

Appendix 1. Search strategy

1. Ovid MEDLINE

1	exp Meditation/
2	meditat*.ti.
3	meditat*.ab.
4	mindful*.ti.
5	mindful*.ab.
6	mindfulness-based stress reduction.ti.
7	mindfulness-based stress reduction.ab.
8	MBSR.ti.
9	MBSR.ab.
10	exp Mindfulness/
11	(mind body adj3 rela*).mp.
12	exp Sleep Disorders/
13	exp "Sleep Initiation and Maintenance Disorders"/
14	insomnia.ti.
15	insomnia.ab.
16	sleep disturbance.ti.
17	sleep disturbance.ab.
18	sleep.tw.
19	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11
20	12 or 13 or 14 or 15 or 16 or 17 or 18
21	19 and 20
22	limit 21 to yr="2020 -Current"
23	randomized controlled trial.pt.
24	controlled clinical trial.pt.
25	randomized.ab.
26	placebo.ab.
27	drug therapy.fs.
28	randomly.ab.
29	trial.ab.
30	groups.ab.
31	23 or 24 or 25 or 26 or 27 or 28 or 29 or 30
32	exp animals/ not humans/
33	31 not 32
34	22 and 33

2. AMED (Allied and Complementary Medicine)

1	mindfulness.mp.
2	exp Meditation/
3	mindfulness-based stress reduction.mp.
4	(mind-body adj3 rela*).mp. [mp=abstract, heading words, title]
5	exp Sleep disorders/
6	sleep disturbance.mp.
7	MBSR*.mp.
8	1 or 2 or 3 or 4 or 7
9	sleep*.mp.
10	exp Insomnia/
11	5 or 6 or 9 or 10
12	8 and 11
13	meditat*.mp.
14	mindful*.mp.
15	insomnia*.mp.
16	1 or 2 or 3 or 4 or 7 or 13 or 14
17	5 or 6 or 9 or 10 or 15
18	16 and 17

3. Embase

1	exp mindfulness/
2	exp meditation/
3	mindfulness-based stress reduction.mp.
4	MBSR*.mp.
5	(mind-body adj3 rela*).mp.
6	exp sleep disorder/
7	sleep disturbance.mp.
8	exp sleep/
9	exp insomnia/
10	meditat*.tw.
11	mindful*.tw.
12	insomnia*.tw.
13	1 or 2 or 3 or 4 or 5 or 10 or 11
14	6 or 7 or 8 or 9 or 12
15	13 and 14
16	Randomized controlled trial/
17	Controlled clinical study/
18	random\$.ti,ab.
19	randomization/
20	intermethod comparison/
21	placebo.ti,ab.
22	(compare or compared or comparison).ti.
23	((evaluated or evaluate or evaluating or assessed or assess) and (compare or compared or comparing or comparison)).ab.
24	(open adj label).ti,ab.
25	((double or single or doubly or singly) adj (blind or blinded or blindly)).ti,ab.
26	double blind procedure/
27	parallel group\$1.ti,ab.
28	(crossover or cross over).ti,ab.
29	((assign\$ or match or matched or allocation) adj5 (alternate or group\$1 or intervention\$1 or patient\$1 or subject\$1 or participant\$1)).ti,ab.
30	(assigned or allocated).ti,ab.
31	(controlled adj7 (study or design or trial)).ti,ab.
32	(volunteer or volunteers).ti,ab.
33	human experiment/
34	trial.ti.
35	or/16-34
36	Animal experiment/ not (human experiment/ or human/)
37	35 not 36
38	15 and 37

4. CINAHL Plus with Full Text

1	(MH randomized controlled trials OR MH double-blind studies OR MH single-blind studies OR MH random assignment OR MH pretest-posttest design OR MH cluster sample OR TI (randomised OR randomized) OR AB (random*) OR TI (trial) OR (MH (sample size) AND AB (assigned OR allocated OR control)) OR MH (placebos) OR PT (randomized controlled trial) OR AB (CONTROL W5 GROUP) OR MH (CROSSOVER DESIGN) OR MH (COMPARATIVE STUDIES) OR AB (CLUSTER W3 RCT)) NOT ((MH ANIMALS+ NOT MH HUMAN) OR (MH (ANIMAL STUDIES) NOT MH (HUMAN)) OR (TI (ANIMAL MODEL) NOT MH (HUMAN)))
2	(MH "Mindfulness") OR "Mindfulness"
3	(MH "Meditation") OR "Meditation"
4	TI MBSR OR AB MBSR
5	TI mindfulness based stress reduction OR AB mindfulness based stress reduction
6	TI mind-body N3 rela* OR AB mind-body N3 rela*
7	(MH "Sleep Disorders+")
8	TI Sleep Disturbance OR AB Sleep Disturbance
9	sleep*
10	insomnia*
11	(MH "Sleep+")
12	S2 OR S3 OR S4 OR S5 OR S6
13	S7 OR S8 OR S9 OR S10 OR S11
14	S12 and S13

