

Mindfulness-Based Stress Reduction for Integrative Cancer Care – a Summary of Evidence

Frauke Musial^a Arndt Büssing^b Peter Heusser^b Kyung-Eun Choi^c Thomas Ostermann^b

^a The National Research Center in Complementary and Alternative Medicine (NAFKAM), Department of Community Medicine, Faculty of Health Science, University of Tromsø, Norway

^b Center for Integrative Medicine, Faculty of Health, University of Witten/Herdecke,

^c Chair of Complementary and Integrative Medicine, University of Duisburg-Essen, Essen, Germany

Keywords

Meta-analysis · Mindfulness · MBSR · Integrative oncology · Cancer patients · Systematic review · Mind-body relation

Summary

This paper provides a comprehensive overview of the relevant existing evidence, and critically appraises the use of mindfulness-based stress reduction (MBSR) in cancer care. Furthermore, a meta-analysis was conducted in order to investigate the effect of MBSR on quality of life (QoL), mood, and distress. Besides 6 reviews (5 systematic, 1 meta-analytic) which are reported separately, a total of 19 original research papers fully met the inclusion criteria for the systematic review. The 19 original papers consisted of 5 randomised controlled trials (RCTs), 4 non-randomised controlled trials (NRCTs), 9 observational studies (OS) and 1 two-arm observational study. The included outcome measures were QoL, mood, and distress. Cohen's effect size *d* was computed for each category. Estimating the effect on QoL, a total of *n* = 248 patients out of 6 studies was included and the overall effect size was 0.29 (95% confidence interval (CI) 0.17–0.40; *p* ≤ 0.00005). Calculating the effect on mood, a total of *n* = 411 patients out of ten studies were included, and the overall effect size was 0.42 (95% CI 0.26–0.58; *p* < 0.0001). Reduction in distress revealed an overall effect size of 0.58 (95% CI 0.45–0.72; *p* < 0.0001; *n* = 587 patients out of 15 studies). MBSR programmes can improve QoL and mood, and reduce distress in cancer patients. However, there is an urgent need for more high quality RCTs implementing adequate controls, longer follow-up periods, sufficient samples sizes, clear descriptions of patients' psychological profiles, and the accompanying utilisation of qualitative measures.

Schlüsselwörter

Meta-Analyse · Achtsamkeit · MBSR · Integrative Onkologie · Krebspatienten · Systematischer Review · Mind-Body-Medizin

Zusammenfassung

Die vorliegende Arbeit versucht, einen umfassenden Überblick über die bestehende Evidenz zum Einsatz von MBSR (mindfulness-based stress reduction)-Programmen im Rahmen der onkologischen Therapie zu geben. Darüber hinaus wurde eine Meta-Analyse durchgeführt, um die Wirkung von MBSR auf die Lebensqualität (quality of life; QoL), Stimmung und Stress eingehender zu untersuchen. Neben 6 Übersichtsarbeiten (5 systematische Reviews, 1 Meta-Analyse), die gesondert referiert werden, erfüllten insgesamt 19 Originalarbeiten die Einschlusskriterien. Von den 19 Originalarbeiten waren 5 Studien randomisiert und kontrolliert, 4 Studien waren nichtrandomisiert, aber kontrolliert, 9 waren Beobachtungsstudien, und eine Studie wurde als zweiarmige Beobachtungsstudie durchgeführt. Relevante Endpunkte waren QoL, Stimmung und Stress. Für jede Kategorie wurde Cohens *d* als Maß für die Effektstärke berechnet. Zur Abschätzung des Einflusses auf die QoL wurden insgesamt *n* = 248 Patienten aus 6 Studien in die Analyse eingeschlossen. Cohens *d* betrug 0,29 (95%-Konfidenzintervall (95%-KI) 0,17–0,40; *p* ≤ 0,00005). Für die Variable Stimmung wurden insgesamt 411 Patienten aus zehn Studien einbezogen; der Gesamteffekt betrug 0,42 (95%-KI 0,26–0,58; *p* < 0,0001). Für die Variable Stress ergab sich eine Effektstärke von 0,58 (95%-KI 0,45–0,72; *p* < 0,0001; *n* = 587 Patienten aus 15 Studien). MBSR-Programme können die Lebensqualität und Stimmung von onkologischen Patienten verbessern und die subjektiv empfundene Belastung reduzieren. Nichtsdestotrotz besteht nach wie vor Bedarf an randomisierten-kontrollierten Studien hoher Qualität, mit angemessenen, aktiven Kontrollbedingungen, längerem Follow-up, ausreichender Stichprobengröße, klaren Beschreibungen der psychologischen Profile von Patienten sowie der vermehrten Integration qualitativer Forschungsmethoden.

