Supplementary Online Content

Garland E, Brintz CE, Hanley AW, et al. Mind-body therapies for opioid-treated pain: a systematic review and meta-analysis. *JAMA Intern Med*. Published online November 4, 2019. doi:10.1001/jamainternmed.2019.4917

eMethods. Supplementary Methods

Search Strategy. Searches were conducted in March 2018 and were run from date of database inception forward, in the following databases: CINAHL 1981-; Cochrane Library: Cochrane Register of Controlled Trials, Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effectiveness, Health Technology Database; Emcare (via OVID) 1995-; Medline In-Process & Other Non-Indexed Citations; Ovid MEDLINE(R) Daily and MEDLINE(R) <1946 - > (via OVID); PsycInfo (via Ebsco) 1800-

Other search methods. We searched three grey literature sites for material not indexed in the above-named databases: Agency for Health Care Quality and Research; American Psychological Association; World Health Organization. We hand-searched the reference lists of related reviews, and contacted authors of studies where data was either missing or unclear.

Search Data Management. Results from bibliographic database searches were organized and de-duplicated in EndNote. A second duplicate removal was achieved upon importing references into Covidence. Results from grey literature, trial registry and conference abstracts were screened online (e.g. at web sites), or in Excel.

Data extraction and management. Data were extracted independently by two review authors and disagreements were resolved by discussion or a third reviewer. For any study reports written by EG, data were extracted by other members of the author team. Data extraction was undertaken in Excel using a data extraction form that had been piloted by multiple review authors. For each study, the form captured sample size, study location, clinical target, proportion of females, mean age, MBT, control conditions, time points assessed, intervention extensiveness (single-intervention session versus multiple-intervention sessions), delivery format (in-person versus recorded intervention), and main outcomes.

***Selection of studies*.** Titles/abstracts and full-text were screened independently by two review authors; disagreements were resolved by discussion or a third reviewer. When we encountered studies written by the first author (EG), to prevent a conflict of interest, decisions for inclusion were made by other members of the author team. Screening was done with Covidence software (https://www.covidence.org).

Assessment of RoB in included studies. RoB (RoB) was assessed in Covidence by two independent reviewers,. using the Cochrane RoB tool. Disagreements were resolved by discussion or a third reviewer. Any studies by EG were assessed by other members of the author team.

MEDLINE search strategy

Ovid MEDLINE(R) Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily, Ovid MEDLINE and Versions(R) <1946 to March 21 2018>

1 mind-body therapies/ or meditation/ or mental healing/ or relaxation therapy/ (10320)

2 (mind-body or meditation? or meditativ$ or mindfulness).ti,ab,kw,kf. (9836)

3 (relaxation adj2 (exercise? or therap$)).ti,ab,kw,kf. (1536)

4 mental$ healing.ti,ab,kw,kf. (46)

5 psychophysiology/ or psychophysiolog$.ti,ab,kw,kf. (15543)

6 breathing exercises/ (3089)

7 (breathing exercise? or (mindful$ adj2 breath$)).ti,ab,kw,kf. (1054)

8 aromatherapy/ (686)

9 (aromatherap$ or aroma therap$).ti,ab,kw,kf. (981)

10 virtual reality/ (189)

11 ((virtual or augmented) adj2 realit$).ti,ab,kw,kf. (8183)

12 Music therapy/ (2978)

13 (music$ adj2 therap$).ti,ab,kw,kf. (2187)

14 Feedback, sensory/ (2290)

15 ((sensory or visual or sensorimotor? or audio or proprioceptiv$) adj2 feedback?).ti,ab,kw,kf. (6364)

16 laughter therapy/ (179)

17 laugh$.ti,ab,kw,kf. (2750)

18 Biofeedback, psychology/ (6843)

19 ((Biofeedback? or bio-feedback?) adj2 (mindful$ or Psycholog$ or psycho-physiolog$)).ti,ab,kw,kf. (41)

20 (Myofeedback? or ((False or Bogus) adj2 Physiological Feedback)).ti,ab,kw,kf. (45)

21 hypnosis/ (8730)

22 ((hypnosis? adj4 (patient? or therap$ or intervention? or pain or post-op$ or postop$ or preop$ or pre-op$ or instead or compared or versus or vs)) or hypnotiz$ or hypnotis$).ti,ab,kw,kf. (2566)

23 "imagery (psychotherapy)"/ (1528)

24 ((pyschother$ or therap$ or exercise or guided) adj2 imagery).ti,ab,kw,kf. (823)

25 Cognitive therapy/ or "Acceptance and Commitment Therapy"/ or ((cognitive or behavio?r$) adj2 therap$).ti,ab,kw,kf. or "commit?ment and acceptance therap$".ti,ab,kw,kf. (35740)

26 Complementary Therapies/ or alternative medicine.ti,ab,kw,kf. (19151)

27 or/1-26 [MInd Body Therapies] (123897)

28 analgesics, opioid/ or alfentanil/ or alphaprodine/ or buprenorphine/ or buprenorphine, naloxone drug combination/ or butorphanol/ or codeine/ or dextromoramide/ or dextropropoxyphene/ or dihydromorphine/ or diphenoxylate/ or "enkephalin, ala(2)-mephe(4)-gly(5)-"/ or "enkephalin, d-penicillamine (2,5)-"/ or ethylketocyclazocine/ or ethylmorphine/ or etorphine/ or fentanyl/ or hydrocodone/ or hydromorphone/ or levorphanol/ or meperidine/ or meptazinol/ or methadyl acetate/ or morphine/ or nalbuphine/ or opiate alkaloids/ or oxycodone/ or oxymorphone/ or pentazocine/ or phenazocine/ or phenoperidine/ or pirinitramide/ or promedol/ or sufentanil/ or tilidine/ or tramadol/ (91150)

29 opiate alkaloids/ or exp morphinans/ or noscapine/ or papaverine/ (81411)

30 (opioid? or opiate? or buprenorphin$ or butorphanol? or codeine or dextromoramid? or dextropropoxyphen? or dihydrocodein$ or dihydromorphin$ or ethylmorphin$ or etorphin$ or fentanyl? or hydrocodon$ or hydromorphon$ or levorphanol$ or meperidin$ or morphin$ or Nalbuphin$ or oxycodon$ or oxymorphon$ or pentazocin$ or phenazocin$ or phenoperidin$ or tilidin$ or tramadol?).ti,ab,kw,kf. (144617)

31 or/28-30 [Opioid Analgesics] (180959)

32 exp Analgesia/ (40435)

33 analgesia?.ti,ab,kw,kf. (58504)

34 or/32-33 [Analgesia] (76798)

35 exp Pain/ or Pain Management/ (365941)

36 pain.ti,ab,kw,kf. (534833)

37 or/35-36 [Pain] (685044)

38 and/27,31 [Opioid Analgesics & Mindfulness] (1160)

39 and/27,37 [Pain & Mindfulness] (10599)

40 and/27,34 [Analgesia & Mindfulness] (1034)

41 (randomized controlled trial or controlled clinical trial).pt. or randomized.ab. or placebo.ab. or clinical trials as topic.sh. or randomly.ab. or trial.ti. (1138623)

42 exp animals/ not humans.sh. (4435061)

43 41 not 42 [Cochrane RCT Filter 6.4.d Sens/Precision Maximizing] (1048581)

44 (or/38-40) and 43 [RCT Results] (3225)

45 (systematic review or meta-analys$ or metaanaly$).ti. or cochrane.jw. (140764)

46 38 and 45 and 20$.yr,dp,ep. [SR search on Mindfulness & Opioids] (46)

47 44 not 45 [RCT results excluding titles with systematic review or meta analysis in title] (2909)

eTable 1. Characteristics of Meditation Studies

Author, year	Country	Clinical Target	N	Female, %	Age, Mean	Mind-Body Intervention(s)	Comparator(s)	Intervention Extensiveness	Delivery Format
Dindo, 2018	USA	Orthopedic surgery	76	6	63	Acceptance and commitment therapy	Usual care	Single	In-person
Esmer, 2010	USA	Failed back surgery	44	44	55	Mindfulness-based Stress Reduction	Waitlist	Multiple	In-person
Garland,2014a, b; Garland, 2017	USA	Chronic pain and taking opioids daily or almost daily for 90 days	115	68	48	Mindfulness-Oriented Recovery Enhancement	Support group	Multiple	In-person
Garland, 2017	USA	Hospital inpatients reporting intolerable pain or inadequate pain control	244	57	51	1. Mindfulness training 2. Hypnotic suggestion	Pain education	Single	In-person
Zgierska, 2016	USA	Back pain	35	80	52	Mindfulness meditation + CBT	Usual care	Multiple	In-person

Abbreviation: N, sample size; CBT, Cognitive Behavioral Therapy. **Note**: For studies that had more than one MBT or comparator, each arm is denoted by a preceding number.

eTable 2. Findings of Meditation Studies

Author, year	Main Outcomes	Time Points	Results
Dindo, 2018	Cessation of: pain, opioid use	Daily for 3 mos post-surgery	ACT achieved pain and opioid cessation sooner compared with usual care.
Esmer, 2010	VAS pain intensity AML opioid use	Baseline, 12 wks, 40 wks	Sig effects of MBSR compared with waitlist on pain intensity and opioid analgesic use.
Garland, 2014a, b Garland, 2017	BPI pain severity and interference NRS desire for opioids and cue-elicited craving COMM opioid misuse NRS EMA momentary pain intensity	Baseline, post-treatment, 3 mos	Sig effects of MORE compared with control group at post-tx and 3 mo on pain severity, functional interference, and EMA momentary pain intensity. Sig effects of MORE at post-tx on desire for opioids, cue-elicited craving, and number of patients meeting opioid use disorder criteria (COMM) at post-tx.
Garland, 2017	NRS pain intensity NRS pain unpleasantness NRS desire for opioids	Pre-intervention, post-intervention	Sig effects of mindfulness and hypnosis compared with education on pain intensity and pain unpleasantness. Sig effects of hypnosis compared with education on lower desire for opioids.
Zgierska, 2016	BPI pain severity Opioid dose (verified self-report) Pain sensitivity to thermal stimuli	Baseline, 8 wks and 26 wks post-intervention	Sig effects of mindfulness compared with usual care on reductions in pain severity and thermal pain sensitivity. No other between-group effects observed.