5. COCHRANE Library

1	MeSH descriptor: [Meditation] explode all trees
2	MeSH descriptor: [Mindfulness] explode all trees
3	(mind-body near/3 rela*):ti,ab,kw (Word variations have been searched)
4	(mindful* near/3 stress):ti,ab,kw (Word variations have been searched)
5	(MBSR):ti,ab,kw (Word variations have been searched)
6	(meditat*):ti (Word variations have been searched)
7	(meditat*):ab
8	(mindful*):ti
9	(mindful*):ab
10	MeSH descriptor: [Sleep] explode all trees
11	MeSH descriptor: [Sleep Wake Disorders] explode all trees
12	MeSH descriptor: [Sleep Initiation and Maintenance Disorders] explode all trees
13	(sleep disturbance):ti,ab,kw
14	("sleep disorder"):ti,ab,kw
15	(insomnia):ti,ab,kw
16	#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9
17	#10 or #11 or #12 or #13 or #14 or #15
18	#16 and #17

Koreamed

1	mindfulness 국내, 인간 제한 (gugnae, ingan jehan)
2	meditation 국내, 인간 제한 (gugnae, ingan jehan)
3	MBSR 국내, 인간 제한 (gugnae, ingan jehan)
6	Or/1-3

Kmbase

1	mindfulness ti, ab, kw 국내 제한 (gugnae jehan)
2	meditation ti, ab, kw 국내 제한 (gugnae jehan)
3	MBSR ti, ab, kw 국내 제한 (gugnae jehan)
4	마음챙김(ma-eumchaeng-gim) ti, ab, kw 국내 제한 (gugnae jehan)
5	Or/1-4

KISS

1	mindfulness ti 제한 (jehan)
2	meditation ti 제한 (jehan)
3	MBSR ti 제한 (jehan)
4	마음챙김 (ma-eumchaeng-gim) ti 제한 (jehan)
5	Or/1-4

NDSL

1	mindfulness ti, ab, kw, 국내 제한 (gugnae jehan)
2	meditation ti, ab, kw, 국내 제한 (gugnae jehan)
3	MBSR ti, ab, kw, 국내 제한 (gugnae jehan)
4	마음챙김 (ma-eumchaeng-gim) ti, ab, kw, 국내 제한 (gugnae jehan)
5	Or/1-4

