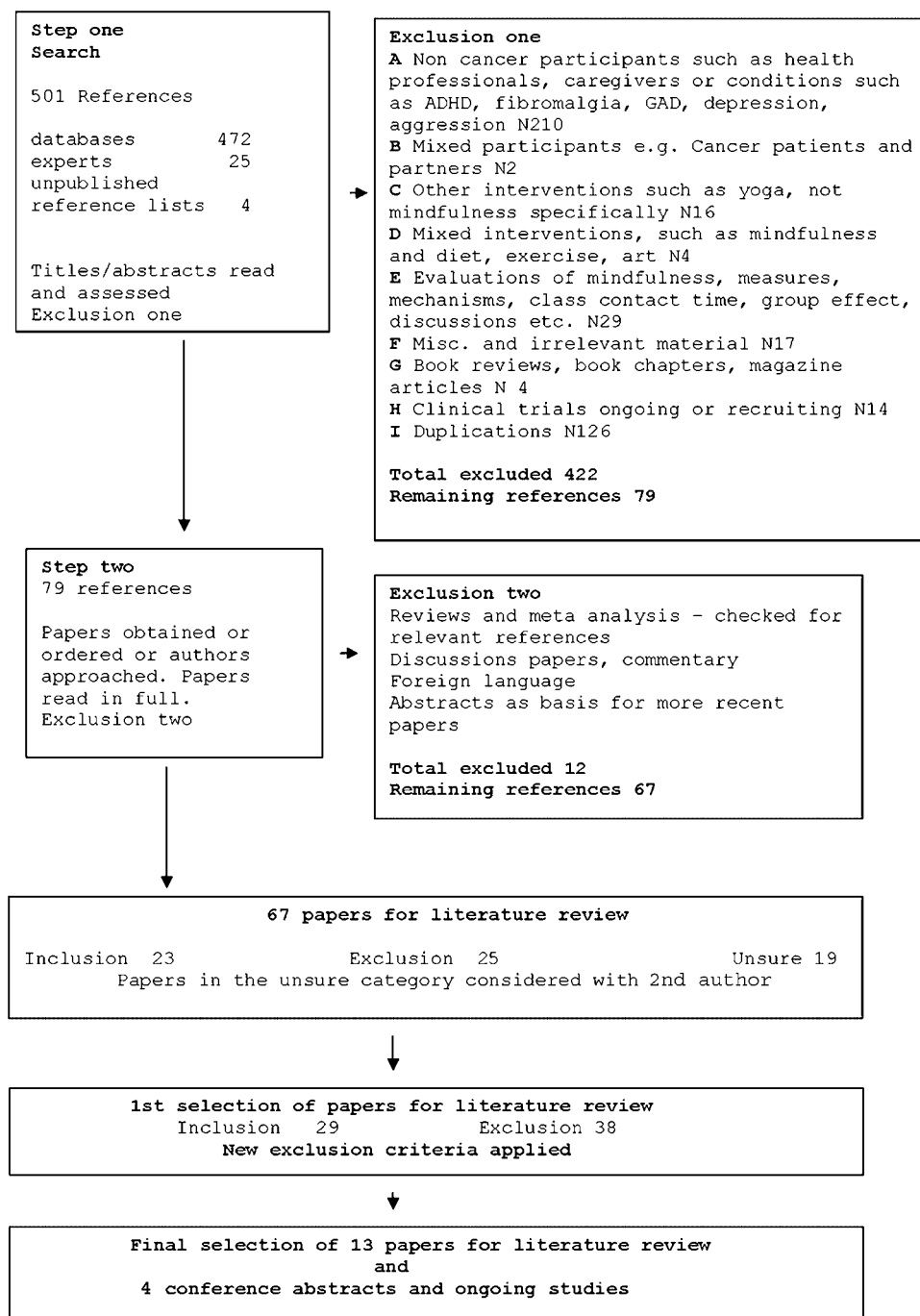
The mindfulness intervention most studied in the field of cancer care has been MBSR. Studies of mindfulness in oncology have been growing since 2000, when Speca *et al.* made some changes to the MBSR programme to suit a cancer population [29]. In recent years, there has been a surge of studies in this area and the introduction of other types of mindfulness intervention besides MBSR, that have yet to be reviewed in an oncology setting. Previous reviews of studies of MBSR in oncology, have documented its potential for improving mood, sleep, fatigue, psychological functioning, psychosocial adjustment, stress reduction and enhanced coping and well-being in cancer patients; they have highlighted the need for more randomised controlled trials (RCTs), a lack of qualitative studies, the need for exploring the underlying mechanisms of mindfulness and expanding outcomes to include physiological responses and quality of life [30–34]. Lack of information regarding the facilitator and the optimum use of home practice have also been noted [30,34]. In response to the need for statistically powered studies of MBSR, an ongoing control trial in Denmark is randomising 265 women with breast cancer to MBSR or a control, to explore the feasibility of MBSR as an intervention for anxiety and depression [35]. Results of a RCT in England, where 229 women with breast cancer were randomly allocated to MBSR or a waiting list control are also yet to be published [36]. Physiological outcomes have been the focus of a waiting list trial in Canada and results are yet to be published of this study, investigating the impact of MBSR on the acute cardiovascular and neuroendocrine stress responses of 34 women with breast cancer [37]. In an area of growing interest, change and debate, a review of the evidence for mindfulness in oncology is timely, to capture and thereby seek to inform development in the field.

## Methods

The review procedure was guided by the principles of the systematic review [38], drawing upon research using different paradigms. Standard Cochrane Collaboration review methods were considered, but deemed inappropriate to capture the diversity of methods identified.

### Search strategy

A thorough literature search was made with the help of a specialist librarian, to identify a wide range of studies, both published and unpublished (Figure 1).