Abbreviations: Sig, significant(ly); ACT, Acceptance and Commitment Therapy; VAS, visual analogue scale; AML, Analgesic Medication Log; MBSR, Mindfulness-based Stress Reduction; BPI, Brief Pain Inventory; NRS, numerical rating scale; COMM, Current Opioid Misuse Measure; EMA, Ecological momentary assessment.

eTable 3. Characteristics of Hypnosis Studies

Author, year	Country	Clinical Target	N	Female, %	Age, Mean	Mind-Body Intervention(s)	Comparator(s)	Session Extensiveness	Delivery Format
Ashton, 1997	USA	Cardiac surgery	32	13	63	Self-hypnosis	Usual care	Single	In-person
Akgul, 2016	Turkey	Cardiac surgery	44	20	55	Hypnosis	Usual care	Single	In-person
Askay, 2007	USA	Burn pain	46	NR	37	Hypnosis	Attention Control	Single	In-person
Enqvist, 1997	Sweden	Dental surgery	69	52	28	Hypnosis	Usual care	Single	Recording
Everett, 1993	USA	Burn pain	32	9	37	1. Hypnosis + placebo 2. Hypnosis + lorazepam	1. Psychological Intervention + placebo 2. Psychological intervention + lorazepam	Single	In-person
Faymonville, 1997	Belgium	Elective plastic surgery	60	87	35	Hypnosis	Stress reducing strategies	Single	In-person
Frenay, 2001	Belgium	Burn pain	30	43	42	Hypnosis	Stress reduction	Multiple	In-person
Garland, 2017	USA	Hospital inpatients reporting intolerable pain or inadequate pain control	244	57	51	1. Hypnotic suggestion 2. Mindfulness training	Pain education	Single	In-person
Ghoneim, 2000	USA	Dental surgery	60	58	23	Hypnosis	Usual care	Single	Recording
Joudi, 2016	Iran	Postoperative pain and analgesic use	120	86	43	Hypnosis	Usual care	Single	Recording

Lang, 1996	USA	Interventional radiology procedures	30	0	67	Hypnosis	Usual care	Single	In-person
Lang, 2000	USA	Arterial, venous, and renal surgery	241	53	56	Hypnosis	1. Structured attention 2. Usual care	Single	In-person
Lang,2008	USA	Percutaneous tumor treatment	201	63	50	Hypnosis	1. Empathic attention 2. Usual care	Single	In-person
Mackey, 2010	USA	Outpatient third molar extraction	91	59	18-25 (no mean)	Hypnosis + music and IV sedation	Music + IV sedation	Single	Recording
Mackey, 2018	USA	Outpatient third molar extraction	119	NR	18-25 (no mean)	Hypnosis + music and IV sedation	Music + IV sedation	Single	Recording
Marc, 2008	Canada	Surgical abortion	350	100	25	Hypnosis	Usual care	Single	In-person
Montgomery, 2007	USA	Breast surgery	200	100	49	Hypnosis	Attention control	Single	In-person
Patterson, 1992	USA	Burn patients, wound debridement	30	NR	34	Hypnosis	1. Attention control 2. Usual care	Single	In-person
Patterson, 2010	USA	Hospitalized for traumatic injury	21	19	32	Virtual reality hypnosis	1. Usual care 2. Virtual reality without hypnosis	Single	In-person

Surman, 1974	USA	Cardiovascular surgery	40	68	50	Hypnosis	Usual care	Single	In-person
Syrjala, 1992	USA	Cancer pain (undergoing bone marrow transplant)	45	19	33	Hypnosis	1. CBT coping skills 2. Therapist contact 3. Usual care	Multiple	In-person
Wang, 2015	China	Lung cancer surgery	60	42	54	Hypnosis + relaxation + music	Usual care	Multiple	Recording
Wright, 2000	Australia	Burn pain	30	27	35	Hypnosis	Usual care	Multiple	In-person

Abbreviations: N, sample size; NR, not reported. **Note**: For studies that had more than one MBT or comparator, each arm is denoted by a preceding number.

eTable 4. Findings of Hypnosis Studies

Author, year	Main Outcomes	Time Points	Results
Ashton, 1997	Post-operative pain medication Intraoperative pharmacological support	Followed for five days post-op	Significantly more pain medication use in self-hypnosis compared with usual care, due to a subset of participants who did not comply with hypnosis practice instructions. No other between group effects.
Akgul, 2016	VAS pain intensity Post-op opioid dose	Anxiety and Depression: 3-5 days pre-op, 1 day pre-op. Pain intensity: pre-op, every two hrs post-op for 12 hrs, 24 hrs post-op	Sig effect of hypnosis compared with usual care, with lower post-op opioid dose.
Askay, 2007	MPQ pain intensity GRS pain intensity	Before and after wound dressing	Sig effect of hypnosis compared with control on pain (MPQ).
Enqvist, 1997	VAS pain intensity Opioid dose	Pre- and post-op	Sig less post-op opioid dose in hypnosis group compared with usual care. No between-group effect on post-op pain.
Everett, 1993	VAS pain intensity Morphine equivalents	Before and after wound dressing	No between-group effects on pain intensity or opioid dose.
Faymonville, 1997	VAS pain Opioid use (alfentanil ug/kg)	Pre-, intra- and post-operative	Sig lower intra-op requirements for opioids in hypnosis compared with stress reduction. Intra- and post-op pain sig lower in hypnosis.
Frenay, 2001	VAS pain intensity	Days 1, 3, 5, 7, 8, 10, 12, and 14	No between-group effects on pain.
Garland, 2017	NRS pain intensity NRS pain unpleasantness NRS desire for opioids	Pre- and post-intervention	Sig improvements in pain intensity and pain unpleasantness, for mindfulness and hypnosis compared with education. Sig effects of hypnosis compared with education on lower desire for opioids.

Ghoneim, 2000	VAS pain intensity Opioid dose	Baseline, immediately post-op, post-op days 1-3, 1 wk post-op	No between-group differences.
Joudi, 2016	VAS pain intensity Narcotic analgesia dose	Post-op hrs 0, 2, 6, 12, 24	Sig lower pain in hypnosis compared with usual care at all time points. Sig lower narcotic analgesia dose in hypnosis compared with usual care.
Lang, 1996	NRS pain intensity Intraprocedural opioid + sedative units	Baseline, once per 40 minute interval during surgery	Sig less maximal pain and less total medication use for hypnosis compared with control.
Lang, 2000	NRS pain intensity Intraprocedural opioid + sedative units	Up to 13 fifteen-minute intervals during surgery	Sig less pain in hypnosis compared with structured attention and usual care. Sig less medication use in hypnosis and structured attention compared with usual care.
Lang,2008	NRS pain intensity Intraprocedural opioid + sedative units	Up to 10 fifteen-minute intervals during procedure	Sig less pain in hypnosis compared with controls from 15 to 45 minutes into the procedure. Sig less medication use during procedure in hypnosis compared with controls.
Mackey, 2010	NRS pain intensity Analgesic used 24 hrs post-op	Post-operative	Sig reduced postoperative pain and postoperative opioids in hypnosis compared with control.
Mackey, 2018	NRS pain intensity Analgesic used 24 hrs post-op	Post-operative	Sig reduced postoperative pain and postoperative opioids in hypnosis compared with control.
Marc, 2008	VAS pain intensity Any med use during surgery (Yes/No)	(T1) pre-randomization,(T2) start of procedure (pelvic exam), (T3) within 1 min of first attempt suction evacuation, (T4) within 1 mo post-surgery.	Sig less likely to use pain medication in hypnosis compared with usual care. Statistical equivalence (noninferiority) for pain at T3.

Montgomery, 2007	VAS pain intensity VAS pain unpleasantness Intra-operative fentanyl Post-operative acetaminophen/oxycodone	Post-operative	Sig less post-surgical pain and pain unpleasantness in hypnosis compared with attention control. No between-group effects on medication use.
Patterson, 1992	VAS pain intensity Morphine equivalent opioid dose	Pain: during wound care on Day 1 (pre-intervention) and Day 2 (post-intervention)	Sig reduction in pain from pre- to post-intervention in hypnosis only. Sig lower post-intervention pain rating in hypnosis compared with control. No between-group or time effect for morphine equivalents.
Patterson, 2010	GRS pain intensity GRS pain unpleasantness	Immediately pre- study intervention, 1 hour post-intervention, 8 hours post-intervention	Sig effects of VRH compared with control (usual care combined with VR distraction) on pain intensity and unpleasantness. Sig increased pain scores in control group.
Surman, 1974	NRS pain (0-3 scale) Medication requirements (analgesics, tranquilizers, hypnotic sedatives)	Pain: Pre-op, intra-op, post-op days 1-5. Medication: Post-op days 1-10	No between-group effects on any outcome.
Syrjala, 1992	VAS pain intensity Morphine equivalent dose	Pain: Daily in hospital until 20 days post-transplant.	Sig lower pain intensity in hypnosis compared with CBT and usual care. No between-group effects on opioid dose.
Wang, 2015	VAS pain intensity Sufentanil total dose and number of uses	4, 8, 12, 16, 20, and 24 hrs post-op	Sig lower pain intensity, Sufentanil total dose and Sufentanil use frequency in hypnosis compared with usual care at each time point.
Wright, 2000	NRS pain intensity NRS pain unpleasantness Opioid dose	Pain: Baseline, 5-minutes before first and second burn treatment Opioid dose: 24-hr baseline interval during burn tx (pre-intervention), and during tx 1 and tx 2 (intervention)	Sig effect of hypnosis compared with usual care on pain unpleasantness with reduction in pain unpleasantness from baseline to tx 1 and tx 1 to tx 2. No between-group effects on pain intensity. Sig reduction in opioid consumption in hypnosis compared with usual care.