Appendix 2. The 65 excluded studies from full-text review

	Reason for exclusion	Reference
1	not RCTs	Bootzin RR, Stevens SJ. Adolescents, substance abuse, and the treatment of insomnia and daytime sleepiness. <i>Clinical psychology review</i> 2005;25:629–644.
2	not RCTs	Brand S, Holsboer-Trachsler E, Naranjo JR <i>et al.</i> Influence of mindfulness practice on cortisol and sleep in long-term and short-term meditators. <i>Neuropsychobiology</i> 2012;65:109–118.
3	not RCTs	Carlson LE, Garland SN. Impact of mindfulness-based stress reduction (MBSR) on sleep, mood, stress and fatigue symptoms in cancer outpatients. <i>International journal of behavioral medicine</i> 2005;12:278–285.
4	not RCTs	Carlson LE, Speca M, Patel KD, <i>et al.</i> Mindfulness-based stress reduction in relation to quality of life, mood, symptoms of stress, and immune parameters in breast and prostate cancer outpatients. <i>Psychosomatic medicine</i> 2003;65:571–581.
5	not RCTs	Cincotta AL, Gehrman PR, Gooneratne NS, <i>et al.</i> The effects of a mindfulness-based stress reduction programme on pre-sleep cognitive arousal and insomnia symptoms: a pilot study. <i>Stress & Health: Journal of the International Society for the investigation of stress</i> 2011;27:e299-305.
6	not RCTs	Flugel Colle KF, Vincent A, Cha SS, <i>et al.</i> Measurement of quality of life and participant experience with the mindfulness-based stress reduction program. <i>Complementary therapies in clinical practice</i> . 2010;16:36–40.
7	not RCTs	Gross CR, Kreitzer MJ, Russas V, <i>et al.</i> Mindfulness meditation to reduce symptoms after organ transplant: a pilot study. <i>Adv Mind Body Med</i> 2004;20:20-29.
8	not RCTs	Kreitzer MJ, Gross CR, Ye X, <i>et al.</i> Longitudinal impact of mindfulness meditation on illness burden in solid-organ transplant recipients. <i>Prog Transplant</i> 2005;15:166-172.
9	not RCTs	Melnyk BM, Fineout-Overholt E, Stetler C, <i>et al.</i> Outcomes and implementation strategies from the first U.S. Evidence-Based Practice Leadership Summit. <i>Worldviews Evid Based Nurs</i> 2005;2:113-121.
10	not RCTs	Roth B, Robbins D. Mindfulness-based stress reduction and health-related quality of life: findings from a bilingual inner-city patient population. <i>Psychosom Med</i> 2004;66:113-123.
11	not RCTs	Wall RB. Tai Chi and mindfulness-based stress reduction in a Boston Public Middle School. <i>J Pediatr Health Care</i> 2005;19:230-237.
12	not RCTs	Fouk MA, Ingersoll-Dayton B, Kavanagh J, <i>et al.</i> Mindfulness-based cognitive therapy with older adults: an exploratory study. <i>J Gerontol/Soc Work</i> 2014;57:498-520.
13	not RCTs	Larouche M, Côté G, Bélisle D, <i>et al.</i> Kind attention and non-judgment in mindfulness-based cognitive therapy applied to the treatment of insomnia: state of knowledge. <i>PatholBiol (Paris)</i> 2014;62:284-291.
14	not RCTs	Yook K, Lee SH, Ryu M, <i>et al.</i> Usefulness of mindfulness-based cognitive therapy for treating insomnia in patients with anxiety disorders: a pilot study. <i>J Nerv Ment Dis</i> 2008;196:501-503.
15	not RCTs	Ong JC, Shapiro SL, Manber R. Combining mindfulness meditation with cognitive-behavior therapy for insomnia: a treatment-development study. <i>Behav Ther</i> 2008;39:171-182.