**Figure 1.** Flow chart of systematic literature search and study selection

### Electronic databases

An electronic search was made of major biomedical, psychological and specialist complementary medicine databases. These included PubMed, Medline, EMBASE, AMED, PsycINFO, CINAHL, Cochrane Library, SCIRUS and the British Nursing Index. Web of Science, ZETOC and Clinical Trials were also included for unpublished research and conference papers.

### Search terms

Pilot searches were made to refine the keywords. This resulted in the use of the terms cancer or neoplasms

and Mindfulness\* or MBSR or MBCT. ACT and DBT were initially included in the search terms, but identified no papers specific to cancer care.

### References

The reference lists of key articles were hand searched to help identify additional papers, which were then followed up.

### Unpublished literature

Efforts were made to discover unpublished and ongoing research by searching the relevant

databases and contacting The Centre for Mindfulness Research and Practice at Bangor. Recognised experts in the field were also identified and approached.

Literature searches took place between July and September 2009.

### Inclusion and exclusion criteria

The literature search was restricted to the English language and to material published and unpublished, from 1 January 2000 to September 2009. Studies of adult patients with a primary diagnosis of cancer were included. Adults could be of any age, gender, race or stage of disease. Studies including adults with a diagnosis other than cancer, or with mixed participants, such as patients and partners, or with children, were excluded. Only studies where mindfulness meditation was the core part of the intervention were selected. Studies of mixed interventions, such as mindfulness based art therapy, were excluded.

No ethical clearance was necessary for the literature review, as no confidential data, such as patient records, was included.

### Results

The outcome of the search and application of the exclusion criteria is shown in Figure 1.

The search identified 501 potentially relevant papers. Of these, 422 were eliminated by the exclusion criteria and by removing duplicates. The resulting 79 references were read in full and a further 12 were excluded. On examination, the remaining references were divided into include, exclude and unsure categories.

To reinforce validity, the second author was consulted and references were discussed; by consensus, 29 papers were identified for inclusion. Of these, 12 had been the subject of previous reviews, discussion or meta-analysis [30–34]. At this point, the inclusion criteria were refined to exclude papers published prior to 2007, to build on findings of earlier reviews and focus on recent developments. Findings of previously reviewed papers are referred to in the discussion. The remaining 13 papers composed of three RCTs, one non-randomised control trial, one non-randomised comparison study, five pre- and post-test designs, some combining quantitative and qualitative methods and two qualitative studies. Given the diversity of approaches, the allocation of quality scores to studies was considered inappropriate. Details of the studies are presented in Tables 1–3 with a narrative synthesis presented below. Details of four ongoing studies and conference abstracts identified are presented in Table 1a and are not included in the findings narrative.

We examined the different deliveries of mindfulness and the participant groups and then looked for evidence of the effectiveness of the different interventions.

### Interventions

The majority were group interventions of MBSR [39–45], with two of MBCT [46,47], one of brief mindfulness training [48], two papers concerned a targeted psycho-educational study with a core mindfulness component [49,50] and one was a one to one mindfulness meditation intervention [51]. Adaptations to standard MBSR are recorded in Table 2. No information was given on how adaptations may have impacted on results. MBCT programmes were tailored to participants' needs and no unique formulation of MBCT for cancer was given.

The one to one mindfulness intervention consisted of twice weekly 30-minute sessions with a mindfulness instructor for explanation and instruction in formal and informal mindfulness practice and recommended daily listening to a 17-minute meditation CD [51]. Sessions took place during hospitalisation, as well as pre and post-treatment. The brief mindfulness intervention for patients with terminal cancer [48] was originally developed for use with people with psychosis [52]. It consisted of six weekly 1-hour classes, with two 10-minute mindfulness of breath practices and reflective discussion. Here, daily practice was supported but not required. A psycho-educational intervention for sexual dysfunction in women with gynaecologic cancer had a mindfulness component [49,50]. The intervention was composed of three 1-hour sessions, including cognitive behaviour therapy, psycho-education and mindfulness training, with homework exercises. Mindful awareness was introduced in session two and daily home practice was invited, increasing from 5 min, first in non-sexual situations, then in sexual exercises.

The facilitator contact time varies across the studies from 3 to 28 h. Invited daily practice, where noted, is from 5 to 60 min. Five studies recorded homework compliance [39,40,45,46,51].

### Facilitators

Interventions were facilitated by one or two health professionals, mostly psychologists. The mindfulness training of some facilitators is unclear [47,49], with the others trained in MBSR and/or MBCT, and one with solely experience of mindfulness meditation retreats [48]. One group [44] had the addition of a third facilitator, a nurse trained in yoga, as well as in MBSR. The one to one mindfulness study [51] has the most varied