Abbreviations: Sig, significant(ly); VAS, Visual Analogue Scale; MPQ, McGill Pain Questionnaire; GRS, Graphic Rating Scale; VRH, Virtual Reality Hypnosis; NRS, Numerical Rating Scale.

eTable 5. Characteristics of Relaxation Studies

Author, year	Country	Clinical Target	N	Female, %	Age, Mean	Mind-Body Intervention(s)	Comparator(s)	Session Extensiveness	Delivery Format
Anderson, 2006	USA	Cancer pain	57	79	52	1. Progressive muscle relaxation 2. Positive imagery	1. Distraction 2. Waitlist	Multiple	Recording
Gavin, 2006	USA	Spinal surgery	49	71	56	Relaxation	Usual care	Single	In-person
Good, 1995	USA	Abdominal surgery	84	70	46	1. Relaxation 2. Relaxation + music	1. Music 2. Usual care	Multiple	Recording
Good, 1999	USA	Abdominal surgery	500	83	45	1. Relaxation 2. Relaxation + music	1. Music 2. Attention control	Multiple	Recording
Good, 2010	USA	Abdominal surgery	517	68	49	Relaxation + music	Patient teaching	Single	Recording
Haase, 2005	Germany	Colorectal cancer surgery	60	38	65	1. Guided Imagery 2. Relaxation	Usual care	Multiple	Recording
Konstantatos, 2009	Australia	Burn wound dressing changes	86	NR	39	Virtual reality relaxation	Usual care	Single	Recording
Kwekkeboom et al, 2008	USA	Cancer pain during hospitalization	40	55	49	1. Progressive muscle relaxation 2. Guided imagery	Information	Multiple	Recording
Mandle, 1990	USA	Femoral angiography	45	NR	NR	Relaxation	1. Music tape 2. Blank tape	Single	Recording

Manyande, 1998	UK	Major abdominal or abdominal-perineal surgery	118	51	42	Relaxation	Informational tape	Single	Recording
Rejeh, 2013	Iran	Elective abdominal surgery	124	74	76	Systematic relaxation	Usual care	Single	Recording
Roykulchareon 2004	Thailand	Abdominal surgery	102	82	42	Systematic relaxation	Lying still in bed	Single	In-person
Sloman, 1994	Australia	Cancer pain	67	28	64	1. Relaxation (in-person) 2. Relaxation (tape)	Usual care	Multiple	In-person + recording
Syrjala, 1995	USA	Cancer pain	94	44	36	1. Relaxation + Imagery 2. Relaxation + Imagery + CBT coping skills	1. Therapist contact 2. Usual care	Multiple	In-person
Wang, 2008	China	Postembolization pain	262	29	53	Relaxation + psychotherapy	Usual care	NR	In-person
Wilson, 1981	USA	Surgery, cholecystectomy and hysterectomy	70	NR	42	1. Relaxation 2. Relaxation + Information	1. Information 2. Usual care	Single	Recording

Abbreviations: N, sample size; NR, not reported; CBT, Cognitive Behavioral Therapy. **Note**: For studies that had more than one MBT or comparator, each arm is denoted by a preceding number

eTable 6. Findings of Relaxation Studies			
Anderson, 2006	BPI pain intensity	Baseline, 2-3 wks, 4-5 wks, 8-9 wks	No between-group effects on any outcome.
Gavin, 2006	NRS pain intensity Opioid dose	Post-op day 1 and 2	Sig greater decreases in pain in relaxation compared with usual care from Day 1 to Day 2. Sig higher opioid dose on Day 1 for relaxation compared with usual care.
Good, 1995	MPQ pain intensity Opioid dose	Baseline, post-op	No between-group differences on any outcome.
Good, 1999	VAS pain sensation VAS pain distress	Baseline, post-op at rest	Sig less pain sensation and distress in the relaxation + music, relaxation only, and music only groups compared with attention control.
Good, 2010	VAS pain sensation VAS pain distress Opioid dose	Baseline, post-op	Sig effects on pain sensation and distress for relaxation + music compared with patient teaching. No between-group effects on opioid dose.
Haase, 2005	VAS pain Opioid use	Postop day 1 to 4	No between-group effects on any outcome.
Konstantatos, 2009	VAS pain intensity Opioid dose (morphine)	Pre- and post-dressing change	Sig greater pain during and after dressing changes for virtual reality relaxation compared with usual care. No between-group effects on opioid dose.
Kwekkeboom et al, 2008	NRS pain intensity NRS pain-related distress	Pre- and post-intervention	Sig pre-post reductions in pain and pain-related in distress in the PMR and imagery groups compared with information.

Mandle, 1990	MPQ pain rating index MPQ pain intensity Fentanyl citrate use NRS nurse-assessed pain	Pre and post-op (STAI), post-op (MPQ, nurse-rated anxiety and pain during procedure)	Sig effects of relaxation compared with control groups on pain rating index and pain intensity (MPQ), nurse-assessed pain, and Fentanyl use.
Manyande, 1998	VAS pain intensity VAS pain distress Analgesic use	Pre-op, post-op days 1-7	Pain intensity and distress declined sig faster in control grp. Lower pain intensity in relaxation grp through post-op period. Sig less pain distress in relaxation early in post-op. Analgesic use: Sig more relaxation patients received recovery analgesia; fewer in relaxation grp received i.m analgesia on surgical ward 1st day; fewer in relaxation grp received i.v. pumps post-op. No between-group effects on receiving intra-op i.m. analgesia or post-op oral analgesia.
Rejeh, 2013	VAS pain intensity Opioid dose and use	Pre-intervention, after 15-min recovery from initial ambulation, 6 hours post-intervention, 12 hours post-intervention	Sig effect of relaxation compared with usual care on pain intensity, mg morphine equivalents received w/in 6 hours after intervention, and # patients receiving opioids after intervention
Roykulchareon 2004	VAS pain intensity VAS pain distress Opioid dose	Baseline, post-ambulation following surgery, opioid dose 6 hours after intervention	Sig less pain and distress in relaxation compared with control. No between-group effects on opioid use.
Sloman, 1994	SF-MPQ pain sensation SF-MPQ pain affect SF-MPQ present pain intensity VAS overall pain intensity Morphine intake	Approximately 3 weeks after hospital discharge	Sig reduced present pain intensity and overall pain severity in both relaxation groups compared with usual care. Significantly reduced pain sensation in in-person relaxation only. No between-group effects on pain affect and morphine intake.
Syrjala, 1995	VAS pain intensity	Averages for days -10 to -1, 0-5, 6-16, 17-22	Sig reduction in pain in the relaxation groups compared with the control groups, with no difference between the two relaxation groups.

Wang, 2008	NRS pain intensity	Pre-op, before and after analgesia, post-treatment	Sig reduction in pain score post-analgesia in relaxation + psychotherapy compared with usual care
Wilson, 1981	Number of opioid injections NRS pain distress	Daily in hospital post-surgery	Sig less opioid injections and pain distress in relaxation groups compared with control groups.
Abbreviations: Sig, significant(ly); BPI, Brief Pain Inventory; NRS, Numerical Rating Scale; MPQ, McGill Pain Questionnaire; VAS, Visual analogue scale; SF-MPQ, Short-form McGill Pain Questionnaire.			

eTable 7. Characteristics of Guided Imagery Studies

Author, year	Country	Clinical Target	N	Female, %	Age, Mean	Mind-Body Intervention(s)	Comparator(s)	Session Extensiveness	Delivery Format
Anderson, 2006	USA	Cancer pain	57	79	52	1. Progressive muscle relaxation 2. Positive imagery	1. Distraction 2. Waitlist	Single	In-person
Antall, 2004	USA	Joint replacement surgery	13	0	>55 (no mean)	Guided imagery	Usual care	Single	Recording
Forward, 2015	USA	Joint replacement surgery	225	66	38-90 (no mean)	1. Guided imagery	1. Massage 2. Usual care	Multiple	In-person
Gonzales, 2010	USA	Head and neck surgical procedures	44	41	35	Guided imagery	Usual care	Multiple	Recording
Haase, 2005	Germany	Colorectal cancer surgery	60	38	65	1. Guided imagery 2. Relaxation	Usual care	Multiple	Recording
Kwekkeboom ,1999	USA	Surgery for breast or gynecologic malignancy	75	100	51	Guided imagery	Usual care	Single	Recording
Kwekkeboom ,2008	USA	Cancer pain during hospitalization	40	55	49	1. Progressive muscle relaxation 2. Guided imagery	Information	Multiple	Recording
Pijl, 2016	Nether-lands	Laproscopic cholecystectomy for gall stones	140	76	51	Guided imagery	Usual care	Multiple	Recording
Tusek, 1997	USA	Colorectal surgery	130	NR	NR	Guided imagery + music	Usual care	Multiple	Recording

Abbreviations: N, sample size; NR, not reported. **Note**: For studies that had more than one MBT or comparator, each arm is denoted by a preceding number.

eTable 8. Findings of Guided Imagery Studies

Author, year	Main Outcomes	Time Points	Results
Anderson, 2006	BPI pain intensity	Baseline, 2-3 wks, 4-5 wks, 8-9 wks	No between-group effects on any outcome.
Antall, 2004	NRS pain intensity Opioid dose	Post-op	No between-group effects on any outcome.
Forward, 2015	NRS pain intensity Opioid dose	Pre-op day 0, post-op days 0, 1, 2	Sig greater decreases in pain for guided imagery and massage than for usual care by post-op day 1. No between-group effects on opioid dose.
Gonzales, 2010	vVAS pain intensity Opioid use	Pre-op, 1 hour post-op, 2 hours post-op	Sig lower pain intensity at 2 hours post-op in guided imagery compared with usual care. No between-group effects on opioid use.
Haase, 2005	VAS pain intenity Opioid use	Postop day 1 to 4	No between-group effects on any outcome.
Kwekkeboom ,1999	VAS pain intensity VAS pain distress BPI pain interference	Immediately pre-intervention, during intervention, post-intervention, 5 minutes post-intervention	No between-group effects on any outcome.
Kwekkeboom ,2008	NRS pain intensity NRS pain-related distress	Pre- and post-intervention	Sig pre-post reductions in pain and pain-related distress in the PMR and imagery groups compared with information.
Pijl, 2016	VAS pain intensity Analgesic use (morphine)	Post-op (morphine use); pre-op and post-op (pain and anxiety)	No between-group effects on any outcome.
Tusek, 1997	LAS pain intensity Opioid requirements	Baseline, pre-op, 6 post-op days	Sig reduction in pain scores, preoperative anxiety, and opioid requirements in imagery compared with usual care.