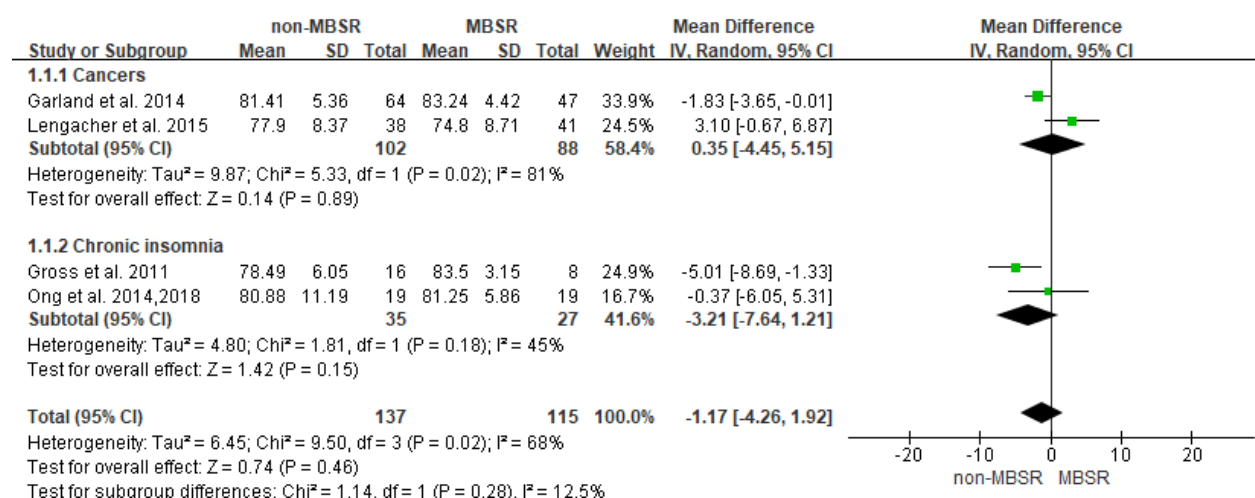
16	not RCTs	Ong JC, Shapiro SL, Manber R. Mindfulness meditation and cognitive behavioral therapy for insomnia: a naturalistic 12-month follow-up. <i>Explore (NY)</i> 2009;5:30-36.
17	not RCTs	Garland SN, Rouleau CR, Campbell T, <i>et al.</i> The Comparative Impact of Mindfulness-Based Cancer Recovery (MBCR) and Cognitive Behavior Therapy for Insomnia (CBT-I) on Sleep and Mindfulness in Cancer Patients. <i>Explore (NY)</i> 2015;11:445-454.
18	not RCTs	Lawson K. Demystifying mindfulness. <i>Minn Med</i> 2011;94:37-39.
19	not RCTs	Purohit MP, Wells RE, Zafonte R, <i>et al.</i> Neuropsychiatric symptoms and the use of mind-body therapies. <i>J Clin Psychiatry</i> 2013;74:e520-526.
20	not RCTs	Roberts KC, Danoff-Burg S. Mindfulness and health behaviors: is paying attention good for you?. <i>J Am Coll Health</i> 2010;59:165-173.
21	not RCTs	Conesa J. Isolated sleep paralysis and lucid dreaming: Ten-year longitudinal case study and related dream frequencies, types, and categories. <i>Sleep and Hypnosis</i> 2002;4:132-142.
22	not RCTs	Xiao C, Chen Y, Wu Y, <i>et al.</i> Mindfulness-based stress reduction therapy as a preclinical intervention for peri-menopausal depressive moods - An observational study. <i>European journal of integrative medicine</i> 2020;39.
23	No information of primary sleep outcome	Lengacher CA, Johnson-Mallard V, Post-White J, <i>et al.</i> Randomized controlled trial of mindfulness-based stress reduction (MBSR) for survivors of breast cancer. <i>Psychooncology</i> 2009;18:1261-1272.
24	No information of primary sleep outcome	Ahani A, Wahbeh H, Nezamfar H, <i>et al.</i> Quantitative change of EEG and respiration signals during mindfulness meditation. <i>J Neuroeng Rehabil</i> 2014;11:87.
25	No information of primary sleep outcome	Van der Lee ML, Garssen B. Mindfulness-based cognitive therapy reduces chronic cancer-related fatigue: a treatment study. <i>Psychooncology</i> 2012;21:264-272.
26	No information of primary sleep outcome	Skovbjerg S, Hauge CR, Rasmussen A, <i>et al.</i> Mindfulness-based cognitive therapy to treat multiple chemical sensitivities: a randomized pilot trial. <i>Scand J Psychol</i> 2012;53:233-238.
27	No information of primary sleep outcome	Bower JE, Crosswell AD, Stanton AL, <i>et al.</i> Mindfulness meditation for younger breast cancer survivors: a randomized controlled trial. <i>Cancer</i> 2015;121:1231-1240.
28	No information of primary sleep outcome	Chinh K, Mosher CE, Brown LF, <i>et al.</i> Psychological processes and symptom outcomes in mindfulness-based stress reduction for cancer survivors: A pilot study. <i>Mindfulness</i> 2020;11: 905-916.
29	No information of primary sleep outcome	Janssen M, Heerkens Y, van der Heijden B <i>et al.</i> Effects of mindfulness-based stress reduction and an organizational health intervention on Dutch teachers' mental health. <i>Health promotion international</i> . 2022;4:1-15
30	Not focused on MBSR	Klatt MD, Buckworth J, Malarkey WB. Effects of low-dose mindfulness-based stress reduction (MBSR-I) on working adults. <i>Health Educ Behav</i> 2009;36:601-614.
31	Not focused on MBSR	Adler E, Dhruva A, Moran PJ, <i>et al.</i> Impact of a Mindfulness-Based Weight-Loss Intervention on Sleep Quality Among Adults with Obesity: Data from the SHINE Randomized Controlled Trial. <i>J Altern Complement Med</i> 2017;23:188-195.
32	Not focused on MBSR	Black DS, O'Reilly GA, Olmstead R, <i>et al.</i> Mindfulness meditation and improvement in sleep quality and daytime impairment among older adults with sleep disturbances: a randomized clinical trial. <i>JAMA Intern Med</i> 2015;175:494-501.
33	Not focused on MBSR	Beddoe AE, Lee KA, Weiss SJ, <i>et al.</i> Effects of mindful yoga on sleep in pregnant women: a pilot study. <i>Biol Res Nurs</i> 2010;11:363-370.
34	Not focused on MBSR	Van Gordon W, Shonin E, Dunn TJ, <i>et al.</i> Meditation awareness training for the treatment of fibromyalgia syndrome: A randomized controlled trial. <i>Br J Health Psychol</i> 2017;22:186-206.