Table 1. Study details

First author Reference number	Sample	Aims of study	Study design	Intervention	Outcome measures	Main study findings results	Attrition %	Comments
Foley <i>et al.</i> Australia [46]	115 Mix cancer site and stage	To evaluate the effectiveness of MBCT for individuals with cancer	RCT Intervention versus waiting list control. Tests at pre, post and 3 months	MBCT	HAM-D HAM-A DASS-21 FACT-G FMI	Significant improvements in mindfulness $p < 0.001$ , depression $p < 0.001$ , anxiety $p = 0.002$ , distress $p < 0.001$ and a trend for QoL $p = 0.011$ , for MBCT group compared with waitlist. Gains maintained at 3 months.	10.4 4 unwell 4 died 3 withdrew 1 unknown	Only 3-month follow-up. No control at 3 months. Self-selected. Self-reported outcomes.
Lengacher <i>et al.</i> USA [40]	84 women with breast cancer	To investigate the effectiveness of MBSR on psychological stress, physical symptoms and quality of life of women with breast cancer in transition from treatment to survivorship.	RCT Intervention versus usual care. Pre- and post-tests.	MBSR	GRS STAI CES-D LOT PSS SF-36 MOS-SSS Likert scales for spirituality MDASI	Significantly better mean scores on recurrence concerns $p = 0.007$ , state anxiety $p = 0.03$ , trait anxiety $p = 0.004$ and depression $p = 0.03$ , than the control group. Improved QoL, physical functioning $p = 0.01$ , role limitations related to physical health $p = 0.03$ , energy $p = 0.02$ . Perceived stress, optimism, spirituality did not differ.	2.3 1 recurrence 1 family duty	No follow-up. Self-selected. Multiple self-report items.
Kingston Ireland (2009) Paper submitted [47]	16 cancer out patients	To explore the effect of a MBCT intervention on distress in cancer outpatients.	RCT Intervention versus TAU	MBCT	HADS BSI WHO-5 KMS SCS	Significant improvements in anxiety $p < 0.05$ , SCS isolation $p < 0.05$ & over identification $p < 0.05$ , KIMS observe $p < 0.05$ compared with TAU. At 3 months, significant improvements in depression $p < 0.001$ and anxiety $p < 0.01$ . Significantly reduced cortisol levels	—	Self-selected small sample size. Self-report measures. No control group at 3 months. Some missing data. Self-selected.
Witek-Janusek <i>et al.</i> USA [41]	66 female early-stage breast cancer	To evaluate the effect and feasibility of MBSR on immune function, quality of life and copying in women recently diagnosed with breast cancer	Non-randomised controlled design. MBSR programme or assessment only control group. Cancer free comparison group. Pre, mid, post and 1 month tests. T1 T2 T3 T4	MBSR	QLI-CV JCS MAAS Immune and cortisol measures	$p = 0.002$ , improved QoL, increased coping post-MBSR compared with non-MBSR group at T3 and T4. Both groups had elevated levels of cortisol compared with cancer free. At T3 and T4, MBSR group but not non-MBSR group reestablished NKCA and cytokine levels, as per cancer free group. No changes or differences overtime in MAAS scores of either group. Improvement in well-being post-MBSR, small effect sizes.	11.99 4 lacked interest 2 transport problems 1 did not want blood withdrawal 1 started another programme 1 failed follow-up	No long-term follow-up.
Kieviet-Stijnen <i>et al.</i> The Netherlands [42]	47 mix cancer patients	To explore satisfaction and changes in well-being in cancer patients following MBSR.	Tests Pre Post and 1 year later.	MBSR	VAS for QOL, RSCL POMS HDI, Experienced meaning in life scale, MCSDS Personal training goals, CSQ-8	Improvement in well-being post-MBSR, small effect sizes.	49.46	Self-selected. No control group. Changes in treatment during MBSR and in follow-up period.

Table 1. Continued

First author Reference number	Sample	Aims of study	Study design	Intervention	Outcome measures	Main study findings results	Attrition %	Comments
Chadwick et al. UK [48]	4 people with terminal cancer	To explore the experience of individuals with terminal cancer attending a mindfulness group and see what benefits it may have.	Exploratory qualitative study.	Brief form of mindfulness training	IPA	Participants report mindfulness beneficial, across emotional, physical, spiritual and social elements, also valuing the group and hospice setting. Relationship between the participant perception of mindfulness and level of engagement.	20 I could not recall mindfulness from other hospice activities	Subjective views
Bauer-Wu et al. USA [51]	20 cancer patients scheduled for HSCT.	To examine feasibility, physiological arousal, psychological and physical symptoms of HSCT patients participating in mindfulness intervention, that begins before and continues through hospital stay	Pre and post and during intervention	Individual guided MM sessions	VAS for comfort, anxiety, mood and pain. Measures of physiological arousal, heart rate, respiratory rate. SI at 6 time points. SES & HADS at each time point.	Statistically significant improvement in relaxation, comfort, happiness and pain levels after most sessions $\alpha = 0.05$ . Statistically significant decreases in heart and respiratory rates, after each session typically $p = 0.0045$ and $p = 0.0039$ , respectively.	25 4 too ill or died I lost to follow-up	Highly symptomatic and distressed patients in complex clinical environment. Small sample. Lack of control group. Highly skilled instructors.
Mackenzie et al. Canada [43]	9 mix cancer patients. Purposeful sampling from MBSR drop-in group.	To describe the subjective effects of MBSR on cancer patients and to identify themes	Qualitative study using grounded theory analysis	Patients had MBSR prior and continue to attend weekly MBSR drop in session	SSI Focus group (7)	Views themed into 5 areas: Opening to change, Self-control, Shared experience, Personal growth, Spirituality. Themes interpreted to fit mindfulness model of reperceiving.	0	Subjective views. Participants attended weekly practice group for some years.
Garland et al. Canada [44]	60 in MBSR group	Comparison of MBSR and creative arts on measures of post-traumatic growth, spirituality, stress and mood disturbance in cancer patients	Non-randomised comparison study. Pre- and post-testing.	MBSR	PTG-HR FACIT-Sp SOSI POMS SSI	Significant improvement in PTG for both groups $p = 0.015$ . Increased PTG positively linked to increased spirituality in MBSR group. Improvements in stress and mood disturbance, greater in MBSR group.	24	Self-selected. No control group. No follow-up.
Dobkin Canada [39]	13 women who had finished treatment for breast cancer	To explore the potential mechanisms underlying changes in women with cancer completing MBSR	Pre- and post-intervention test. Combined quantitative and qualitative data.	MBSR	CES-D MSCL PSS CHIP SOC MAAS Focus group interview Follow-up practice questionnaire	Themes identified: acceptance, regaining and sustaining mindful control, taking responsibility for what could change, spirit of openness and connectedness. Increase in SOC scores $p = 0.179$ , might suggest women find life more meaningful after MBSR and linked to theory of reperceiving.	—	Small sample. No control.