Abbreviations: BPI, Brief Pain Inventory; NRS, Numerical rating scale; vVAS, vertical Visual Analogue Scale; VAS, Visual Analogue Scale; LAS, Linear analogue scale, 0-100.

eTable 9. Characteristics of Therapeutic Suggestion Studies

Author, year	Country	Clinical Target	N	Female, %	Age, Mean	Mind-Body Intervention(s)	Comparator(s)	Session Extensiveness	Delivery Format
Block, 1991	USA	Heterogeneous sample of anesthetized surgical patients	209	90	35	Therapeutic suggestion	Blank tape	Single	Recording
Laan, 1996	USA	Gynecologic surgery	60	100	41	Therapeutic suggestion	Story control	Single	Recording
Melzack, 1996	Canada	Surgery, cholecystectomy and hysterectomy	20	55	51	Positive suggestion + music	Scientific information + music	Single	Recording
McLintock, 1990	UK	Hysterectomy surgery	63	100	41	Positive suggestion	Blank tapes	Single	Recording
Nilsson, 2001	Sweden	Abdominal surgery	90	100	50	Therapeutic suggestion + music	1. Music 2. Operating sounds	Single	Recording
Nilsson, 2003	Sweden	Varicose vein or open inguinal hernia repair surgery	182	27	52	Therapeutic suggestion + music	1. Music alone 2. Blank tape	Single	Recording

Note: For studies that had more than one MBT or comparator, each arm is denoted by a preceding number

eTable 10. Findings of Therapeutic Suggestion Studies

Author, year	Main Outcomes	Time Points	Results
Block, 1991	VAS pain intensity Opioid use	Every 2 hrs post-op day 0-1, every 4 hrs subsequent hospital days (pain); Every 24 hrs hospital days (opioids); Post-op day 3 (anxiety)	Sig decreases in opioid dose on 8th postoperative day in suggestion compared with blank tape. No other between-group differences.
Laan, 1996	VAS pain intensity Opioid dose	6, 12, 18, and 24 hrs after surgery	No between-group effects on any outcome.
Melzack, 1996	VAS pain intensity MPQ pain intensity Drug intake	Post-op days 1, 2, 3, and 4	No between-group effects on any outcome.
McLintock, 1990	VAS pain intensity Morphine use	0, 6, 12, 18, and 24 hrs (pain); 0-24 hours post-op (morphine use)	Suggestion group used sig less morphine compared with control. No between-group effects on pain.
Nilsson, 2001	VAS pain intensity VAS pain unpleasantness Cumulative morphine (mg)	Every hr for first 24 hours post-op, then every 3 hrs post-op	Sig less opioid use in music + suggestion relative to control groups; Music only reduced pain sig more than operating sounds.
Nilsson, 2003	VAS pain intensity Morphine (mg)	Pre and post (STAI and well-being) Post only (morphine and pain intensity)	Suggestion + music and music only had sig lower pain intensity than blank tape at post-op. No between-group effects on post-op morphine.

Abbreviations: VAS, Visual analogue scale; MPQ, McGill Pain Questionnaire.

eTable 11. Characteristics of Cognitive Behavioral Therapy Studies

Author, year	Country	Clinical Target	N	Female, %	Age, Mean	Mind-Body Therapy(ies)	Comparator(s)	Intervention Extensiveness	Delivery Format
Jamison, 2010	USA	Chronic back/neck pain + history of or high risk for prescription opioid misuse	62	44	48	Cognitive behavioral substance misuse counseling	Usual care	Multiple	In-person
Kroenke, 2009	USA	Comorbid chronic musculoskeletal pain and depression (opioid users analyzed separately)	250 (134 opioid users)	53 (full sample)	56 (full sample)	Pain self-management	Usual care	Multiple	In-person
Naylor, 2010	USA	Chronic musculoskeletal pain (opioid use analyzed separately)	51 (32 opioid users)	84 (full sample)	46 (full sample)	Group CBT followed by Therapeutic Interactive Voice Response	Group CBT followed by usual care	Multiple	In-person + recording
Rolving, 2016	Denmark	Undergoing lumbar spinal fusion due to degenerative spinal disorders	90	57	50	Pre-operative CBT	Usual care	Multiple	In-person
Syrjala, 1992	USA	Cancer pain (undergoing bone marrow transplant)	45	19	33	1. CBT coping skills 2. Hypnosis	1. Therapist contact 2. Usual care	Multiple	In-person
Syrjala, 1995	USA	Cancer pain	94	44	36	1. Relaxation + Imagery 2. Relaxation + Imagery + CBT coping skills	1. Therapist contact 2. Usual care	Multiple	In-person
Wilson, 2016	USA	Chronic noncancer pain + prescribed opioids	92	78	49	Internet-based pain self-management	Usual care	Multiple	Recording (online self-led)

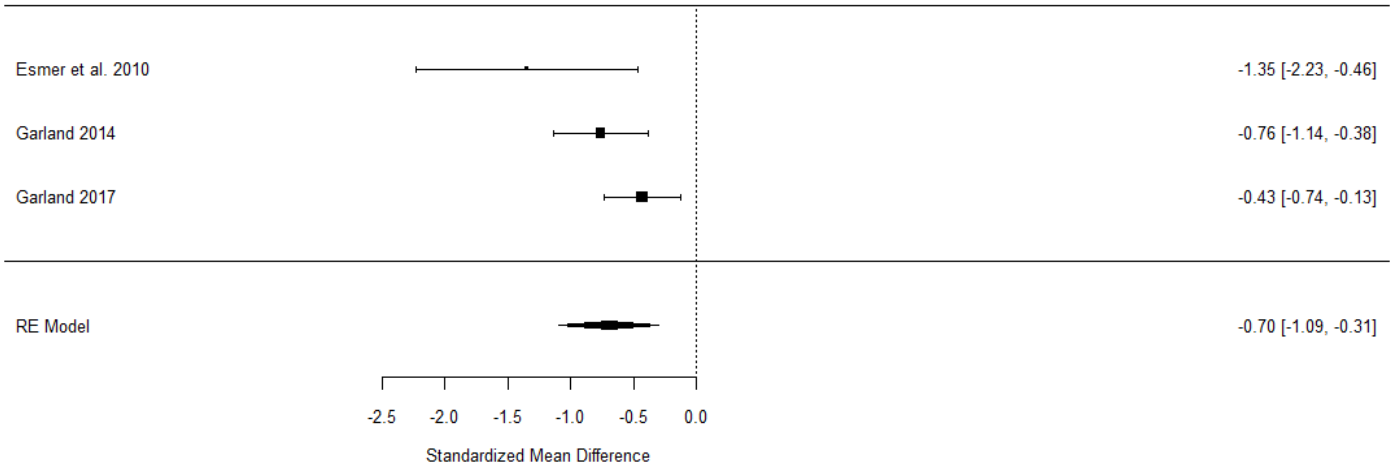
Abbreviations: N, sample size; CBT, Cognitive Behavioral Therapy. **Note**: For studies that had more than one MBT or comparator, each arm is denoted by a preceding number.

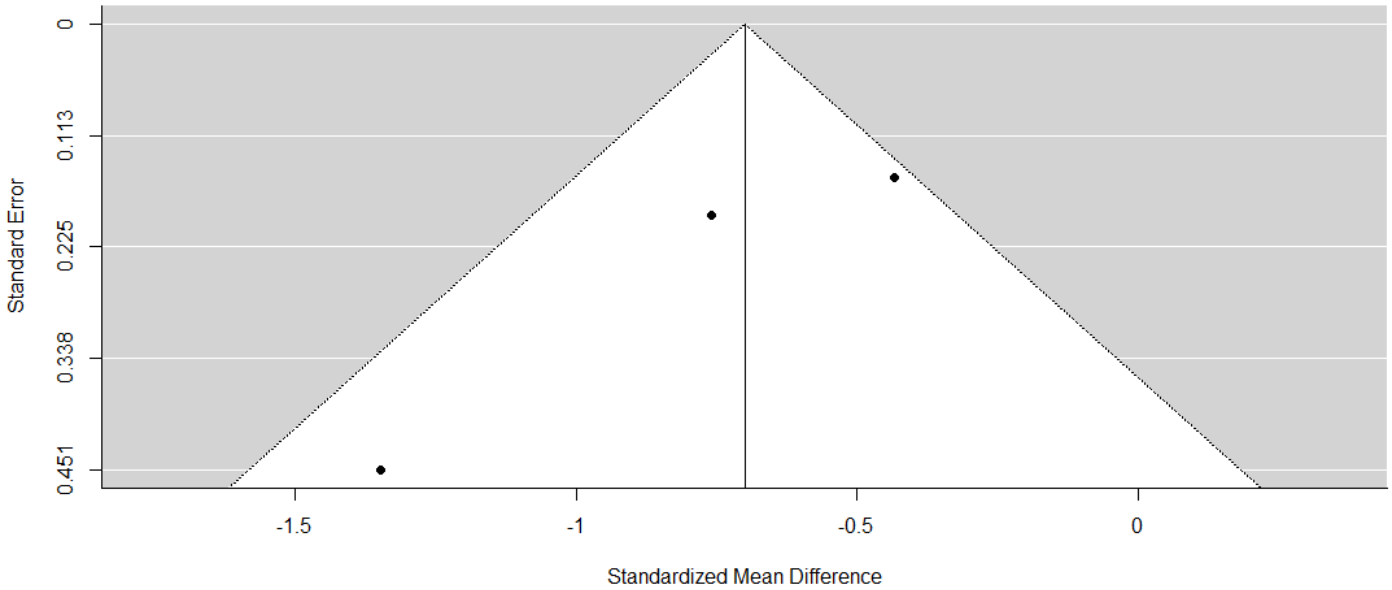
eTable 12. Findings of Cognitive Behavioral Therapy Studies

