Table 1: Systematic reviews of mindfulness for cancer

Source: Cramer H, CAM-Cancer Consortium. Mindfulness [online document]. https://cam-cancer.org/en/mindfulness-cam, February 2021.

Study year	Design and methods	Inclusion criteria	Included studies and participants	Included interventions and outcomes	Main results/Conclusions	Comments
Overviews of systematic reviews published before 2015						
Gotink, 2015	Type of review: Overview of SRs Search strategy: PubMed, Embase, PsycInfo, Cochrane, Medline, Web of Science through January 12, 2015, restricted to systematic reviews and meta-analyses Quality assessment: Checklist based on PRISMA Measure of treatment effect: SMD Data synthesis: meta-analysis of meta-analyses	Studies: SRs of RCTs Participants: Any Interventions/comparator: MBSR or MBCT compared to any comparator Outcomes: Any health outcome measure	Studies: 23 SRs including 6 on cancer patients; 23 RCTs including 16 on cancer patients Participants: 1,668 mixed cancer patients	Intervention: MBSR/MBCT Control: Active treatment, UC, WL Concurrent treatment: Not reported Outcome measures: Not reported	Results for outcome measures: Significant improvements for depression, anxiety, stress, quality of life, but not for physical health Results quality assessment: 19 (Cramer 2012), 6 (Ledesma), 8 (Shennan), 7 (Smith), 2 (Ott), and 10 (Piet 2012) items form the PRISMA checklist were rated 'yes' for the individual reviews on cancer. Conclusions: MBSR/MBCT are associated with improvements in depressive symptoms, anxiety, stress, quality of life, selected physical outcomes in the adjunct treatment of cancer	Meta-analysis of meta-analyses not differentiated by patient groups; quality assessment tool not validated; quality assessment not reflected in conclusions

Systematic reviews published from 2015 onwards						
Castanhel 2018	Type of review: SR and MA Search strategy: PubMed between 2013 and 2017, published in English Quality assessment: Cochrane RoB tool, PEDro score Measure of treatment effect: SMD Data synthesis: meta-analysis	Studies: RCTs and non-randomized studies published in English between 2013 and 2017 with a PEDro score > 3 Participants: BC Interventions/comparator: MBSR compared to any comparator Outcomes: Any	Studies: 6 RCTs, 1 non-randomized study (2 RCTs in meta-analysis) Participants: 532 breast cancer patients	Intervention: MBSR Control: UC, nutritional intervention, metacognitive treatment Concurrent treatment: not reported Outcome measures: BFI, EORTC QLQ-C30, HADS, FSS, MADSI, SCL-90-R	Results for outcome measures: Significant improvements for fatigue, depression, anxiety, cognitive symptoms in single studies. No effects on fatigue in a meta-analysis of 2 RCTs. Results quality assessment: low risk of selection bias in 3 out of 6 RCTs; blinding high RoB in 4 out of 6 RCTs; low risk of selective reporting in 4 out of 6 RCTs; low risk of attrition and other bias; mean PEDro score 6.71 (standard deviation 0.48). Conclusions: Mindfulness-Based Stress Reduction can be considered a promising alternative for the treatment of breast cancer symptoms.	Methods incompletely reported. Search very limited; missed a number of eligible studies, results therefore incomplete. Safety not assessed.
Cillessen 2019	Type of review: SR and MA Search strategy: PubMed Web of Science, PsycInfo, CINAHL, through October 2018 Quality assessment: Shaw criteria, GRADE Measure of treatment effect: SMD Data synthesis: meta-analysis	Studies: RCTs Participants: Mixed cancer Interventions/comparator: Mindfulness-based interventions compared to any comparator Outcomes: any health outcomes	Studies: 29 RCTs Participants: 3,274 breast cancer patients	Intervention: MBSR, MBCT, MBAR, MAPS, MBCR, MBT Control: usual care, wait-list, supportive expressive group therapy, group nutrition education program, relaxation, sleep hygiene program, mind-body bridging program, ambulant activity feedback, stress management Concurrent treatment: None in 4 RCTs; not reported for remaining RCTs Outcome measures: not reported	Results for outcome measures: Significant small to medium short-term improvements for psychological distress, anxiety, depression, fear of cancer recurrence, fatigue. Significant small longer-term improvements for psychological distress, sleep, pain, anxiety. Results quality assessment: Moderate quality of evidence. Conclusions: Mindfulness-based interventions appear efficacious in reducing psychological distress and other symptoms.	Outcome measures not reported; different control interventions pooled; adverse events not reported.