Carlson <i>et al.</i> Canada [45]	59 patients with breast cancer and prostate cancer	To investigate the ongoing effects of MBSR on quality of life, symptoms of stress, mood and endocrine, immune and autonomic parameters in early-stage breast and prostate cancer patients	One year pre- and post-intervention follow-up 6 and 12 months post-MBSR	MBSR	Health Behaviours form EORTC QLQ-C30 POMS SOSI Immune and cortisol measures BP	Significant (lower range) improvements in overall symptoms of stress maintained over follow-up period. No significant change in mood disturbance. Cortisol levels decreased systematically over follow-up period. Immune patterns over the year supported a continued reduction in Th1 cytokines	30.5 4 did not complete MBSR 4 did not complete measures 2 missed appts. 5 did not return calls 3 unable to contact	No control. Drop outs more distressed at baseline.	
Brotto <i>et al.</i> Canada [50]	22 women having sexual difficulty following radical hysterectomy due to cervical or endometrial cancer	To pilot a brief PED targeting female sexual arousal disorder in women with early stage gynaecological cancer	Pre- and post-test. Quantitative and qualitative data	PED with component of mindfulness	DASA FSFI FSDS SFQ SBIQ DAS BDI SF-36 The Film Scale SSI	Significant positive effect on sexual desire, arousal, orgasm, sexual distress, depression and well-being. A positive trend in genital arousal.	2666 7 cancelled prior 1 died	Small, highly selective sample. No control No follow-up	
Brotto and Heiman Canada [49]	As Brotto <i>et al.</i> [50]	Is mindfulness effective in improving sexuality and quality of life?	As Brotto <i>et al.</i> [50]	As Brotto <i>et al.</i> [50]	Qualitative data from Brotto <i>et al.</i> [50]	Women reported mindfulness component of PED to be the most helpful	As Brotto <i>et al.</i> [50]	As Brotto <i>et al.</i> [50] Subjective view	
<b>Table 1(a) Conference abstracts and ongoing studies</b>									
Hoffman London Personal Communication [36]	229 women with stages 0–III breast cancer.	To determine what effect MBSR has on mood, quality of life, well-being and endocrine symptoms in women with stages 0–III breast cancer	RCT Treatment versus waiting list control group	MBSR	POMS FACT-B FACT-E WHO-5 Short pro forma for qualitative data	Participants in MBSR had significantly improved results compared with controls. Details of results unknown	7	Promising study. Insufficient data to assess	
Wurtzen <i>et al.</i> Denmark Poster presentation [35]	265 women, aged 18–65 with breast cancer, within 3 months after operation	To explore MBSR as a feasible intervention for anxiety and depression in breast cancer patients	RCT Intervention versus control	MBSR	NEO PI-R SCL-90 MDI BAI SCS FFMQ MAAS QoL Blood samples Interviews	Preliminary results unknown. Intervention and analysis ongoing	—	Promising study. Insufficient data to assess.	

Table 1. Continued

First author Reference number	Sample	Aims of study	Study design	Intervention	Outcome measures	Main study findings results	Attrition %	Comments
Brannstrom Sweden Abstract [77]	19 women with varying cancer diag- nosis	To study the effects of a mindfulness medita- tion programme among women with various types of cancer	RCT Randomised to inter- vention or waitlist control group	Not stated. 8 x 2 h sessions of mindfulness meditation intervention	Outcome mea- sures of post traumatic stress, anxiety, depres- sion, coping self- efficacy, stress, experience of positive moods, salivary cortisol	Significant decrease in anxiety, perceived stress and post traumatic stress over time. Increase in mindfulness not significant. Increase in positive mood. Significant positive effect on perceived coping ability	—	Small sample. Insufficient information to assess
Lengacher et al. USA Abstract [78]	17 women with early stage breast cancer	To investigate the effi- cacy of MBSR in im- proving psychological psychosocial and gen- eral health status among women with breast cancer who have recently completed treatment	Pre- and post-test design	MBSR	Multiple self report measures including STAI CES-D SF-36	Significant difference in concerns about reoccurrence. Significant reduction in anxiety, depression and stress. Emotional well-being and general health significantly improved. Measures of residual pain and social support similar pre and post.	10.5	Self-selected. Small sample size. No control. No follow-up.