Author, year	Main Outcomes	Time Points	Results
Jamison, 2010	BPI pain intensity PDI pain disability COMM opioid misuse Opioid compliance checklist DMI drug misuse	Baseline, monthly for 6 months (pain intensity), 6 months	No between-group differences on pain disability or pain interference. Sig effects of intervention compared with usual care on Drug Misuse Index. Sig lower average pain intensity over 6 month study period in intervention group compared with usual care.
Kroenke, 2009	Opioid use from electronic medical record	12-month study period	No sig between group difference in amount of opioid use.
Naylor, 2010	Self-reported opioid use, verified with electronic medical record or psychiatrist interview.	Baseline, post-CBT (11 wks), 4 months post-CBT (completion of TIVR), 8 months post-CBT	Sig lower mean opioid dose in experimental compared with control group at 4 and 8 months. Sig within-group decrease in opioid dose in experimental vs. sig increase in opioid dose in control group at 8 months.
Rolving, 2016	NRS pain intensity CAS mobility Opioid use beyond standard protocol from medical record	NRS: post-op days 1-7; CAS: post-op days 1-3); opioids: post-op hospitalization	No sig between-group differences in pain intensity. Sig between-group differences in post-op mobility with CBT group performing better. Sig between-group difference, with lower opioid analgesic use in CBT group on post-op day 2 only.
Syrjala, 1992	VAS pain intensity Morphine equivalent dose	Pain: Daily in hospital until 20 days post-transplant.	Sig lower pain intensity in hypnosis compared with CBT and usual care. No between-group effects on opioid dose.
Syrjala, 1995	VAS pain intensity	Averages for days -10 to -1, 0-5, 6-16, 17-22	Sig reduction in pain in the mind-body intervention groups compared with the control groups, with no difference between the two mind-body intervention groups.
Wilson, 2016	BPI pain intensity and interference COMM opioid misuse Self-reported opioid use	BPI: Baseline, 2 wks, 4 wks, 6 wks, 8 wks, 6 months; COMM: Bsl, 8 wks, 6 mos Opioids: Baseline, 8 wks	No sig between-group differences in pain intensity or interference. Sig between-group difference on opioid misuse, with greater decreases in the intervention vs. usual care group. Sig between-group difference in number of participants decreasing or stopping opioid use, with more in intervention compared with usual care group.

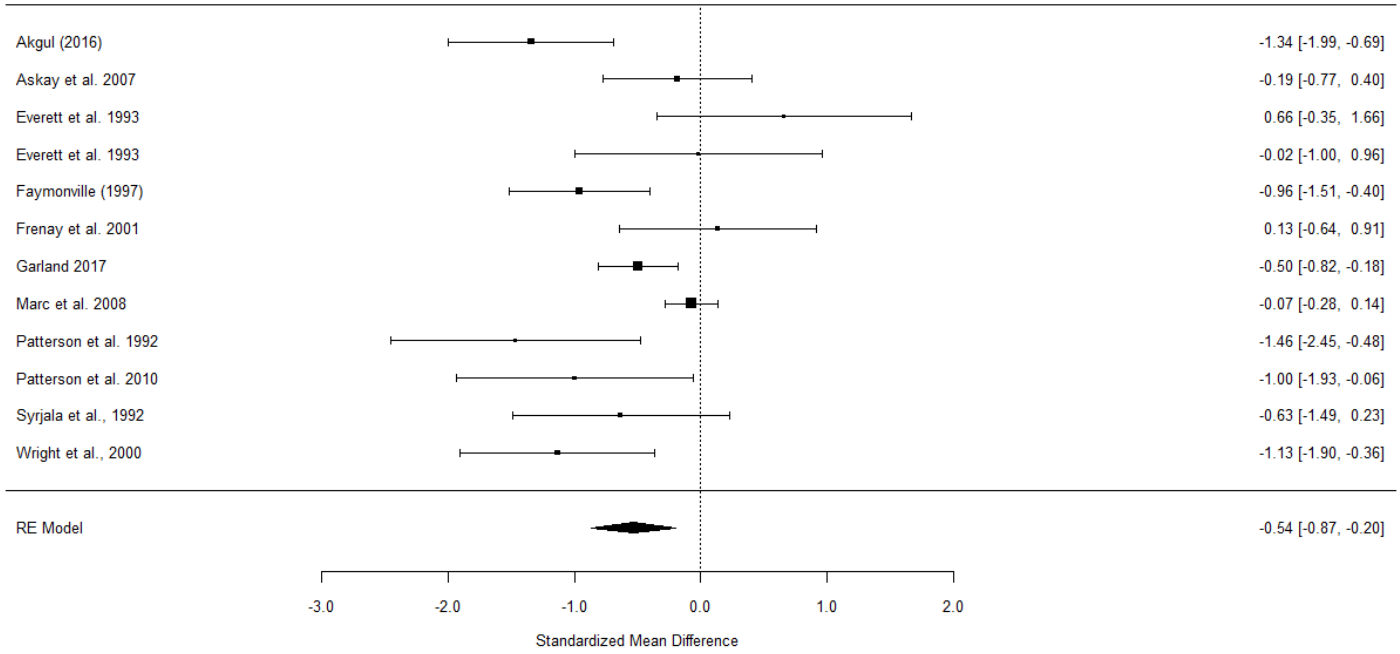
Abbreviations: Sig, significant(ly); BPI, Brief Pain Inventory; PDI, Pain Disability Index; COMM, Current Opioid Misuse Measure; DMI, Drug Misuse Index; MPQ, McGill Pain Questionnaire; TOPS, Total Pain Experience Scale; TIVR, Therapeutic Interactive Voice Response; NRS, numerical rating scale; CAS, Cumulated Ambulation Score.

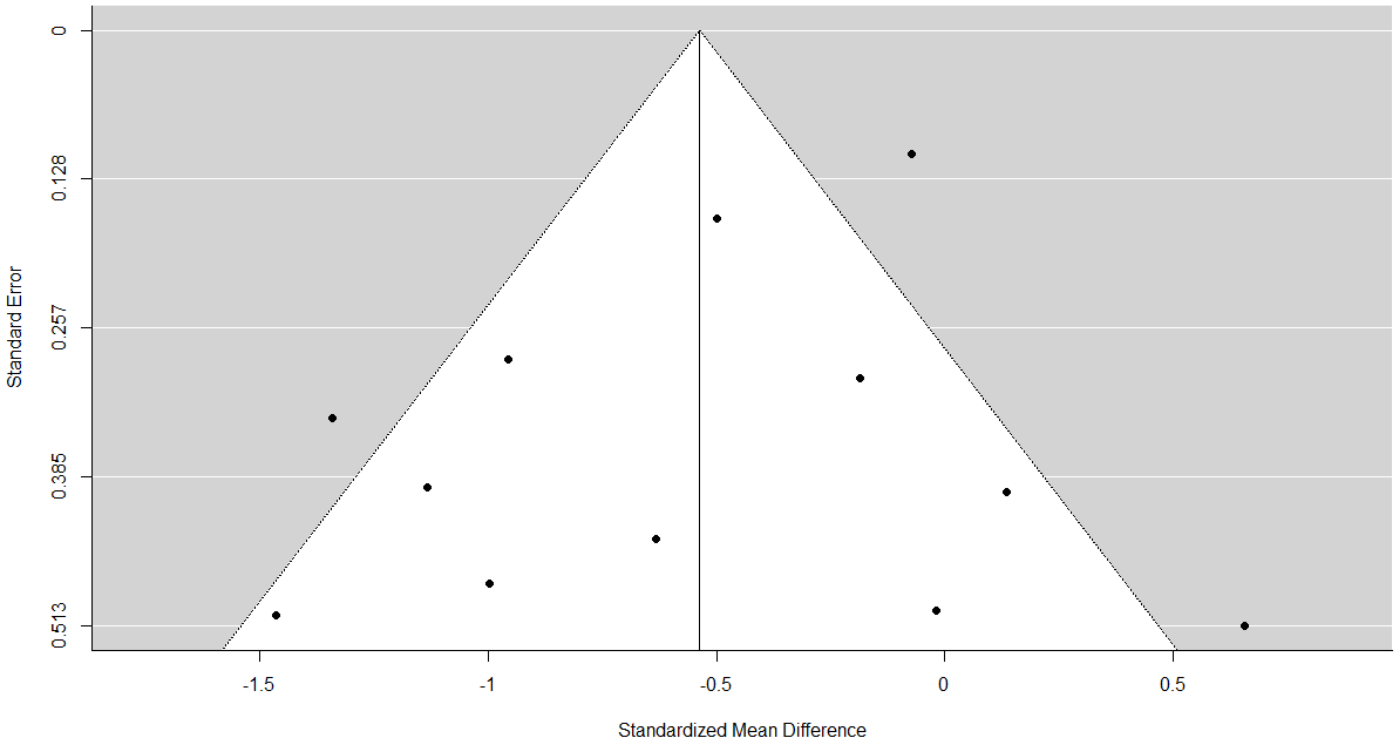
eFigure 1. Meta-analysis of Meditation Studies on Pain Outcomes