Introduction

Being diagnosed with cancer is generally experienced as a life-threatening situation, resulting in a particularly high degree of emotional strain [1]. The fact, that a cancer diagnosis represents an 'existential plight' has long been recognised [2], and consequently, psychological and physical symptoms such as anxiety and depression, fatigue and sleep disturbance [3, 4] even to the degree of traumatisation [5] have been described. The 'existential plight' induced by a cancer diagnosis with all its consequences for the individual patient as a physical, mental and spiritual being thus should be recognised as a major source of suffering itself. Consequently, it is consensus that psychological interventions should be an integral part of cancer care (e.g. NICE <http://guidance.nice.org.uk/Topic/Cancer>). Complementary and alternative medicine involves a whole spectrum of therapeutic interventions including mind-body medicine (definition and overview: <http://nccam.nih.gov/health/whatiscam/>). Therefore it is not surprising that the interest in integrative cancer care is steadily increasing among cancer patients and that a growing number of patients use mind-body interventions such as meditation as a self-help strategy to alleviate their suffering [6, 7]. Nevertheless, utilisation of meditative approaches can also be the expression of a patient's reflection on what is essential in life (in terms of a reappraisal strategy) with subsequent changes of life concerns and behaviour. For several patients, these practises may reflect a vital search for meaning in life, or a search for an individual experience of the divine – which would transcend the experience of suffering and illness [8]. A systematic survey revealed that an average of about 30% of cancer patients have tried complementary treatments [9], and consequently, many oncology centres provide some kind of complementary treatment [10].

Mindfulness-Based Stress Reduction

Mindfulness meditation is seen as a way to experience life in a 'non-judgemental' way, i.e., non-judgemental acceptance of the current situation (including symptoms of illness), and also mindful presence in the given situation (including negative emotions). The emphasis of mindfulness is placed on an observational orientation of what is happening, concerning thoughts and feelings in this very moment. Mindfulness exercises train to keep an observant, non-judgemental attitude to the present momentum without getting entangled in feelings of guilt or failure, desires, in memories of what was, or anticipations of what will be in the future. Full awareness of what happens in this very moment yet at the same time being able to release emotionally is incongruent with unpleasant memories or anticipated worries. Therefore, mindfulness is an attitude towards the presence rather than a technique to control unwanted feelings.

Mindfulness-based stress reduction (MBSR) is a structured, psychoeducational programme which combines yoga exercises, educational sequences on lifestyle, and a spectrum of mindfulness exercises with different mental foci such as a sitting exercise with a focus on breathing or the classical 'body scan'. It is a group-oriented programme, usually delivered in 8–12 sessions lasting 2.5 h, and a retreat of a whole day. MBSR has often been successfully implemented in clinical settings [11–13] but is, however, not restricted to clinical populations. The basic idea of MBSR is the promotion of relaxation through the nonjudgmental, moment-to-moment awareness of internal and external sensations, experiences, and reactions concerning both body and mind. The MBSR programme delivers useful skills for coping with emotional distress and a variety of bodily symptoms and has been shown to be beneficial for a variety of diseases, especially pain and stress disorders [14–16], but also anxiety [17] and depression [18–20]. Stress, anxiety, depression, and often pain are among the core symptoms associated with cancer diagnosis and treatment. It is likely that MBSR provides a useful strategy for cancer patients to improve their psychosocial well-being under the circumstances of an often devastating diagnosis. Consequently, several studies investigating the effects of mindfulness meditation for oncology patients have been conducted.

Reviews on Mindfulness-Based Stress Reduction in the Treatment of Cancer

Overall, 5 systematic reviews [21–25] – of which one is a meta-analysis [22] – and a comprehensive narrative review [26] have been published. In her recent review, Shennan et al. [21] performed a comprehensive systematic literature review, including 17 quantitative and qualitative studies published between January 2007 and September 2009. The group of authors made a special effort to find and include qualitative studies, since they were explicitly interested in the potential mediators of possible effects. Significant improvements of anxiety, depression, stress level, sexual problems, physiological arousal, immune function as well as other subjectively perceived benefits were described, mostly in female patients. However, the diversity in study design, interventions and patient-therapist contact time was seen as a problem, and the authors claim a need for more high quality randomised controlled trials (RCTs) as well as qualitative studies. Nonetheless, Shennan et al. [21] conclude that mindfulness interventions provide a useful approach for the supportive treatment of cancer patients.

Ledesma and Kumano [22] provided the only meta-analysis on the topic so far. The authors included 10 studies and calculated Cohen's *d* as a measure of effect on immediate post-intervention data (6–15 weeks). For statistical analysis, the measures were subdivided in measures of mental or physical health, and a considerable effect for improvements in the patients' mental health was found (Cohen's *d* = 0.48). The authors criticise the small number of eligible studies and the

Table 1. Reviews for mindfulness-based stress reduction (MBSR)