Abbreviations: BAI Beck, Anxiety Inventory; BDI, Beck Depression Inventory; BP, Blood Pressure; BSI, Brief Symptom Inventory; CES-D, Center for Epidemiologic Studies Depression Scale; CRS, Concerns about Recurrence Scale; CHIP, Coping with Health Injuries and Problems; CSQ-8, Client Satisfaction Questionnaire; DAS, The Dyadic Adjustment Scale; DASA, The Detailed Assessment of Sexual Arousal; DASS-21, Depression, Anxiety Stress Scale; EORTC QOQ-C30, The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire; FACT-G, The Functional Assessment of Cancer Therapy – General; FACT-Sp, Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being; FFMQ, Five Facet Mindfulness Questionnaire; FSDS, Female Sexual Distress Scale; FSFI, The Female Sexual Function Index; FSI, Fatigue Symptom Inventory; HDI, Health and Disease Inventory; HRSD, Hamilton Rating Scale for Depression; HADS, Hospital Anxiety and Depression Scale; HAM-D, Hamilton Rating Scale for Depression; HAM-A, Hamilton Anxiety Rating Scale; IPA, Interpretative Phenomenological Analysis; JCS, Jalowiec Coping Scale; HSCT, Hematopoietic Stem Cell Transplantation; KIMS, Kentucky Inventory of Mindfulness Skills; LOT, Life Orientation Test; MAAS, Mindful Attention Awareness Scale; MBCT, Mindfulness Based Cognitive Therapy; MBSR, Mindfulness Based Stress Reduction; MDI, Major Depression Inventory; MM, Mindfulness Meditation; MCSDS, Marlowe Crowne Social Desirability Scale; MDASI, M.D. Anderson Symptom Inventory; MOS-SSS, Medical Outcomes Study Social Support Survey; MSCL, Medical Symptom Checklist; NEO-PIR, Personality Inventory Revised; PED, Psycho educational Intervention; POMS, The Profile of Mood States; PSQI, Pittsburgh Sleep Quality Index; PSS, Perceived Stress Scale; PTGI-R, Post Traumatic Growth Inventory-Revised; QoL, Quality of Life; QLI-CV, Quality of Life Index Cancer-Version 111; RSCL, Rotterdam Symptom Checklist; SBIQ, Sexual Beliefs and Information Questionnaire; SCL-90, Symptom Checklist 90; SCS, Self Compassion Scale; SES, Symptom Experience Scale; SF-36, The Medical Outcomes Study Short-Form Health Survey; SFQ, Sexual Function Questionnaire; SOC, Orientation to Life Questionnaire Sense of Coherence; SOSI, The Symptom of Stress Inventory; SI, Structured Interview; SSI, Semi Structured Interview; STAI, The State-Trait Anxiety Inventory; TAU, Treatment as usual; VAS, Visual analogue scale; WHO-5, World Health Organisation Five-Item Well-being Questionnaire.



Table 2. Intervention and facilitator

Ref No.	Intervention and setting	Number of session	Session hours	All day hours	Total contact time hours	Invited daily practice minutes	Daily practice recorded	Facilitators	Supervision
[46]	MBCT Didactic info specific to cancer experiences of anxiety, pain and depression. Modifications made to suit health and treatment needs—different positions, midsession break, shorter home practice, assistance of carers	8	2	5	21	Up to 60 Or shorter x 2 a day	Yes Average 30 min practice daily At 3 months 62% practice regularly	1 facilitator trained in MBSR and MBCT	Psychologist with experience in practice and clinical application of mindfulness
[40]	Cancer Centre MBSR Cancer Centre	6	2	0	12	15–45	Yes 70% compliance defined as ≥75% completion Average 18 ± 11.5 h over 6 weeks	1 psychologist trained in MBSR Independent observer	—
[47]	MBCT Adjustments to cognitive sections with attention to cancer specific ruminations and fatigue Mindful movement modified	8 *e	2 e	—	16 e	45 e	—	—	—
[41]	Hospital MBSR University Cancer Centre	8	2.5	8	28	45 e	—	1 psychologist trained in MBSR for all groups 2 therapist facilitators for each group, 1 trained in MBSR	—
[42]	MBSR Centre for psycho oncology	6	2.5	8	23	45	—	Psychologist experienced in mindfulness meditation over 10 retreats	—
[48]	Brief form of mindfulness training. Weekly sessions comprising of 2 x 10 minute mindfulness of breath with reflective discussion	6	1	0	6	At participant choice	—	—	—
[51]	Hospice Individual guided mindfulness meditation sessions, first session before hospital admission and 1 or 2 times weekly during hospitalisation, typically 3 weeks. CD for daily practice. Informal mindfulness practices integrated	6 approx	0.5	0	3 approx	17	Yes Pre hospital 89.5% listen to CD x3 In hospital 94.7 % listen x 3 a week 55% listen daily	Registered nurses, psychologist, chaplain trained in MBSR	Weekly meetings with senior mindfulness instructor Peer supervision
[43]	Acute Hospital MBSR Weekly drop in Cancer Centre	n/a	n/a	n/a	n/a	n/a	n/a	3 MBSR trained facilitators in focus group	—

Table 2. Continued

Ref No.	Intervention and setting	Number of session	Session hours	All day hours	Total contact time hours	Invited daily practice minutes	Daily practice recorded	Facilitators	Supervision
[44]	MBSR Cancer Centre	8	1.5	3	15	45	—	2 psychologists and 1 registered nurse with yoga training all with MBSR training	—
[39]	MBSR —	8 e	2.5 e	9 8	28 e	45 e	Yes f/up (time unknown) 84.61% practice $\geq 3 \times$ week $\geq 15$ mins. 84.61 practice yoga daily. All use breath awareness	—	—
[45]	MBSR (as per Speca et al., 2000) Cancer Centre	8	1.5	3	15	45	Yes Average 24 min/day meditation 13 min/day yoga over 8 weeks 6 month f/up m 7.4 h/month (1/3 yoga, 2/3 meditation)-range 0–59 h/month 1 year f/up m 5.6 h/month range 0–73 h/month	—	—
[49, 50]	PED with mindfulness meditation component introduced in second session University Medical Centre	3	1	0	3	Increasing from 5 after 2nd session	No	—	—

\*e, estimate of time taken from standard MBCT/MBSR.