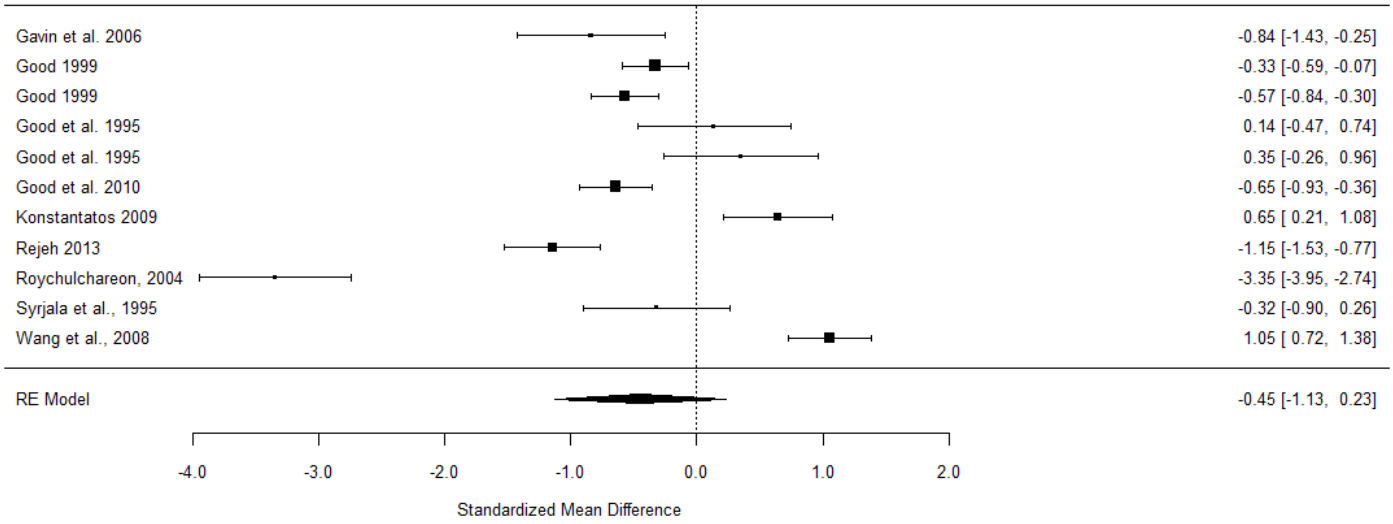


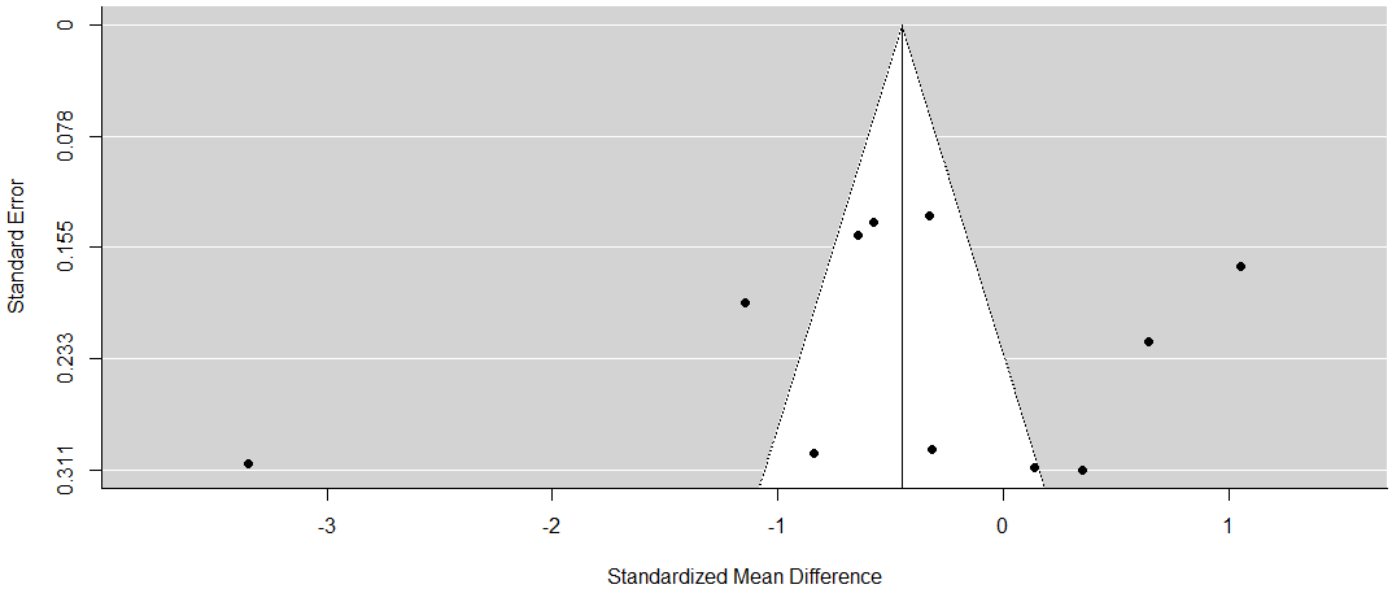
eFigure 2. Meta-analysis of Hypnosis Studies on Pain Outcomes



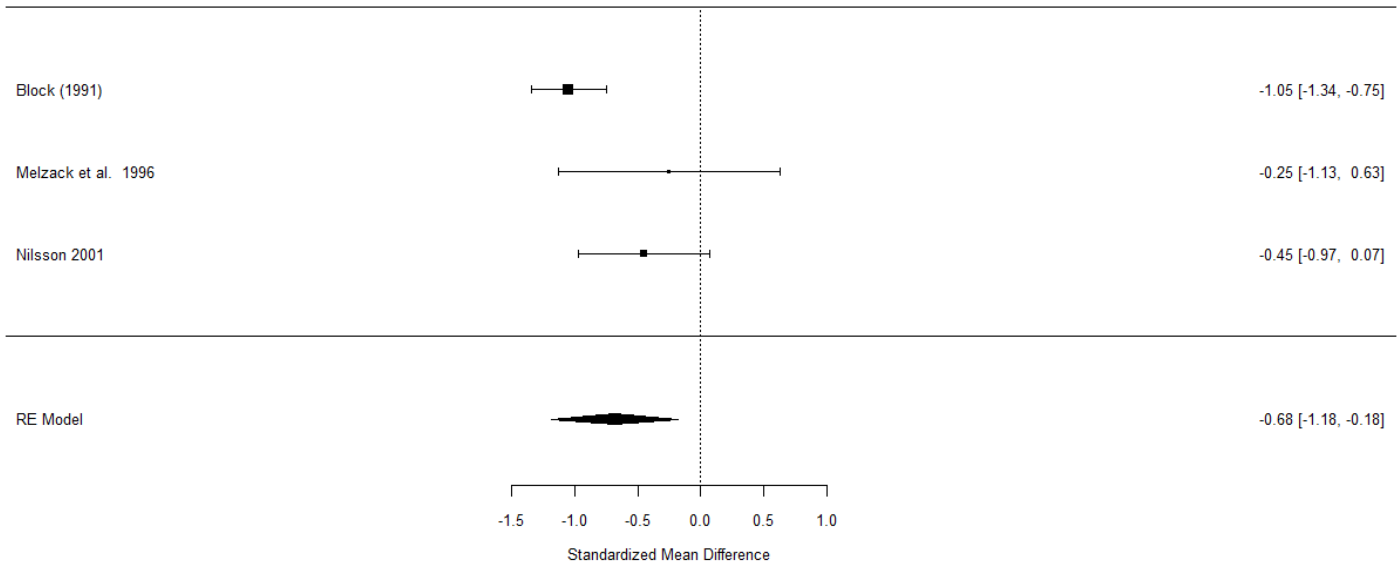


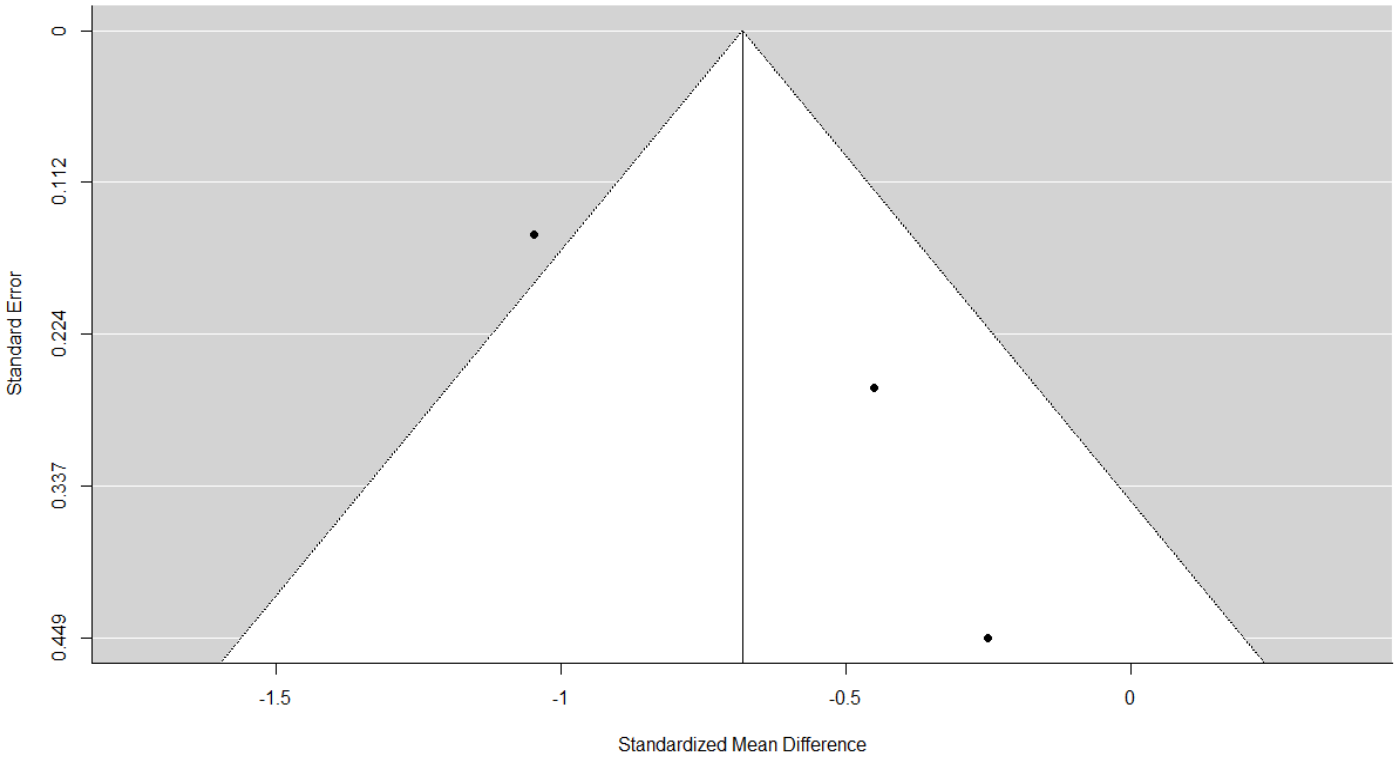
eFigure 3. Meta-analysis of Relaxation Studies on Pain Outcomes