Haller 2017	Type of review: SR and MA Search strategy: PubMed (including MEDLINE), Scopus, Cochrane, through October 2016 Quality assessment: Cochrane RoB tool Measure of treatment effect: SMD Data synthesis: meta-analysis	Studies: RCTs Participants: BC Interventions/comparator: MBSR or MBCT compared to any comparator Outcomes: Any	Studies: 10 RCTs Participants: 1,709 breast cancer patients	Intervention: MBSR or MBCT Control: usual care, enhanced usual care, wait-list, supportive expressive group therapy, group nutrition education program Concurrent treatment: None in 6 RCTs; chemotherapy and/or radiotherapy allowed in 4 RCTs Outcome measures: C-SOSI, CES, CES-D, CPSS, EORTC QLQ-30, FACT-B, FSI, HADS, MDASI, MOS-SF36, MOSS, PSS, PSQI, QLAQS, SCL-90-R, POMS, STAI, WHO-5, adverse events	Results for outcome measures: Significant short-term improvements for quality of life, fatigue, sleep, stress, anxiety, depression. Significant medium-term improvements for anxiety, depression. Significant long-term improvements for anxiety. Compared to active interventions short-term improvements of anxiety and depression. Insufficient data for adverse events. Results quality assessment: Unclear methods randomization and/or allocation concealment in 7 out of 10 RCTs; blinding unclear RoB; low risk of attrition bias; high risk of selective reporting; low risk of other bias Conclusions: Evidence for short-term effectiveness and safety. Clinical relevance remains unclear.	No grey literature included; publication bias could not be assessed.
He 2020	Type of review: SR and MA Search strategy: PubMed, Cochrane, Clinicaltrials, China Biomedical Literature Database, China National Knowledge Infrastructure, China Science Periodical Database through October 2018 Quality assessment: Cochrane RoB tool Measure of treatment effect: SMD Data synthesis: meta-analysis	Studies: RCTs Participants: any cancer with fatigue Interventions/comparator: MBSR compared to routine treatment Outcomes: fatigue, adverse events	Studies: 5 RCTs Participants: 700 cancer patients	Intervention: MBSR Control: usual care, psychoeducation Concurrent treatment: None Outcome measures: CFS, FSI, PFS	Results for outcome measures: Significant medium-size improvement in fatigue. Results quality assessment: Two RCTs 'A' rating, 3 RCTs 'B' rating Conclusions: MBSR can alleviate cancer-related fatigue to a certain extent.	Risk of bias unclear (eg, low risk of participant blinding); different control interventions pooled; adverse events reporting unclear.
Huang 2016	Type of review: SR and MA Search strategy: PubMed, EMBASE, Cochrane though June 30, 2014	Studies: RCTs and non-randomized studies Participants: BC	Studies: 3 RCTs, 1 non-randomized CCTs, 4 uncontrolled trials	Intervention: MBSR Control: free choice of stress management techniques, nutrition education, UC	Results for outcome measures: Short-term innergroup effects on depression, anxiety, and stress.	Search strategy incompletely reported; MD used although different

	Quality assessment: Cochrane RoB tool, NOS Measure of treatment effect: MD Data synthesis: meta-analysis	Interventions/comparator: MBSR compared to UC or SC Outcomes: Quality of life, psychological function	Participants: 880 BC (728 in RCTs)	Concurrent treatment: Active radiation and/or chemotherapy for a subset of patients in 1 RCT Outcome measures: BAI, BDI, CES-D, C-SOSI, FACT-B, MMOS, PSS, SCL-90	Results quality assessment: Only 1 RCT had adequate randomization and blinding of outcome assessors Conclusions: Positive effect of MBSR in decreasing anxiety, depression and stress and improving overall quality of life among breast cancer survivors. This approach should be recommended to breast cancer patients.	outcome measures were used (MA biased); no between-group comparisons but only within-group comparisons in MA; safety not assessed.