Author [ref.], year	n	Study references	Method of review	Inclusion criteria	Exclusion criteria	Main results	Limitations (reported by the authors)	Conclusion
Shenman et al. [21], 2010	17	[34–50]	systematic review / non-meta-analytic; search through electronic databases, additional manual search, identification of unpublished work and congress abstracts	quantitative and qualitative studies (January 2007 to September 2009) with mindfulness meditation as the core part of the intervention	studies including adults with a diagnosis other than cancer, children or mixed participants such as patients and partners; studies with mixed interventions (e.g. mindfulness art therapy)	improvement of anxiety, depression, stress levels, sexual problems, physiological arousal, immune function, as well as other subjectively perceived benefits; most study participants were female (50–100%)	diversity in study designs, diversity in methods of interventions, restriction to the English language, diversity in patient-therapist contact time (3–28 h), diversity in homework time	mindfulness interventions seem to provide a useful tool in the treatment of cancer patients; there is a need for more high quality RCTs, longer follow-up, as well as qualitative studies in order to increase the understanding of the mediators of effect
Ledesma et al. [22], 2009	10	[42, 51–59]	systematic review / meta-analytic; using Cohen's d as measure of effect on immediate post-intervention data (6–15 weeks); search through electronic databases, additional manual search, identification of unpublished work and congress abstracts; outcome measures were subdivided into mental and physical health groups	MBSR intervention for a period of 5–12 weeks; cancer patients of any age, gender, or stage of disease; must report at least 1 quantitative outcome (physical or mental health measure); published in English; published in or prior to 2007	MBSR for non-cancer patient populations, mixed patient populations without subgroup specification, or populations other than patient populations; inadequate data; no MBSR	MBSR shows an effect on patient's mental health (Cohen's $d = 0.48$) and less convincing effects on patient's physical health (Cohen's $d = 0.18$)	small number of eligible studies; mostly data on physical symptoms were derived from subjective data (self reports); insufficient reporting of method of MBSR application, patient compliance with home exercise, and cancer staging; confounding effects of other elements (e.g. diet) of the mostly multicomponent treatments	MBSR is likely to improve cancer patient's psychosocial adjustment; there is unconfirmed but promising evidence that MBSR can also improve physical symptoms
Matchim et al. [25], 2007	7	[51, 57–62]	systematic review / non-meta-analytic; aimed at instruments measuring the psychological impact of mindfulness meditation; search through electronic databases	studies investigating the effect of mindfulness meditation on cancer patients; focus on instruments measuring psychological functions	no measures of psychological function, no cancer patient population; no MBSR	overall 13 different instruments were used to measure the psychological impact of MBSR in cancer patients; main psychological measures were mood, stress, and anxiety; post-intervention reductions in stress and anxiety, improvements in health locus of control (internal and external), coping style (reactive and suppressive), mental adjustment (helplessness/hopelessness, anxious preoccupation) and sleep quality were seen	heterogeneous types of study; high variability in the utilised measures leading to insufficient data for most of the instruments	Symptom of Stress Inventory (SOSI) and Profile of Mood States (POMS) were identified as suitable instruments, the data base was insufficient to draw conclusions for other measures; MBSR was seen as potentially beneficial for the psychological adjustment of cancer patients
Ott et al. [23], 2006	14	[51, 52, 54, 56–58, 60–64]	systematic review / non-meta-analytic; search through electronic databases (ranging from 1987 to 2005, studies reported from 2000 to 2005), additional identification of congress abstracts	original research investigating the effects of mindfulness-based interventions in cancer populations	no measures of psychological function, no cancer patient population; no MBSR	9 research articles (published peer reviewed) from 2000 to 2005, 3 of these were RCTs; MBSR was applied mostly in a clinical setting as group intervention; improvements were seen for psychological (stress, anxiety, depression) and physical symptoms (e.g. sleep disturbance); limited evidence for an effect of MBSR on health behaviours and physical outcomes (e.g. immune and neuroendocrine functioning)	methodological quality of studies is often limited and the sample size small; there is a need for more RCTs with larger sample size; data are often based on subjective self reports and the specific component of the treatment effects remains unclear	there is limited evidence that mindfulness techniques may help cancer patients to reduce their stress levels and thus promote effective coping

Table 1 continued on next page

Table 1. Continued

Author [ref.], year	n	Study references	Method of review	Inclusion criteria	Exclusion criteria	Main results	Limitations (reported by the authors)	Conclusion
Mackenzie et al. [26], 2005			narrative overview	studies on MBSR or mixed treatments in an oncology setting	not applicable	MBSR has been shown to be helpful alleviating anxiety and depression in other clinical conditions and can be adjusted well to an oncology setting; studies are available suggesting that MBSR has positive effects on mood states, physical functioning, the immune system, and sleep disturbances	studies are often observational and/or have methodological problems; MBSR in itself is a multi-component treatment and often combined with other health-related behavioural instructions (e.g. diet) so that the specific effect of mindfulness on the overall treatment effect remains unclear	MBSR is a useful tool in the integrative treatment of cancer patients; MBSR can help alleviate psychological distress and improve physical function in cancer patients
Smith et al. [24], 2005	10	[34, 51, 52, 55–58, 61, 65–67]	systematic review / non-meta-analytic; search through electronic databases, additional manual search; identification of unpublished work and congress abstracts	quantitative and qualitative studies on MBSR or modified psychological interventions including mindfulness meditation; patients with primary diagnosis of cancer; report of quantitative outcomes such as subjective well-being, quality of life, mental health, physical functioning, objective physical measures	other outcome measures, unclear whether MBSR intervention, no cancer patients	3 RCTs and 7 uncontrolled clinical studies were included; improvements in mood and quality of sleep, and stress reduction were reported; dose-dependent effect between MBSR practice and desired outcome was seen; no adverse effects	small sample size, limited description of randomisation, recruitment and sampling, non-reporting of the reasons for loss to follow-up, and inadequate reporting of the specifics of the MBSR interventions; lack of relevant quantitative studies was noted	MBSR has potential to be a clinically valuable intervention for cancer patients; there is limited evidence that it can alleviate stress and anxiety and improve quality of life; the fact that it is self-administered is seen as being particularly beneficial

generally low study quality. Furthermore, there was insufficient reporting of the specific MBSR application, patient compliance with home exercise, and cancer staging. Another serious concern was the fact that physical measures were generally derived from subjective reports. Overall, the authors conclude that MBSR is likely to improve the social adjustment of cancer patients and that there is the possibility that it has additional beneficial effects on physical symptoms.