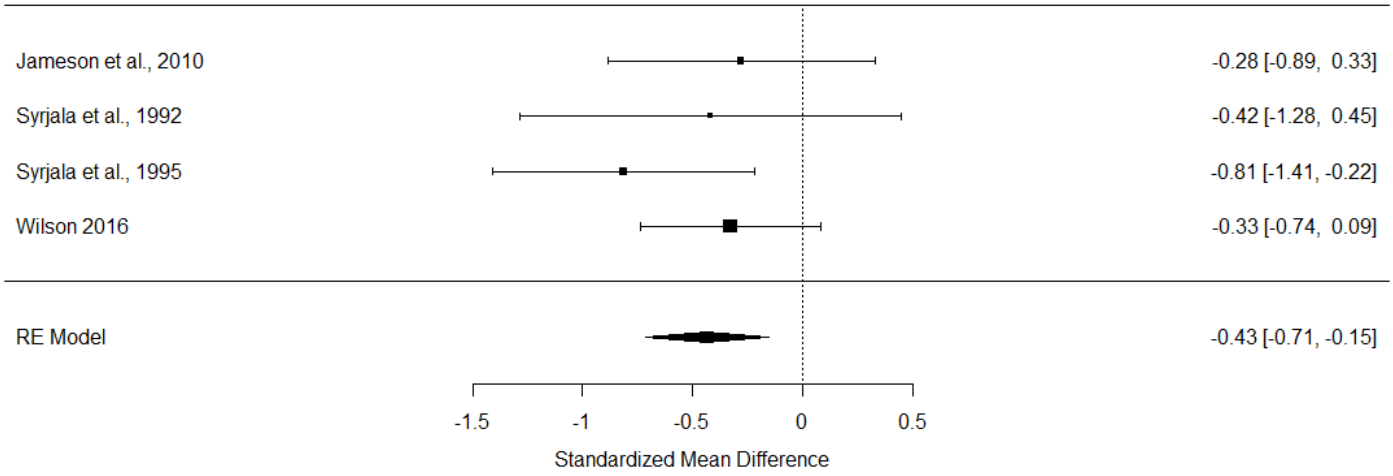


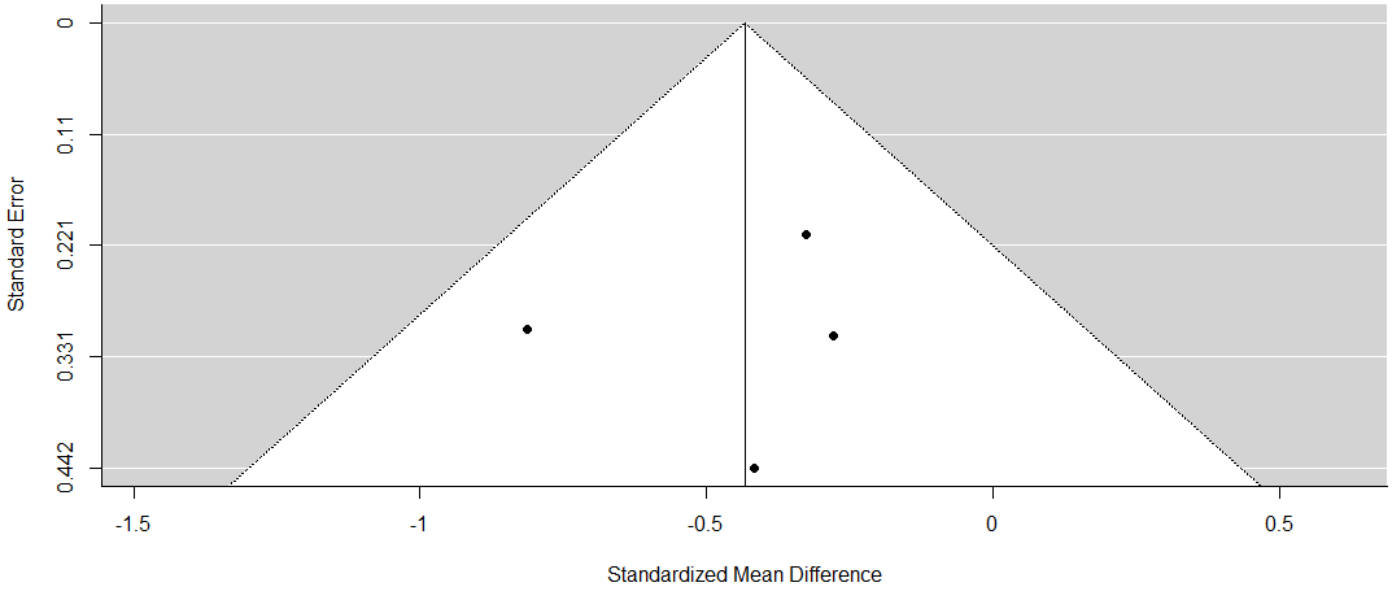
eFigure 4. Meta-analysis of Suggestion Studies on Pain Outcomes



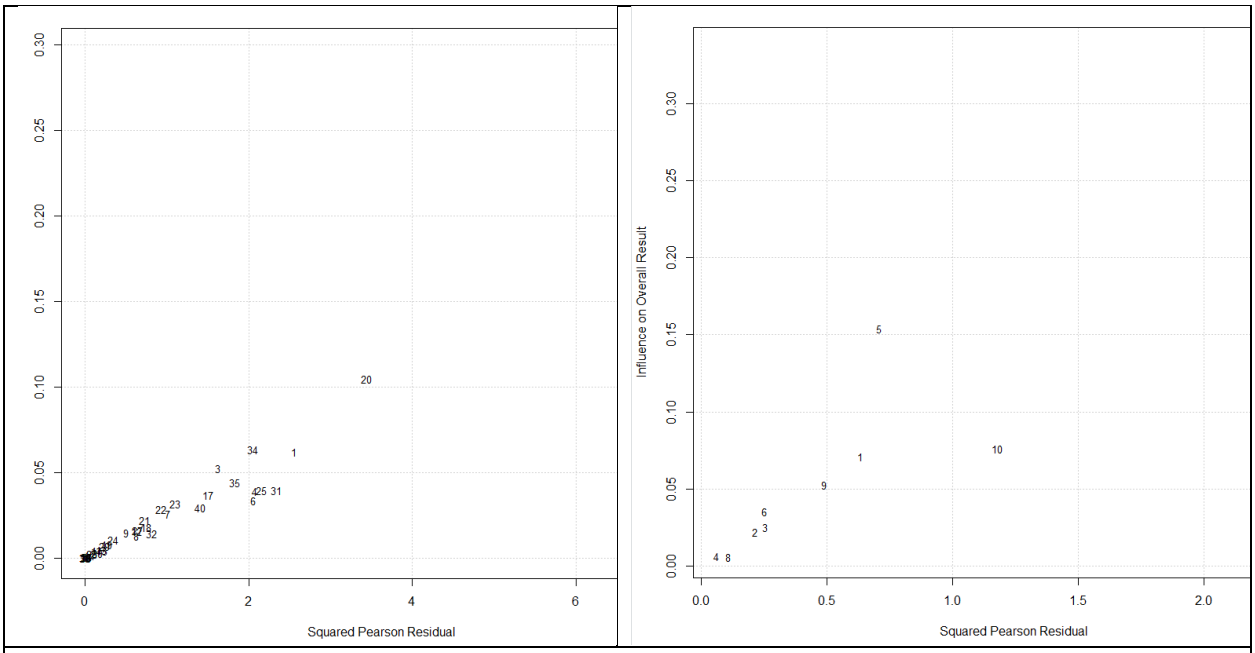


eFigure 5. Meta-analysis of Cognitive-Behavioral Therapy Studies on Pain Outcomes





eFigure 6. Baujut Plots



eFigure 2. Baujut Plots for both Meta-analyses. 2a depicts the Baujut plot for pain studies and 2b depicts the Baujut plot for opioid use studies

eFigure 7. Funnel Plots

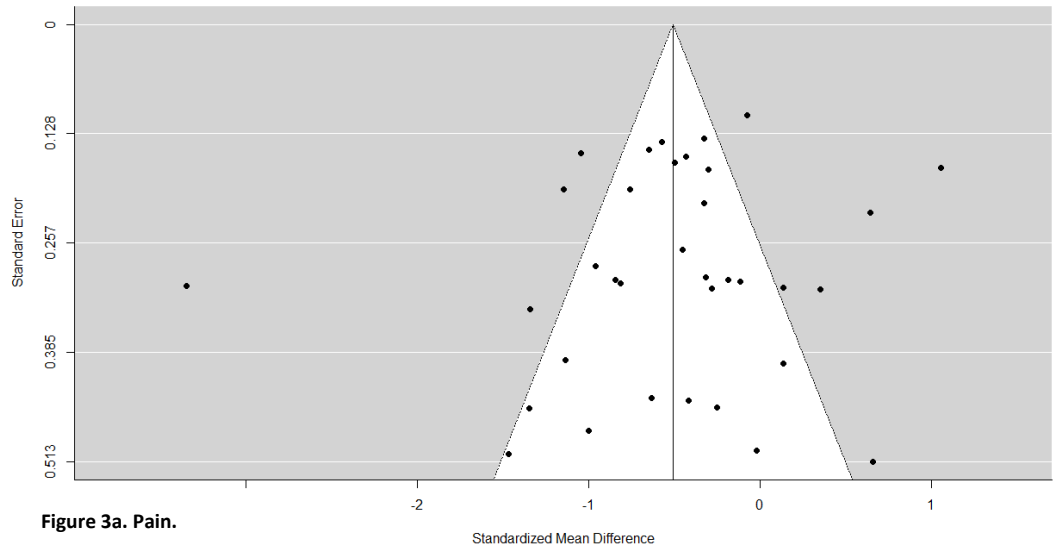


Figure 3a. Pain.