35	Not focused on MBSR	Wong MY, Ree MJ, Lee CW. Enhancing CBT for Chronic Insomnia: A Randomised Clinical Trial of Additive Components of Mindfulness or Cognitive Therapy. <i>Clin Psychol Psychother</i> 2016;23:377-385.
36	Not focused on MBSR	Ong JC, Manber R, Segal Z, <i>et al.</i> A randomized controlled trial of mindfulness meditation for chronic insomnia. <i>Sleep</i> 2014;37:1553-1563.
37	Not focused on MBSR	Britton WB, Haynes PL, Fridel KW, <i>et al.</i> Polysomnographic and subjective profiles of sleep continuity before and after mindfulness-based cognitive therapy in partially remitted depression. <i>Psychosom Med</i> 2010;72:539-548.
38	Not focused on MBSR	Britton WB, Haynes PL, Fridel KW, <i>et al.</i> Mindfulness-based cognitive therapy improves polysomnographic and subjective sleep profiles in antidepressant users with sleep complaints. <i>Psychother Psychosom</i> 2012;81:296-304.
39	Not focused on MBSR	Malboeuf-Hurtubise C, Achille M, Sultan S, <i>et al.</i> Mindfulness-based intervention for teenagers with cancer: study protocol for a randomized controlled trial. <i>Trials</i> 2013;14:135.
40	Not focused on MBSR	Burns JW, Jensen MP, Thorn B, <i>et al.</i> Cognitive therapy, mindfulness-based stress reduction, and behavior therapy for the treatment of chronic pain: randomized controlled trial. <i>Pain</i> 2020;163(2): 376-389.
41	Not focused on MBSR	Liang H, Liu L, Hu H, <i>et al.</i> The effects of mindfulness-based stress reduction on the mental states, sleep quality, and medication compliance of patients with acute myocardial infarction after percutaneous coronary intervention. <i>International Journal of Clinical and Experimental Medicine</i> 2019;12(12): 13514-13523.
42	Not original article	Hong SC, Kim TW, Kim SY. The effectiveness of mindfulness with cognitive behavioral therapy in patients with chronic insomnia. <i>Journal of sleep research</i> 23, 2014;132.
43	Not original article	Heidenreich T, Tuin I, Pflug B, <i>et al.</i> Mindfulness-based cognitive therapy for persistent insomnia: a pilot study. <i>Psychother Psychosom</i> 2006;75:188-189.
44	Not original article	Kozasa EH, Hachul H, Monson C, <i>et al.</i> Mind-body interventions for the treatment of insomnia: a review. <i>Braz J Psychiatry</i> 2010;32:437-443.
45	Not original article	Hülshager UR, Lang JW, Depenbrock F, <i>et al.</i> The power of presence: the role of mindfulness at work for daily levels and change trajectories of psychological detachment and sleep quality. <i>J Appl Psychol</i> 2014;99:1113-1128.
46	Not original article	Dempsey C, Chesney M, Lao L <i>et al.</i> Acupuncture and mindfulness-based stress reduction among female child abuse survivors: A randomized waitlist-controlled pilot study. <i>The Journal of alternative and complementary medicine (New York, N.Y.)</i> 2014;20:A87.
47	Not original article	Gross CR, Kreitzer MJ, Reilly-Spong M, <i>et al.</i> Mindfulness meditation training to reduce symptom distress in transplant patients: rationale, design, and experience with a recycled waitlist. <i>Clin Trials</i> 2009;6:76-89.
48	Not original article	Gallegos AM, Hoerger M, Talbot NL, <i>et al.</i> Emotional benefits of mindfulness-based stress reduction in older adults: the moderating roles of age and depressive symptom severity. <i>Aging Ment Health</i> 2013;17:823-829.
49	Not original article	Janusek LW, Tell D, Mathews HL, <i>et al.</i> Mindfulness Predicts Psycho-behavioral Improvement after Breast Cancer Diagnosis: influence of Childhood Adversity. <i>Western journal of nursing research</i> 2021;43(3): 239-249.
50	Not original article	Cavalcante V, Mesquita E, Cavalcante AC <i>et al.</i> A Stress Reduction, Meditation and Mindfulness Program in Stable Patients with Chronic Heart Failure. <i>Journal of the American College of Cardiology</i> 2020;75(11 Supplement 1): 992.
51	Not original article	Drks. Effects of mindfulness Meditation (MBSR) on daytime sleepiness for excessive daytime sleepiness: A randomized controlled pilot study. 2021. https://trialsearch.who.int/Trial2.aspx?TrialID=DRKS00026812 .