Oberoi 2020	Type of review: SR and MA Search strategy: Medline, Embase, Cochrane, CINAHL, PsycInfo, Scopus through May 2019 Quality assessment: Cochrane RoB tool Measure of treatment effect: SMD Data synthesis: meta-analysis	Studies: RCTs Participants: any cancer Interventions/comparator: Mindfulness-based interventions compared to usual care, no treatment or sham Outcomes: anxiety, depression, quality of life	Studies: 28 RCTs Participants: 3,035 cancer patients	Intervention: MBSR, MBCT, MBAT, other mindfulness-based interventions Control: usual care, psychoeducation Concurrent treatment: No treatment in 12 RCTs, chemotherapy/radiotherapy in 3 RCTs, mixed in 10 RCTs, unclear in 3 RCTs Outcome measures: BAI, CES-D, DASS, EORTC QLQ-C30, FACT-B, FACT-G, Generalized Anxiety Disorder Scale, HADS, HAM-A, Personality Assessment Inventory, Prostate Specific Anxiety Scale, PHQ, POMS, SCL-90, Self-rating Anxiety Scale, Self-rating Depression Scale, SF-36, STAI, VAS, WHO-5	Results for outcome measures: Significant short- and medium- but not long-term improvement in anxiety, depression and quality of life. Results quality assessment: High risk of performance and detection bias. Conclusions: Mindfulness-based interventions were associated with reductions in anxiety and depression up to 6 months in adults with cancer.	Different control interventions pooled; non-eligible control interventions included; adverse events not reported
Rush 2017	Type of review: SR and MA Search strategy: Medline, Alt Health Watch, CINAHL between October 2009 and November 2015, restricted to adults and English language	Studies: Any Participants: Any cancer Interventions/comparator: MBSR	Studies: 8 RCTs, 2 non-randomized CCTs, 3 uncontrolled trials	Intervention: MBSR Control: nutrition education, UC, WL Concurrent treatment: None (not reported for some studies)	Results for outcome measures: Not synthesized Results quality assessment: None Conclusions: MBSR is a promising modality for stress management among cancer patients. All	Studies not indexed in the searched databases were excluded; search strategy

	Quality assessment: None Measure of treatment effect: NA Data synthesis: qualitative	compared to any comparator Outcomes: Stress, anxiety	Participants: 1,575 mixed cancer patients (1,143 in RCTs)	Outcome measures: BAI, BDI, blood pressure, CES-D, CSES, Cortisol, C-SOSI; FACT, FACT-Sp, FFMQ, HADS, heart rate IES, MAAS, MAC, MSCL, POMS, respiratory rate, RRQ, RSES, SCL-90, UCLA Loneliness Scale	practitioners must include MBSR as one of the approaches for stress reduction as part of cancer care.	inadequate; no RoB assessment; results not synthesized but only listed in a table; safety not assessed; conclusions not based on evidence (too strong).