One of the earlier systematic reviews on the question whether mindfulness interventions have beneficial effects in the treatment of cancer was conducted by Ott et al. [23] in 2006, including 9 out of 14 research papers published in peer reviewed journals, 3 of which were RCTs. The authors found that the methodological quality of the studies was limited and sample size rather small. Moreover, the data are often based on subjective self-reports, and the specific component of the treatment effects remains unclear. Nonetheless, Ott et al. [23] conclude that there is some evidence that MBSR helps patients to reduce their stress level and thus may support effective coping.

The first systematic review on the topic was provided by Smith et al. [24] in 2005, who included 3 RCTs and 7 observational studies. Like the other authors of systematic reviews, this group also criticizes the small sample sizes, limited description of randomisation, recruitment and sampling, the non-reporting of the reasons for loss to follow-up, and inadequate reporting of the specifics of the MBSR interventions. Furthermore, a lack of relevant qualitative studies was noted. Nonetheless, these authors also conclude that there is some evidence that MBSR can alleviate stress and anxiety and improve quality of life (QoL). The fact that this technique is self-administered and can be seen as a self-help strategy is evaluated as being particularly beneficial.

One of the major criticisms of almost all authors was the heterogeneity of measures. In 2007, Matchim et al. [25] performed a systematic review focussing on the question which instruments were most valid to measure the effects of MBSR in cancer patients. They included 7 studies and found a total of 13 different instruments utilised for the measurement of the impact of MBSR in cancer patients. Main psychological dimensions were mood, stress, and anxiety. The Symptom of Stress Inventory (SOSI) and the Profile of Mood States (POMS) were identified as suitable instruments to measure the psychological impact of MBSR in cancer patients. Moreover, post-intervention reductions in stress and anxiety, improvements in health locus of control, coping style, mental adjustment, and sleep quality were seen. The authors conclude that MBSR is potentially beneficial for the psychological adjustment of cancer patients.

In summary, most systematic reviews follow the notion of Mackenzie et al.'s [26] most readable narrative review of 2005 that mindfulness interventions are helpful in alleviating anxiety and stress, reduce depression, and help patients to

Table 2. Descriptive characteristics of studies included

Author [ref.], year	n (group 1 + group 2)	Mean age, years (\pm STD)	Type of cancer	Status of cancer	Treatment status	Current treatment	Study type	Control group	Type and duration of MBSR	Outcome measures	
										QoL	mood
Birnie et al. [68], 2010	42 (21 + 21)	62.9 (7.4)	various	mean of 2 years after diagnosis	not applicable	not applicable	OS – 2 arms	partners of the patients	8-weekly 90-min sessions, plus one 3-hour weekend silent retreat	POMS	SOSI
Bränström et al. [69], 2010	60 (25 + 35)	51.8 (9.9)	various	mixed	not applicable	no current radiation or chemotherapy treatment	RCT	wait-list	8-weekly 2-hour sessions with experiential and group exercises	POMS	PSS
Carlson et al. [61], 2001	54	50.6 (9.3)	various				OS – single group	–	7-weekly 90-min sessions, plus home meditation	POMS	SOSI
Carlson et al. [51], 2003	42	54.5 (10.9)	breast and prostate	median of 1.1 years after diagnosis; stage I: 38.3%, stage II: 62.7%	not applicable	no current treatment	OS – single group	–	8-weekly 90-min sessions, plus one 3-hour weekend silent retreat	EORTC, POMS, QLQ-C30	SOSI
Carlson et al. [53], 2005	63	54	breast, prostate, ovarian, and lymphoma				OS – single group	–		POMS	SOSI
Carlson et al. [38], 2007	31	54.5 (10.9)	breast and prostate	median of 1.1 years after diagnosis; stage I: 35.6%, stage II: 64.4%	not applicable	no current treatment	OS – single group	–	8-weekly 2-hour sessions with experiential and group exercises	EORTC, POMS, QLQ-C30	SOSI
Dobkin [40], 2007	13	54	breast	not applicable	not applicable	complete medical treatment for breast cancer	OS – single group	–	not applicable		PSS
Foley et al. [41], 2010	115 (55 + 60)	54.82 (9.08)	various	time since initial diagnosis: 2.2 years; stage I: 11%, stage II: 36%, stage III: 30%, stage IV: 24%	not applicable	not applicable	RCT	wait-list	8-weekly 2-hour group sessions with a day-long session of meditation in week 6	FACT-G	DASS
Garland et al. [42], 2007	104 (60 + 44)	52.2	various				NRCT	creative arts (active)	8-weekly 90-min sessions, plus one 3-hour weekend silent retreat	POMS	SOSI
Kieviet-Stijnen et al. [44], 2008	47	48.4 (7.6)	various	metastasis: 28%	4 without treatment	surveillance: 23%, hormonal: 17%, chemotherapy: 17%, radiotherapy: 6%, CAM: 21%, other: 6%	OS – single group	–	8-weekly sessions of 2.5 h with a meditation in silence for a whole day of 8 h in week 6	QoL-VAS, POMS	