**Table 3.** Demographics

Ref No.	Cancer type	N	% female	Mean age	Race	Education
[46]	Breast 48 Gynaecological 7 Lymphoma 8 Prostate 8 Bowel and colon 9 Lung 4 Head and neck 5 Melanoma 6 Myeloma 6 Leukaemia 3 Other 11	115	77	55	—	—
[40]	Breast Recent post treatment	84	100	60% over 55	85% white	45% college or professional degree
[47]	Leukaemia 5 Lymphoma 4 Breast 4 Other 3	16	62.5	50	—	—
[41]	Breast Recent diagnosis	75	100	55	85.3% white	16 years
[42]	Breast 19 Haematological 6 Gynaecological 6 Skin 3 Other 6 Missing 3	47	72	46	—	—
[48]	Mix cancer site Terminal	4	50	Range 54 to 77	—	—
[51]	HSCT patients Acute treatment	20	75	51	95% white	50% with college or degree 25% advanced degree
[43]	Breast 4 Prostate 2 Ovarian 1 Melanoma 1 Multiple cancers 1	9	78	60	—	—
[44]	Breast 34 Prostate 3 Colorectal 5 Lung 3 Ear/nose/throat 2 Brain 2 Skin 1 Lymphatic 2 Other 8	60	90	52	—	Mean 14 years
[39]	breast	13	100	54	—	85% with university degree
[45]	49 breast 10 prostate	59	83	54.5	—	Mean 14.7 years
[49,50]	Gynaecological	22	100	49.4	All white	82% post secondary education

staff involvement, with nurses, a chaplain and a psychologist delivering the intervention and weekly team meetings with a senior mindfulness teacher. No data concerning the facilitators is provided with one exception [48]. Here, it was found that the age and delivery style of the facilitator might influence the way the teaching is perceived.

### Settings

The majority of studies took place in Cancer Centres, one in an acute hospital setting [51] and one in a hospice environment [48].

### Participants

The majority of participants across the studies were white, female, well educated and middle aged, with breast cancer the most common diagnosis (Table 3). Five studies focused on participants with mixed cancer diagnosis and stage [42–44,46,47]. One study was specific for participants at early diagnosis [41] and one study focused on women in transition to survivorship [40]. One study focused on participants undergoing acute treatment [51], one study had participants with terminal cancer [48] and one study concerned participants with gynaecological cancer and specific sexual difficulties [49,50].

## Effectiveness of the interventions

### Psychological symptoms

Five studies investigated psychological distress [40,44,46,47,51]. In a well-designed RCT involving 115 participants with a mix cancer site and stage [46], the MBCT group showed significant improvement in depression, anxiety and distress, post-intervention, as compared with the waiting list group. The waiting list group showed similar changes after they received the intervention. Treatment gains were sustained at a 3-month follow-up, though as there was no control group comparison at 3 months, the effects of passing of time are not accounted for. A smaller RCT [47], with 16 cancer patients, who had symptoms of anxiety, depression or stress, found significant improvements in anxiety post-intervention, compared with the TAU group, but no change in depression scores. At 3-month follow-up, the authors reported significant improvements in both depression and anxiety on a HADS scale. However, there was no control group at 3 months, so there is no evidence for the author's hypothesis that this is indicative of the time it takes for the effect of MBCT to become established.

In a RCT using MBSR [40], with 84 breast cancer survivors, the intervention group showed significantly better mean scores on reoccurrence concerns, anxiety and depression, at 6 weeks, than the control group. Mean scores for social support and spirituality, perceived stress and optimism did not differ between groups. As there is no follow-up, there is no evidence for psychological change being sustained. A non-randomised comparison study of MBSR and a healing arts (HA) programme [44], with 60 participants in the MBSR group, reported on measures of post-traumatic growth (PTG), spirituality, stress and mood disturbance. Participants in both programmes showed increased total PTG, but with a small effect size and this was positively related to increased spirituality in the MBSR group. A decrease in symptoms of stress was significantly related to reduction in mood disturbance in both groups, with small effect sizes in the HA group and medium in the MBSR group. The study suffered from a lack of a control group and a high attrition rate.

In a feasibility study of an individual mindfulness intervention [51], symptoms of relaxation, comfort and happiness were measured after each mindfulness meditation session on a visual analogue scale and showed statistical improvement after most sessions.

### Quality of life and well-being

Quality of Life or well-being was investigated in four studies [40–42,46], with limited significant findings. In two RCTs, the change in quality of life

of the MBCT and MBSR group was not significant post-intervention, but had a trend for improvement [40,46]. In a non-randomised design, MBSR participants had improved quality of life and increased coping effectiveness compared with the non-treatment group, but again the changes were not significant [41]. One uncontrolled MBSR study collected data on patient well-being before, after and 1 year following the intervention [42]. Effect sizes for changes in well-being pre- and post-intervention are small. At 1-year follow-up, significant changes in well-being are presented, except for meaning of life and fatigue. However, the lack of control group means it is not possible to attribute change to the intervention. It is also worth noting that there were changes in medical treatments for 16 patients during the intervention and for 20 during the follow-up period.

### Physical effects

Two studies investigated the physical effects of MBSR [41,45] and one study [49,50], looked at the effect of a PED with a mindfulness component on sexual dysfunction. All showed some positive results. A non-randomised control study involving 66 women with a recent diagnosis of breast cancer [41], investigated the effect of MBSR on immune function. An age-matched group of cancer free women was also included in the study for comparison. Immune function and cortisol were assessed at four time points; pre, mid, completion and 1-month post-MBSR. The intervention group showed significantly reduced cortisol levels post-MBSR compared with the non-MBSR group at T3 and T4. However, both groups had elevated levels of cortisol compared with the cancer free group. At T3 and T4, the MBSR group re-established NKCA and cytokine levels, as per the cancer free group, which was not equalled by the non-MBSR group. While the lack of randomisation may have influenced results, this is encouraging evidence of the positive effect of MBSR on immune function. As follow-up was at 1 month only, there is no evidence that improvement is maintained over time. One paper [45] reported on the 1-year follow-up of an uncontrolled trial [53,54] of MBSR for 59 cancer patients, measuring immune cell count, cytokine production and salivary cortisol. Findings showed that cortisol levels decreased systematically over the follow-up period. Immune patterns over the year supported a continued reduction in Th 1 cytokines. However, the lack of a control group undermines the evidence supporting MBSR as the agent for change. In a feasibility study of an individual mindfulness intervention with 20 cancer patients undergoing haematopoietic stem cell transplants [51], measures of physiological arousal, heart rate and respiratory rate were taken before and after each mindfulness meditation