Schell 2019	Type of review: Cochrane SR and MA Search strategy: Cochrane, MEDLINE, Embase, WHO ICTRP, ClinicalTrials.gov through April 10, 2018, no restrictions Quality assessment: Cochrane RoB tool Measure of treatment effect: SMD Data synthesis: meta-analysis	Studies: RCTs Participants: BC Interventions/comparator: MBSR plus anticancer therapy compared to anticancer therapy alone Outcomes: Quality of life, overall survival, fatigue, anxiety, depression, quality of sleep, adverse events	Studies: 14 RCTs (10 RCTs in MA) Participants: 1,756 BC patients (1571 BC patients in MA)	Intervention: MBSR plus anticancer therapy (not defined) Control: anticancer therapy (not defined) Concurrent treatment: None in 6 RCTs; chemotherapy and/or radiotherapy allowed in 3 RCTs Outcome measures: BAI, BDI, CES-D, EORTC QLQ-30, EORTC QLC-BR23, FACT-B, FACT-ES, FSI, GAD-7, HADS, IBCSG QoL, ISI, MOS- SF-36, MOSS, PHQ-8, POMS, PSQI, SCL-90-R, STAI, survival	Results for outcome measures: Significant short-term improvements for quality of life (low-quality evidence), fatigue (moderate-quality evidence), anxiety (moderate-quality evidence), depression (high-quality evidence). Significant medium-term improvements for fatigue (moderate-quality evidence), anxiety (moderate-quality evidence), depression (moderate-quality evidence), and quality of sleep (moderate-quality evidence). No long-term effects on quality of life, anxiety or depression. No data on overall survival or adverse events. Results quality assessment: Unclear methods randomization and/or allocation concealment in 10 out of 14 RCTs; blinding high RoB in all RCTs; high or unclear risk of attrition bias in 8 out of 14 RCTs high or unclear risk of selective reporting in 13 out of 14 RCTs; low risk of other bias in 12 out of 14 RCTs	Anticancer therapy is given as an inclusion criterion; only 3 out of 10 RCTs in the meta-analysis fulfil this inclusion criterion.

					Conclusions: May improve quality of life and fatigue in the short-term, anxiety and depression up to six months after the end of the intervention. No effects up to two years after the intervention.	
Tomlinson 2020	Type of review: SR Search strategy: Medline/Pubmed, Embase, CINAHL, PsycInfo through September 2019, restricted to children, adolescents, young adults and English language Quality assessment: EPHPP Measure of treatment effect: NA Data synthesis: qualitative	Studies: any Participants: children, adolescents, young adults with cancer Interventions/comparator: Mindfulness-based interventions; any comparator Outcomes: any	Studies: 2 RCTs, 2 uncontrolled studies Participants: 178 children, adolescents, young adults with mixed cancer	Intervention: MBSR/other mindfulness-based interventions/breathing interventions Control: UC/no control group Concurrent treatment: not reported Outcome measures: Analgesia use, BAI, DASS, distress thermometer, CAMM, FCRI, heart rate, LEIDS, PANAS-C, PedsQL Wong-Bakers FACES	Results for outcome measures: Improvement in all outcome measures Results quality assessment: Limitations due to methodological flaws. Conclusions: Mindfulness-based interventions delivered to children with cancer may have beneficial effects.	No grey literature included; very limited evidence-base; safety not assessed.
Xie 2020	Type of review: SR and MA Search strategy: PubMed, Cochrane, Web of Science, Spring Link, China National Knowledge Infrastructure, Wangfang, VIP Journal Resource Integration Service Platform, China Biology Medicine through January 2019 Quality assessment: Cochrane RoB tool Measure of treatment effect: SMD Data synthesis: meta-analysis	Studies: RCTs Participants: any cancer Interventions/comparator: MBSR compared to UC or no intervention Outcomes: fatigue, adverse events	Studies: 15 RCTs Participants: 1,794 cancer patients	Intervention: MBSR Control: usual care, no intervention Concurrent treatment: Surgery, chemotherapy and/or radiotherapy in 14 RCTs, none in 1 RCT Outcome measures: CFS, FSI, FSS, MDASI, PFS, POMS	Results for outcome measures: Significant large improvement in fatigue. Adverse events reported in only 1 RCT Results quality assessment: High risk in at least one category in 7 RCTs. Conclusions: MBSR is effective for cancer-related fatigue management and can be recommended as a beneficial complementary therapy for cancer-related fatigue patient.	Risk of bias not taken into account for conclusions.