Table 2 continued on next page

Table 2. Continued

Author [ref.], year	n (group 1 + group 2)	Mean age, years (\pm STD)	Type of cancer	Status of cancer	Treatment status	Current treatment	Study type	Control group	Type and duration of MBSR	Outcome measures		
										QoL	mood	distress
Lengacher et al. [47], 2009	41+43	57.5 (9.4)	breast	stage 0/I: 70%, stage II/III: 30%			RCT	usual care	weekly 2-hour sessions for 15 month	SF-36	STAI, CESDS	PSS
Lengacher et al. [70], 2010	17	56.8 (8.8)	breast	stage 0: 26.3%, stage I: 73.7%		radiation: 89.5%, radio- and chemotherapy: 10.5%	OS – single group	–	8-weekly 2-hour sessions	SF-36		PSS
Matchim et al. [71], 2010	32 (15 + 17)		breast				NRCT	no intervention			POMS	SOSI
Matousek et al. [72], 2010	57	56.4 (10.2)	breast	stage 0: 3.4%, stage 1: 28.8%, stage 2: 33.9%, stage 3: 3.4%, stage 4: 10.2%			OS – single group	–				PSS
Monti et al. [55], 2006	111 (56 + 55)	53.6 (11.5)	various	mixed	19 without treatment	chemotherapy, radiation, treatment for side effects, other outpatient cancer-related procedures	RCT	wait-list	8-week mindfulness-based art therapy	SF-36		GSI – SCL90
Shapiro et al. [57], 2003	63 (32 + 31)	57 (9.7)	breast	stage II, cancer free		treatment completed	NRCT	freely chosen stress management	6-weekly 2-hour sessions and one 6-hour silent retreat		POMS	
Specca et al. [58], 2000	90 (53 + 37)	54.9 (10.5) (n = 51 complete)	various	37 with early stage cancer (stages I and II) and 16 with late stage cancer (stages III and IV)			RCT	wait-list	7-weekly 90-min sessions, plus one 3-hour weekend silent retreat		POMS	SOSI
Tacon et al. [62], 2004	27	53.3	breast			11% radiation, surgery, or chemotherapy, all others oral medication	OS – single group	–	8-weekly 90-min sessions, homework encouraged		STAI	rating scale
Witek-Jamusek et al. [49], 2008	66 (28 + 38)	35–75	breast	37 with early stage cancer	without treatment	83% had surgery with or without radiation, no chemotherapy treatment	NRCT	usual care	8-weekly 2.5-hour group sessions with a day-long session of meditation in week 5	QoL		Cancer Index

DASS = Depression Anxiety Stress Scale; EORTC = European Organisation for Research and Treatment of Cancer; FACT-G = Functional Assessment of Cancer Therapy – General; GSI-SCL90 = Global Severity Index – Symptom Checklist 90; NRCT = non-randomised controlled trial; OS = observational study; POMS = Profile of Mood States; PSS = Perceived Stress Scale; QOL-C30 = 30 Core items of the QoL questionnaire launched by the EORTC; QoL = quality of life; VAS = visual analogue scale; RCT = randomised controlled trial; SF36 = Short Form 36; Health related quality of life questionnaire; SOSI = Symptom of Stress Inventory.

adjust to the challenges associated with a cancer diagnoses. MBSR is likely to reduce psychological distress and may even improve physical function, while no negative side-effects have been reported. It is very well possible to adapt these interventions into an oncology setting, and the authors agree that MBSR may provide a useful tool in the integrative treatment of cancer patients. However, all authors also agree that there are as yet several rather severe limitations to the quality of the available studies. Studies are often observational and/or have methodological problems. Small sample size, heterogeneous designs, and limited reporting have already been mentioned. Moreover, MBSR is in itself a multi-component treatment and is often combined with other health-related behavioural instructions (e.g. diet), and thus the specific effect of mindfulness remains unclear. Another serious problem is the question of generalisation. Most studies were performed in female patient populations, and it is questionable whether mindfulness interventions are as helpful in a male patient population. Moreover, cancer diagnoses vary significantly concerning the time course of the disease and its life-threatening and thus palliative character. It is unclear how effective mindfulness interventions can be when the time course of the disease is rapid, such as in lung or pancreatic cancer.

Specific Aims

The aim of this paper was to summarise the current evidence for a possible effectiveness of MBSR in the treatment of cancer as comprehensively as possible. Interestingly enough, even though the search strategies and inclusion/exclusion criteria of the 5 systematic reviews were quite similar, not all of them cover the same publications (even if the time periods were comparable). Also, all of them present a slightly different focus of interest which makes it intriguing to combine the available evidence. Overall, all systematic reviews (table 1) suggest that there is convincing evidence that MBSR is beneficial for the relief of psychological symptoms but less so with regard to physical complaints, a finding which is also confirmed by the only currently available meta-analysis on this specific topic [22]. Moreover, even though the existence of 5 systematic reviews suggests that there are enough data available to perform a statistical meta-analysis in order to achieve the highest possible evidence, only one meta-analysis on the specific topic of the role of MBSR in cancer treatment has been performed so far [22]. Therefore, the aim of this paper was i) to combine all available evidence including the data from all systematic reviews to date into 1 overview; ii) to combine all papers available from these sources into one meta-analysis, since although the search strategies and inclusion/exclusion criteria of the 5 systematic reviews were quite similar, they revealed a slightly different set of publications; and iii) since there is accumulating evidence that beneficial MBSR effects aim at psychological well-being, to provide a differentiated picture of the possible beneficial psychological effects of MBSR in cancer patients.