session, and pain was measured by VAS. Statistically significant decreases in heart and respiratory rates were observed after each session. Symptoms of pain were statistically improved after most sessions. In the study investigating sexual dysfunction, assessments of physiological as well as subjective sexual arousal were taken at baseline and 12 weeks later, 1 month after the PED. There was a significant positive effect on sexual desire, arousal, orgasm, satisfaction, sexual distress, depression and a trend towards significantly improved physiological genital arousal and perceived genital arousal. The small sample ( $n = 22$ ) was highly selective, consisting of the response to a survey of 270 women.

### Mindfulness measures

Four studies used measures for mindfulness, namely the Mindful Attention and Awareness Scale (MAAS), the Freiburg Mindfulness Inventory (FMI) and the Kentucky Inventory of Mindfulness Skills (KIMS). One study using MAAS [41] found no difference in mindfulness scores between the MBSR and non-MBSR group. However, the other study [39] found a non-significant increase in MAAS scores after an MBSR intervention. Post-MBCT [46] participants had significantly higher mindfulness scores compared with the waiting list group, as measured by FMI. In another MBCT study [47], decreases in anxiety, isolation and over-identification were allied to a significant increase in the sub scale of observing in the KIMS mindfulness measure.

### Theory building

Data from qualitative studies were used to assist with theory building. One MBSR study involving 13 women with breast cancer [39], explored potential mechanisms underlying changes. Qualitative data from a focus group of eight patients was organised into themes of acceptance, regaining and sustaining mindful control and taking responsibility for what they could. This, together with an increase (small) in scores in meaningfulness on the Sense of Coherence questionnaire, is linked with Shapiro *et al.*'s theory of the practice of mindfulness leading to re-perceiving [15]. A qualitative study using grounded theory analysis [43] described the subjective effects of nine cancer patients who had attended a MBSR programme and continued to attend MBSR drop in sessions. Five themes emerging were opening to change, self-control, shared experience, personal growth and spirituality. The themes were used to build theory that is consistent with the concept of mindfulness leading to re-perceiving, resulting in self-regulation and

includes the idea of shared experience alleviating isolation. Participants in another MBSR study [42] were asked to note three goals for their MBSR training, which fits with the axiom of intention for mindfulness, as well as inviting insight into individuals' perception of needs. Progress on goals and how having goals might have affected outcomes is not explained. A study using Interpretative Phenomenological Analysis [48] demonstrated a relationship between the participant perception of mindfulness and their level of engagement.

### Methodology

Overall, participants in the studies are not reflective of the general cancer population. Recruitment is not reaching the poor, illiterate or ethnic groups, young people, males or those with lung cancer and less common cancers. Some of the screening criteria [40,41] exclude those who cannot read or write English to a given standard. Other screening criteria excludes those on any form of anti-depressant medication [41,49], although psychological distress is under investigation. All the participants are self selected. The majority of the quantitative studies have a small sample size, which limits the authority of the findings. There is a lack of control groups [39,42,44,45,49,51], lack of follow-up [39,40,44,49] and follow-up further than 3 months [31,41,44,46,47,49]. One study [44] had a comparison group. Of the two studies that had a 1-year follow-up [42,45], both had an unexplained high attrition rate and neither had a control group. Both these studies had multiple measures, 9 self-report measures, including personal training goals [42] and four self report measures, together with meditation log, immune, cortisol, heart rate and blood pressure measures [45], which may have contributed to attrition. There is a balance to consider between the amount of measures desired for exploratory studies and the burden of measures on the participant.

### Discussion

#### Effectiveness of interventions

Although a comparison of effectiveness across the five different interventions is not possible, due to the disparity of study designs and measures, there is evidence of quantitative and subjective benefit for each intervention. There is evidence that mindfulness interventions may help to reduce psychological symptoms of anxiety and stress that supports findings of previous studies of MBSR with cancer populations that found significant positive changes in anxiety, stress and mood disturbance, post-interventions [29,53–58], and some conflicting evidence on improvements gained

in depression. Overall findings for quality of life show a trend for improvement, but do not reflect the pattern for significant change found in earlier studies of MBSR for cancer patients [53,54]. There is evidence for a positive effect on immune function and physiological arousal that builds on the findings of previous immune function and hormone investigations that showed changes in cancer-related cytokine production post-MBSR, with a shift to healthier profiles [53,54]. Positive effects on sexual difficulties have also been demonstrated.

### Delivery of mindfulness

This is the first review of mindfulness in oncology to combine both qualitative and quantitative data and different mindfulness approaches. This has helped to gather information on process and open up aspects of ongoing debate around mindfulness applications, which are significant for a cancer population. The questions include what the best form of delivery of mindfulness should be [59], the length of the contact time [60] and the necessity for daily practice [61].