Zhang 2015	Type of review: SR and MA Search strategy: Medline, Cochrane, EMBASE, Google Scholar through November 2014, no restrictions	Studies: RCTs Participants: Any cancer Interventions/comparator: Mindfulness-	Studies: 7 RCTs Participants: 888 mixed cancer patients	Intervention: MBSR/MBCT/MBAT Control: UC Concurrent treatment: Not reported	Results for outcome measures: Moderate short-term effects on anxiety; large short-term effects on depression; no medium-term effects on anxiety or depression	No grey literature included; search strategy incomplete; treatment status unclear; RoB

	Quality assessment: Cochrane RoB tool Measure of treatment effect: SMD Data synthesis: meta-analysis	based interventions compared to UC Outcomes: Depression, anxiety		Outcome measures: HADS, HAM-D, POMS, SCL-90-R	Results quality assessment: Low RoB except for blinding of participants Conclusions: Mindfulness-based interventions can relieve anxiety and depression among patients with cancer. Further research is warranted.	assessment not in line with other reviews (overly positive); safety not assessed.
Zhang 2016	Type of review: SR and MA Search strategy: PubMed, Cochrane, SCI, EBSCO, Chinese Biomedical Literature Database, Chinese Digital Journals Fulltext Database through January 2015, no restrictions Quality assessment: Jadad Score, baseline comparability, allocation concealment Measure of treatment effect: MD or SMD Data synthesis: meta-analysis	Studies: RCTs Participants: BC Interventions/comparator: MBSR or MBCT compared to UC, WL or placebo Outcomes: Physical health, psychological health, quality of life	Studies: 7 RCTs Participants: 951 BC	Intervention: MBSR, Mindful Awareness Practices Control: UC, WL Concurrent treatment: Not reported Outcome measures: BCPT, CES-D, CRS, FACT, FACT-B, FSI, MDASI, POMS, PSS, PSQI, SCL-90, STAI, QLACS	Results for outcome measures: Small short-term effects of MBSR compared to WL or UC on anxiety or emotional well-being, moderate short-term effects on fear of recurrence, large short-term effects on depression, no short-term effects on stress or spirituality. Results quality assessment: 2 RCTs ≥ 4 on Jadad Score; 2 RCTs adequate randomization and allocation concealment; 2 RCTs blinded outcome assessors Conclusions: Clear support for the efficacy of MBT as adjunctive treatment of BC. More research is needed	No grey literature included; validity of Jadad Score under discussion; overestimation of the findings in light of the limited study quality; publication bias not assessed; safety not assessed.
Zhang 2019	Type of review: SR and MA Search strategy: Cochrane Library, Central, PsycINFO, Web of science, Medline, EMBASE, CNKI, CBM database through May 2018, no restrictions Quality assessment: Cochrane RoB tool; NOS Measure of treatment effect: MD Data synthesis: meta-analysis	Studies: Not reported Participants: Not reported Interventions/comparator: Not reported Outcomes: Not reported	Studies: 8 RCTs, 6 non-randomized CCTs Participants: 1,505 BC	Intervention: MBSR Control: UC, WL, no treatment Concurrent treatment: Not reported Outcome measures: BPI, CAMS-R, CES-D, C-SOSI, distress thermometer scale, ECOG, EORTC QLQ-C30, EORTC QLQ-BR23, FACT-B, FACT-ES, FFMQ, FSI, GAD-7, HADS, ISI, MAAS, MOS-SF36, PHQ-8, PFS, POMS, PSS, SCL-	Results for outcome measures: Positive effects of MBSR on psychological function, cognitive function, fatigue, emotional wellbeing, anxiety, depression, stress, distress, mindfulness. No effects on pain, sleep quality, global quality of life. Results quality assessment: Inconsistent reporting between text and tables, RoB in RCTs cannot be interpreted; good quality of non-randomized studies	No grey literature included; inclusion criteria not reported; RoB assessment inconsistent and not interpretable; short- and long-term effects not differentiated.

				90-R, SOSI, STAI, symptom scales, WBPI, WEMWBS, WHO-5	Conclusions: Mindfulness-based interventions can relieve anxiety and depression among patients with cancer. Further research is warranted.	