Material and Methods

We performed a systematic literature review which included clinical trials of MBSR (including mindfulness-based art therapy) in cancer according to the PRISMA-statement [27, 28]. Two review authors (F.M. and T.O.) independently assessed trials for inclusion in the review. Inclusion criteria were published studies and reviews of MBSR in cancer including observational studies, cohort studies, clinical trials, multicenter studies, RCTs, systematic reviews, and meta-analyses. The studies were requested to involve a structured MBSR programme of at least 6 weeks duration, to involve cancer patients, and to report at least 1 quantitative standardised outcome measure related to QoL, mood, or distress. Exclusion criteria were comments, opinions, programme descriptions and theoretical considerations, and publications in languages other than English and German.

Search Strategy

The following databases were used to find articles: MEDLINE, EMBASE, AMED, PsycInfo, PsycLit, CCMED, SOMED. We also screened the journal databases of relevant publishers, i.e., gms, Karger, Kluwer, Krause and Pachernegg, Springer, Thieme, and Wiley-Interscience, to find relevant information. Finally, we searched the archive of the specialist library for complementary and alternative medicine (CAM), Witten/Herdecke University CAMbase [29], for gray literature not listed in the above mentioned databases. The search terms were similar to those of Ledesma and Kumano [22]: mindful, insight meditation, Vipassana, mindfulness-based, cancer, neoplasm, lymphoma, sarcoma and carcinoma. We also screened already existing reviews for further articles that may not have been tracked by this search strategy. All articles found this way were fully read and their reference lists were checked for further relevant publications. To guarantee a certain amount of validity of the selection process, all abstracts of excluded papers were double checked. The search was conducted in January 2011. The reporting of the results adhered to the MOOSE and QUOROM guidelines. The coding of the descriptive factors was performed by A.B. and T.O.; the effect of MBSR on psychological variables was estimated by including data on standardised and validated scales on anxiety, depression, stress and QoL (table 2). Scales were then aggregated as measures on 'QoL', 'mood' or 'distress'.

Statistical Analysis

In addition to the review of published evidence, a meta-analysis on the effects of MBSR in cancer was carried out. When a trial was found to be eligible, data of pre-post MBSR effects on the dimensions QoL, mood and distress were extracted, entered into a data form, and converted into effect sizes and their standard deviation using a MS-Excel sheet. To calculate the effect size and its standard deviation according to the recommendations of Dunlap et al. [30], the following formulas were utilised:

$$d = \frac{m_1 - m_2}{\sqrt{(s_1^2 + s_2^2) / 2}} \quad (1)$$

$$STD(d) = \sqrt{\frac{2(1-r)}{n} + \frac{d^2}{2(n-2)}} \quad (2)$$

Effect sizes between 0.5 and 0.8 indicate medium effects, while effect sizes > 0.8 indicate large effects. Assuming that the studies found by the systematic review are showing different treatment effects with some degree of unknown variability, a random effects model was chosen to calculate overall estimates of the treatment effect according to the recommendations and algorithms given in [31]. Heterogeneity between trials was assessed by standard chi-square tests and the I^2 coefficient measuring the percentage of total variation across studies due to true heterogeneity. Results were displayed using a forest plot. Due to the expected small number of eligible studies, further analysis by means of meta-regression was omitted.

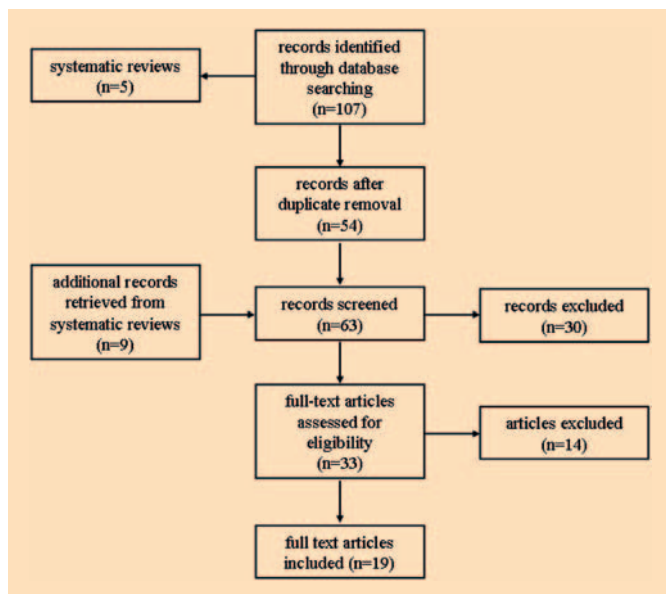


Fig. 1. Flow chart.

Results

Through data base searching, 107 records were identified. Of these, 54 remained after the removal of duplicates and were screened. An additional total of 9 records were drawn from the reference list of the 5 systematic reviews so that overall 63 records were screened. After screening the abstracts, 30 records were excluded because they did not fit the inclusion/exclusion criteria. Of the remaining 33 full text articles assessed for eligibility, 14 were excluded according to the inclusion/exclusion criteria after reading the full text. Therefore a total of 19 studies was included in the systematic review (fig. 1). There were no additional papers retrieved published in German.