MBSR and MBCT ask for a commitment of time and focus from participants, both in programme attendance and home practice, which the other mindfulness interventions here do not require. The variant in contact time across the studies seems to have no direct correlation to benefits gained. Where contact time was investigated as a mediator [40], it was found that the improvements in the MBSR intervention group were gained irrespective of compliance, measured by class attendance and home practice. This reflects findings of a recent review of class contact time in MBSR [60], which indicated there is no easy formula between increased contact time and decreased psychological distress. Daily practice of mindfulness has been regarded as fundamental in MBSR and MBCT. In previous studies of MBSR with cancer patients, findings indicated that greater practice significantly improved sleep quality [62] and significantly predicted mood change [29]. However, increased home practice as an indicator of improvement is not substantiated by long-term follow-up of home practice here [45], which is consistent with the findings of a recent review on mindfulness homework [61]. While this augurs more flexibility for mindfulness interventions, this is a complex area of debate that warrants further investigation. MBSR and MBCT facilitators are required to have an ongoing personal mindfulness meditation practice and are asked to embody the qualities of mindfulness [14,27]. Regular supervision with a mindfulness teacher, a mindful movement practice and yearly attendance at mindfulness retreats are requirements for MBSR teaching and best practice for MBCT teachers [63]. This has cost and time implications for future

facilitators and the infra structure for the provision of a service. The need for personal practice has yet to be scientifically demonstrated [6] and it has been pointed out that DBT, which has mindfulness as a component, does not have this requirement of teachers [64]. The personal practice of all facilitators here is not known. As results of mindfulness interventions continue to be positive, research evidence on the training and personal practice of facilitators is called for, to inform decisions of how mindfulness programmes can best be implemented [65].

As MBSR and MBCT programmes are multifaceted, dismantling research studies might help determine active components. The simpler mindfulness interventions reported here [48–51] may assist this exploration. Delivery of mindfulness in these studies is less complex, involves shorter mindfulness meditation practices, requires less contact time from participants and minimal daily practice varying from none to 17 min. Mindfulness is delivered to participants who are undergoing intensive treatment [51] or have terminal cancer [48], who would be potentially excluded by the requirements of MBSR and MBCT. Benefits observed in psychological and physical well-being in one study [51] were compared favourably to previous studies of MBSR for cancer patients [29,56,62]. A large randomised clinical trial of this intervention is now underway [30]. Delivery of mindfulness may be adaptable to participants' needs. More research into different interventions is required.

### Methodological issues

Complex interventions present methodological and evaluative challenges in research [66,67]. The UK Medical Research Council (MRC), the US National Center for Complementary and Alternative Medicine (NCCAM), the Norwegian National Research Center in Complementary and Alternative Medicine and the International Whole Systems Research group (WRS) recognise the inherent complexity of many health-care interventions and the limitations of explanatory RCTs to adequately assess these [68]. Indeed it is difficult to imagine a placebo-controlled RCT for mindfulness; MRC guidance notes RCTs with waiting list controls and treatment as usual as appropriate comparisons [65]. Understanding context is key and fidelity to strict protocols is unrealistic [65]. A variety of research methods, including qualitative designs, can be employed to understand the processes and mechanisms of complex interventions [65,66]. In the flexible framework for developing, evaluating and implementing complex interventions, set out in the MRC's new guidelines, more weight is now given to the development phases of research [65,69].

### Mindfulness measures

The complexity of defining mindfulness and understanding 'what works' is reflected in the ongoing development and divergence of self-report mindfulness measures. Current mindfulness questionnaires include the FMI ([70]), the MAAS ([12]), the Kentucky Inventory of Mindfulness Skills (KIMS; [71]), the Toronto Mindfulness Scale (TMS; [72]), the Five Facet Mindfulness Questionnaire ([73]), the Cognitive and Affective Scale—Revised ([74]) and the Southampton Mindfulness Questionnaire ([75]). With the exception of the TMS, which is a state measure, these self-report questionnaires are all trait measures. This paper's attempt to capture mindfulness has found elements of awareness, attention, intention and attitudes of acceptance, allowing, non-judgment, curiosity, patience and kindness within the whole. The four measures used in studies here focus on some of these elements. MAAS [12] focuses on present moment awareness; FMI [70] was originally designed for experienced meditators and highlights non-judgmental present moment awareness and a detached openness to the difficult; KIMS [71] considers four facets of observing, describing, acting with awareness and accepting or allowing. Mindfulness scores presented in studies [39,41,46,47] with these measures are inconsistent with theory that increased mindfulness is the operator of change. Grossman has voiced concerns for the validity of mindfulness self-report measures and has suggested that qualitative strategies may help our understanding of mindfulness to unfold [7]. Whether using mindfulness measures and/or qualitative designs, research must continue to seek to understand how these interventions cause change [65].

### Qualitative studies

Qualitative data [39,43] is used to support the theory of mindfulness leading to re-perceiving, resulting in improved self-regulation [15]. However, recent enquiries into this theory are challenging its assessment [76]. More qualitative data is needed to continue to illuminate the underlying mechanisms and process of mindfulness practice.

### Limitations

The review is limited in that due to resource constraints only English language studies were considered. One potential paper in German was identified, but we believe no major papers have been overlooked.

### Conclusion

Quantitative mindfulness studies report significant benefits in psychological symptoms and physical

effects, across all interventions, although methodological issues limit the authority of the findings. There are no significant findings for quality of life or well-being. Qualitative studies report subjective benefits of different mindfulness interventions and begin to build on our understanding of the underlying mechanisms. The collective evidence supports the view that mindfulness is a promising intervention in cancer care, which warrants more rigorous investigation. There is a continued need for more randomised control trials, longer follow-up, comparison groups and larger sample sizes in quantitative research studies, as well as a more diverse participant base. Delivery of mindfulness in cancer care is not limited to the protocols of MBSR and MBCT and studies of thoughtful and informed flexible uses of mindfulness are to be encouraged. More research is needed on simplified mindfulness interventions, which may be appropriate for those who are sick, undergoing intensive treatment, or in terminal stages. More qualitative research of the participant's experience is needed to continue to increase our understanding of mindfulness and its mechanisms and to inform operational definitions and measures. Research on the facilitator is also recommended.

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