Abbreviations: 7DDR, 7-Day Diet Recall; BAI, Beck Anxiety Index; BC, women diagnosed with breast cancer; BCPT, Breast Cancer Prevention Trial Symptom Checklist; BDI, Beck Depression Index; BFI, Brief Fatigue Inventory; BPI, brief pain inventory; CAMM, Children's Acceptance and Mindfulness Measure; CAMS-R, cognitive and affective mindfulness scale-revised; CARS, Concerns About Recurrence Scale; CCT, controlled clinical trial; CES-D, Center for Epidemiological Studies Depression Scale; CFS, Cancer Fatigue Scale; COC, Courtauld Emotional Control Scale; CPSS, Chinese Perceived Stress Scale; CSES, Coping Self-efficacy Scale; C-SOSI, Calgary Symptoms of Stress Inventory; DASS, Depression Anxiety Stress Scale; DWI, Dealing with Illness Questionnaire; ECOG, everyday cognition scale; EORTC QLQ-30, European Organization for Research and Treatment quality of life questionnaire-30 Items; EORTC QLC BR23, European Organization for Research and Treatment quality of life questionnaire - Breast Cancer-23 Items; EPHPP, Effective Public Health Practice Project; FACT, Functional Assessment of Cancer Therapy; FACT-B, Functional Assessment of Cancer Therapy-Breast; FACT-ES, Functional Assessment of Cancer Therapy-Endocrine Symptoms; FACT-Sp, Functional Assessment of Cancer Therapy-Spirituality; FCRI, Fear of Cancer Recurrence Inventory; FFMQ, Five-Facet Mindfulness Questionnaire; FSI, Fatigue Symptom Inventory; FSS, FAatigure Severity Scale; GAD, Generalized Anxiety Disorder; HADS, Hospital Anxiety and Depression Scale; HAM-A, Hamilton Anxiety Rating Scale; HAM-D, Hamilton Depression Rating Scale; IBCSG QoL, International Breast Cancer Study Group Quality of Life Core Questionnaire; IES, Impact of Event Scale; ISI, Insomnia Severity Index; LEIDS, Leiden Index of Depression Sensitivity; LOT, Life Orientation Test; MA, meta-analysis; MAAS, Mindful attention Awareness Scale; MAC, Mental Adjustment to Cancer Scale; MBAT, Mindfulness-based Art Therapy; MBCR, Mindfulness-based Cancer Recovery; MBCT, Mindfulness-based Cognitive Therapy; MBSR, Mindfulness-based Stress Reduction; MBT, Mindfulness-based Training; MD, mean difference; MDI, Major Depression Inventory; MDASI, MD Anderson Symptom Inventory; Mini-MAC, Mental Adjustment to Cancer Scale short form; MOS-SF, Medical Outcomes Studies Short-form General Health Survey; MOS-SSS, Medical Outcomes Social Support Survey; MOSS, Medical Outcome Study sleep scale; MSCL, Medical Symptom Checklist; NOS, Newcastle-Ottawa Assessment Scale; PANAS-C, Positive and Negative Affect Schedule for Children; PEDro, Physiotherapy Evidence Database; PedsQL, Pediatric Quality of Life Score; PENN, Penn State Worry Questionnaire; PHQ, Patient Health Questionnaire Depression Scale; PFS, piper fatigue scale; POMS, Profile of Mood Scale; PRISMA, Preferred reporting items for systematic review and meta-analysis protocols, PSS, Perceived Stress Scale; PSQI, Pittsburgh Sleep Quality Index; QLACS, Quality of Life in Adult Cancer Survivors; RCT, randomized controlled trial; RoB, risk of bias; RRQ, Rumination-Reflection Questionnaire; RSES, Rosenberg Self-Esteem Scale; SC, standard care; SCI, Shapiro Control Inventory; SCL-90-R, Symptom Checklist-90-Revised; SMD, standardized mean difference; SOC, Sense of Coherence Scale; SOSI, Symptoms of Stress Inventory; SR, systematic review; STAI, State-Trait Anxiety Inventory; UC, usual care; WBPI, Wisconsin brief pain inventory; WEMWBS, Warwick-Edinburgh mental wellbeing scale; WHO-5,WHO five-item well-being questionnaire; WL, wait list