Among the 19 studies, 5 were RCTs, 4 were non-randomised controlled trials (NRCTs), and 10 were observational studies (OS) (9 studies had a single group design, and 1 study enrolled 21 couples). The mean number of patients enrolled was 59 ± 30 (range 13–115). Most studies clearly described a loss of patients during the course of time, or reported reasons for drop out. Out of the 19 included papers, 9 were performed without a control group and 10 included some kind of experimental control. The type of controls was heterogeneous and mostly passive. In 4 studies, a wait-list control was included, in 2 studies the control consisted of a usual care group (passive), 1 study included a creative arts group (active), 1 study offered a freely chosen stress management (putatively active), and in 1 study the partners of the patients were included as control group. Thus, most controls were chosen in favour of the MBSR intervention. The 19 original papers are summarised in table 2.

Several different QoL measures were utilised in the included studies, and QoL data were extracted from standard-

Table 3. Effect sizes, number of patients, and standard deviation (STD) for the studies included in the analyses

	n	Cohen's d	STD (d)
QoL^a			
Carlson 2003	42	0.35	0.13
Carlson 2007	31	0.25	0.13
Kieviet-Stijnen 2008	47	0.10	0.11
Lengacher 2010	17	0.40	0.20
Monti 2006	56	0.23	0.11
Foley 2010	55	0.48	0.11
Mood^b			
Birnie 2010	21	0.36	0.18
Carlson 2001	54	0.51	0.13
Carlson 2003	42	0.06	0.12
Carlson 2005	63	0.57	0.11
Carlson 2007	31	0.00	0.14
Matchim 2010	15	0.71	0.24
Kieviet-Stijnen 2008	47	0.28	0.11
Speka 2000	53	0.62	0.12
Garland 2007	60	0.44	0.11
Branström 2010	60	0.76	0.12
Distress^c			
Branström 2010	60	0.87	0.13
Birnie 2010	19	0.17	0.18
Carlson 2001	54	0.49	0.12
Carlson 2003	42	0.35	0.13
Carlson 2005	63	0.44	0.10
Carlson 2007	31	0.28	0.15
Matchim 2010	15	0.50	0.22
Dobkin 2007	13	1.10	0.31
Matousek 2010	57	0.63	0.12
Lengacher 2010	17	0.72	0.23
Monti 2006	56	0.38	0.11
Speka 2000	53	0.78	0.13
Tacon 2004	27	1.64	0.27
Garland 2007	60	0.49	0.11
Foley 2010	55	0.70	0.13

^aTotal of n = 248 patients, overall effect size 0.29 (95% CI 0.17–0.40; $p \leq 0.00005$), heterogeneity $I^2 = 23.4\%$ ($Q = 6.53$; $p = 0.26$).

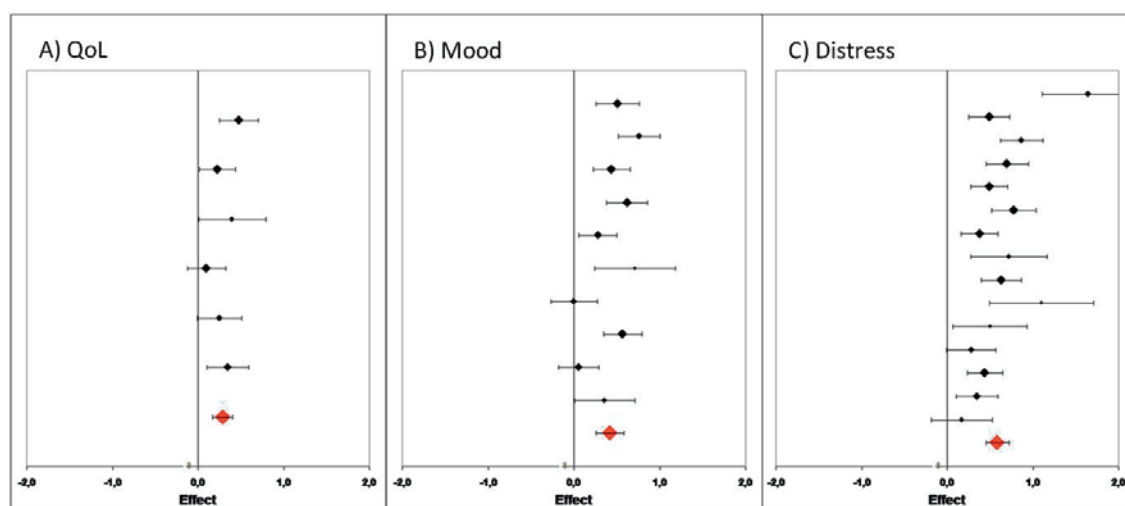
^bTotal of n = 411 patients, overall effect size 0.42 (95% CI 0.26–0.58; $p < 0.0001$), heterogeneity $I^2 = 73.5\%$ ($Q = 34.0$; $p = 0.0001$).

^cTotal of n = 587 patients, overall effect size 0.58 (95% CI 0.45–0.72; $p < 0.0001$), heterogeneity $I^2 = 67.2\%$ ($Q = 45.7$; $p < 0.0001$).

ised instruments such as the EORTC QLQ-C30, FACT-G or MOS-SF36, and less suited measures such as visual analogue scale (VAS) and QoL Index Cancer (table 2). A total of n = 248 patients out of 6 studies was included and the overall effect size was 0.29 (95% confidence interval (CI) 0.17–0.40; $p \leq 0.00005$). Heterogeneity was low with $I^2 = 23.4\%$ ($Q = 6.53$; $p = 0.26$). Table 3 shows the results of the meta-analysis and figure 2 (a) provides the corresponding forest plots.