52	Not original article	Tong LQ. Effects of eight weeks of simple mindfulness stress reduction training on anxiety, depression, and sleep quality in elderly patients with functional dyspepsia. <i>World Chinese Journal of Digestology</i> 2020;28(7): 265-269.
53	Not original article	Victorson D, Phillips S, Murphy K, <i>et al.</i> Mindfulness mediates the relationship between negative mind-body experiences and engagement in physical activity in a sample of young adult cancer survivors. <i>Global Advances in Health and Medicine</i> 2020;9: 4-5.
54	Duplicates	Garland SN, Carlson LE, Antle MC, <i>et al.</i> I-CAN SLEEP: rationale and design of a non-inferiority RCT of Mindfulness-based Stress Reduction and Cognitive Behavioral Therapy for the treatment of Insomnia in CANcer survivors. <i>Contemp Clin Trials</i> 2011;32:747-754.
55	Duplicates	Johns SA, Brown LF, Beck-Coon K, <i>et al.</i> Randomized controlled pilot trial of mindfulness-based stress reduction compared to psychoeducational support for persistently fatigued breast and colorectal cancer survivors. <i>Support Care Cancer</i> 2016;24:4085-4096.
56	Duplicates	Cash E, Salmon P, Weissbecker I, <i>et al.</i> Mindfulness meditation alleviates fibromyalgia symptoms in women: results of a randomized clinical trial. <i>Ann Behav Med</i> 2015;49:319-330.
57	Duplicates	Ong JC, Manber R, Segal Z, <i>et al.</i> A randomized controlled trial of mindfulness meditation for chronic insomnia. <i>Sleep</i> 2014;37:1553-1563.
58	Duplicates	Gross CR, Kreitzer MJ, Thomas W, <i>et al.</i> Mindfulness-based stress reduction for solid organ transplant recipients: a randomized controlled trial. <i>Altern Ther Health Med</i> 2010;16:30-38.
59	Duplicates	Gross CR, Kreitzer MJ, Reilly-Spong M, <i>et al.</i> Mindfulness-based stress reduction versus pharmacotherapy for chronic primary insomnia: a randomized controlled clinical trial. <i>Explore (NY)</i> 2011;7:76-87.
60	Qualitative study	Kvillemo P, Bränström R. Experiences of a mindfulness-based stress-reduction intervention among patients with cancer. <i>Cancer Nurs</i> 2011;34:24-31.
61	Qualitative study	Ong J, Sholtes D. A mindfulness-based approach to the treatment of insomnia. <i>J Clin Psychol</i> 2010;66:1175-1184.
62	Qualitative study	Lehto RH, Wyatt G. Perceptions about using mindfulness therapy: a lung cancer focus group study. <i>Cancer Nurs</i> 2013;36:E51-60.
63	Qualitative study	Morone NE, Lynch CS, Greco CM, <i>et al.</i> "I felt like a new person." the effects of mindfulness meditation on older adults with chronic pain: qualitative narrative analysis of diary entries. <i>J Pain</i> 2008;9:841-848.
64	Participants: not adult	Biegel GM, Brown KW, Shapiro SL, <i>et al.</i> Mindfulness-based stress reduction for the treatment of adolescent psychiatric outpatients: A randomized clinical trial. <i>J Consult Clin Psychol</i> 2009;77:855-866.
65	Cannot extract sleep data due to incomplete outcome reporting	Shapiro SL, Bootzin RR, Figueredo AJ, <i>et al.</i> The efficacy of mindfulness-based stress reduction in the treatment of sleep disturbance in women with breast cancer: an exploratory study. <i>J Psychosom Res</i> 2003;54:85-91.

Appendix 3

Figure 1. Forest plot-effectiveness of MBSR compared with controls to improve objective sleep quality



Appendix 4

Figure 2 Forest plot-effectiveness of MBSR compared with controls to improve patient-reported sleep quality