Consistently, the POMS was utilised for the measurement of mood states. A total of n = 411 patients out of 10 studies was included and the overall effect size was 0.42 (95% CI

Fig. 2. Forest plots for **A** quality of life (QoL), **B** mood, and **C** distress. Each dark diamond represents the effect size of the included study while the red diamonds show the overall effect size per dimension.



0.26–0.58; $p < 0.0001$). Even though the instrument used to measure mood was very consistent, heterogeneity was rather high $I^2 = 73.5\%$ ($Q = 34.0$; $p = 0.0001$). Table 3 shows the results of the meta-analysis and figure 2 (b) provides the corresponding forest plot.

Several different measures were used to determine emotional distress, such as the SOSI, PSS, DASS, and the Scl-90s Global Severity Index (GSI-SCL90; table 2). A total of $n = 587$ patients out of 15 studies was included. The overall effect size was 0.58 (95% CI 0.45–0.72; $p < 0.0001$) and heterogeneity was high with $I^2 = 67.2\%$ ($Q = 45.7$; $p < 0.0001$). Table 3 shows the results of the meta-analysis and figure 2 (c) the corresponding forest plot.

Discussion

Helping cancer patients to regain control after being diagnosed with cancer and treated with a variety of therapies such as chemo- or radiotherapy is one of the most challenging tasks for physicians and relatives. MBSR in such situations is supposed to be one of the most powerful mind-body interventions to alleviate psychological symptoms, and several reviews suggest that mindfulness interventions seem to provide a useful tool in the treatment of cancer patients. Potential benefits are seen in the psychological adjustment of cancer patients and in helping them to reduce their stress level and promote their mood by effective coping. Some studies also reveal hints that MBSR may improve physical symptoms leading to an improvement of QoL.

This review assessed for the first time the pre-post effects of MBSR in both, observational and randomised clinical studies, in the dimensions mood, distress, and QoL. Overall, MBSR resulted in rather low effect sizes for QoL, weak effect sizes for mood and moderate effect sizes for emotional distress. Although the pre-post effect sizes presented here are

slightly higher and we chose other outcome dimensions, the results are comparable to those reported by Ledesma and Kumano [22] in the dimensions ‘mental health measures’ (0.48) and ‘physical health measures’ (0.18). Also in congruence with Ledesma and Kumano [22], a slight decrease in the published effect sizes was detected when only RCTs were included and effect sizes were calculated on the basis of between-group differences. This, however, was not further addressed in our analysis.

Homogeneity measures did not show a consistent picture. While in QoL the I^2 value of heterogeneity was quite low and not significant, heterogeneity of included studies on mood and distress was high. Particularly regarding mood measures, this result is interesting because all studies used the well established POMS questionnaire as outcome measure. Thus it must be assumed that either the overall effect size does not represent a homogenous population of cancer patients or that other factors may have biased the results. Indeed, the methodological quality of the investigations on the clinical effects of MBSR may limit the validity of the results. Most trials did not sufficiently report data on compliance and completeness of follow-up, and with the exception of 3 studies, the number of patients did not reach $n = 100$ which would be considered sufficient power when testing repeatedly for all dimensions. In particular, the compliance of the patients seems to be the factor being responsible for a high loss in follow-up. In fact, a review of controlled studies on mindfulness meditation and anxiety/depression indicated that if adherence to the programme was assessed (and it was infrequently assessed) ‘the relation between practising mindfulness and changes in depression and anxiety was equivocal’ [32]. The majority of studies documented pre-post effects of compliant patients, while intent-to-treat analysis was rarely seen. Moreover, one might also argue that in order to identify active ingredients adequate control conditions (e.g. against a progressive muscle relaxation training) should be applied. The review by To-

neatto and Nguyen [32] supports this assumption, since MBSR had no effect on the outcome parameters when active controls were used in the studies. At least, even though MBSR in some cases was poorly described, the analysis of the papers suggests a homogenous approach of MBSR following the recommendations of Kabat-Zinn [13].

From a clinical point of view, limitations include the heterogeneous cancer staging (it would be important to know at what stage of disease MBSR might be helpful), heterogeneity in types and status of cancer (self-selection of patients may impose a problem: most studies included women with breast cancer), as well as insufficient information and reporting on treatment status and on the concurrent treatments applied. Moreover, the studies generally do not assess whether the cancer patients are emotionally engaged in the interventions and do positively adhere to the interventions. In fact, a potential low inner congruence with the interventions [33] could explain in part the drop outs and loss to follow-up of patients.

Conclusion

There is evidence that MBSR can improve mood and distress in cancer patient, while physical symptoms are unlikely to improve as a consequence of MBSR interventions. SOSI and POMS are well established in MBSR studies and are identified as suitable and easy to use instruments. However, there is still a need for high quality RCTs with adequate controls, sufficient samples sizes, clear descriptions of patients' psychological profiles, and longer follow-up results. They should moreover be accompanied by qualitative methodology in order to increase the understanding of the mediators of MBSR effects.

Disclosure Statement

The authors declare that they have no conflict of interest.

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