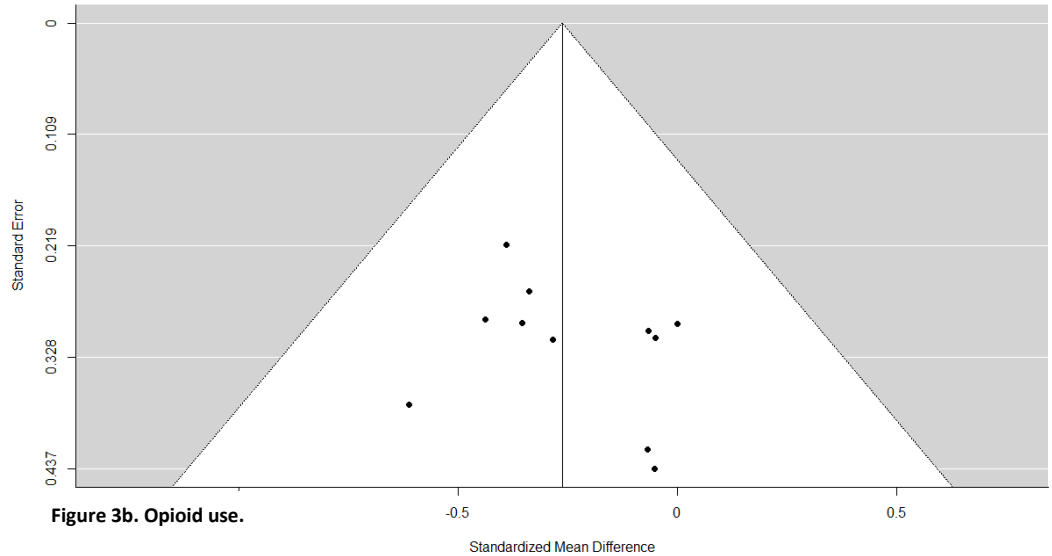
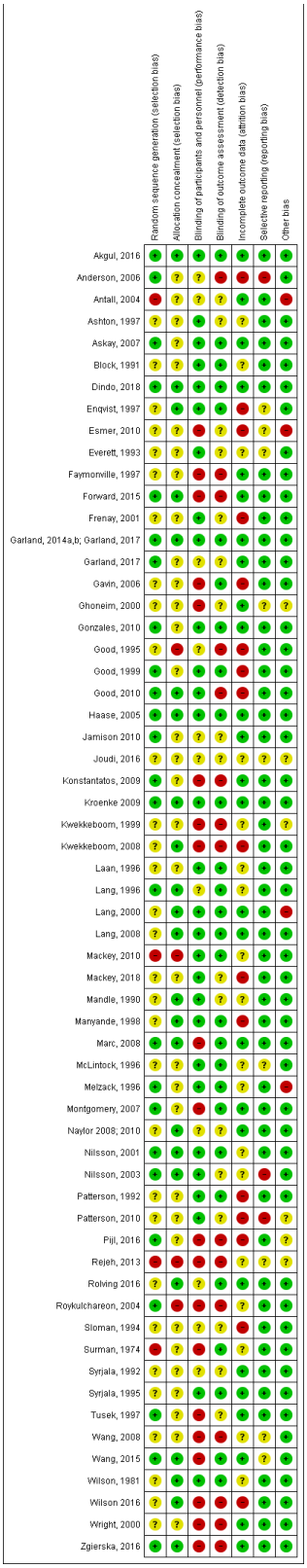


Figure 3b. Opioid use.

eFigure 3a. Funnel plot to illustrate publication bias in pain outcome studies. The plot's symmetry demonstrates no publication bias. **e igure 3a. Funnel plot to illustrate publication bias in opioid use outcome studies.** The plot's symmetry demonstrates no publication bias.

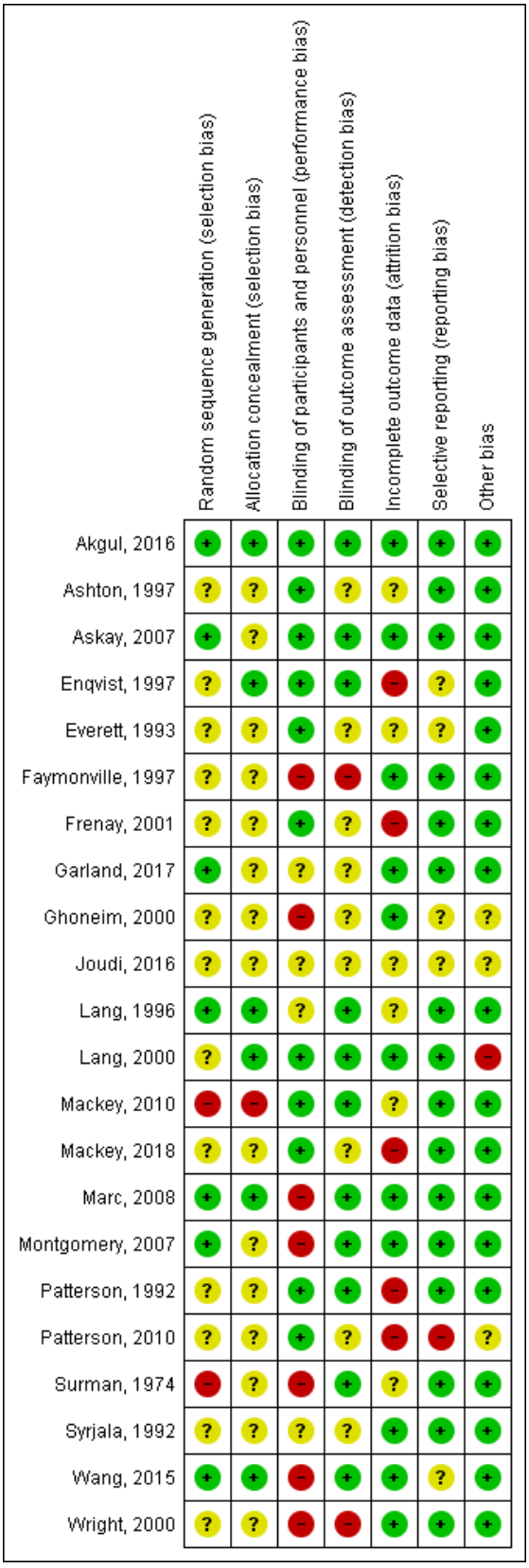
eFigure 8. RoB Across All Studies

Risk of bias summary: review authors' judgements about each risk of bias item for each included study.

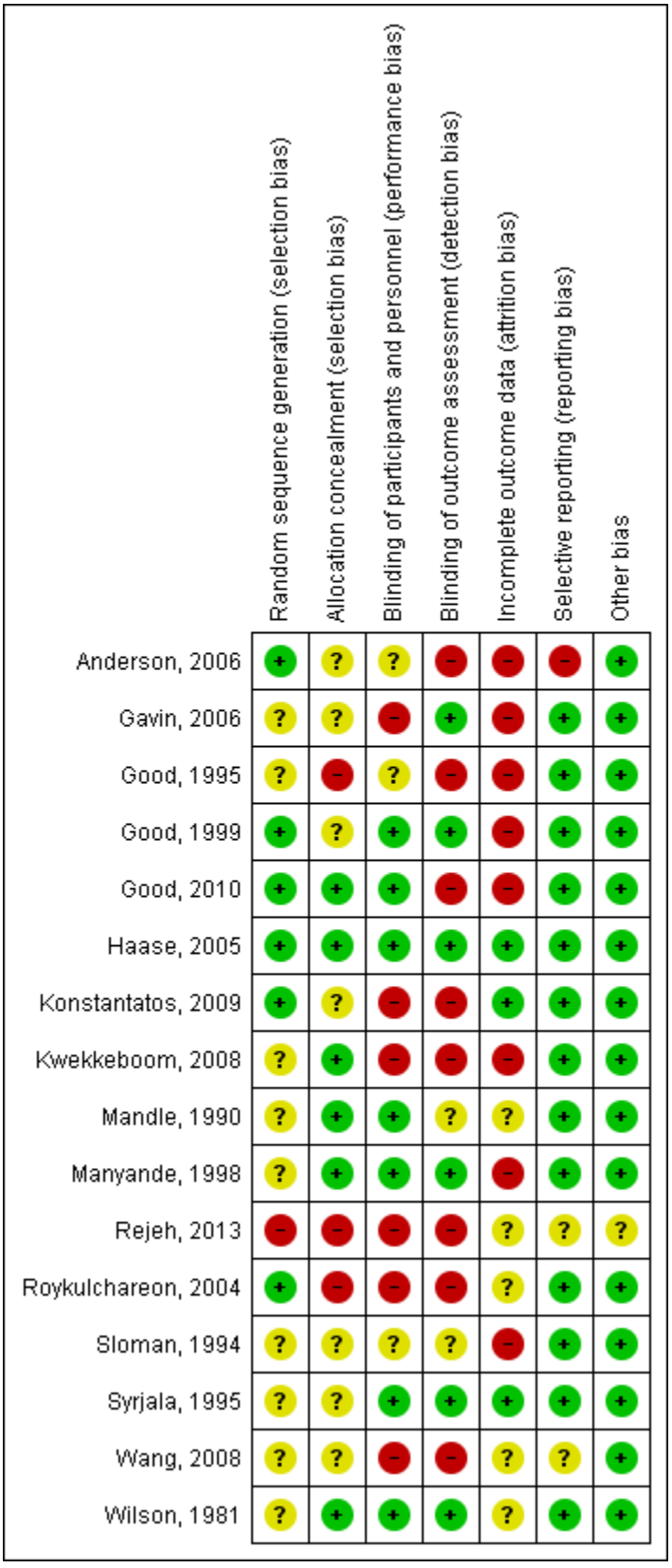


eFigure 9. RoB for Meditation Studies

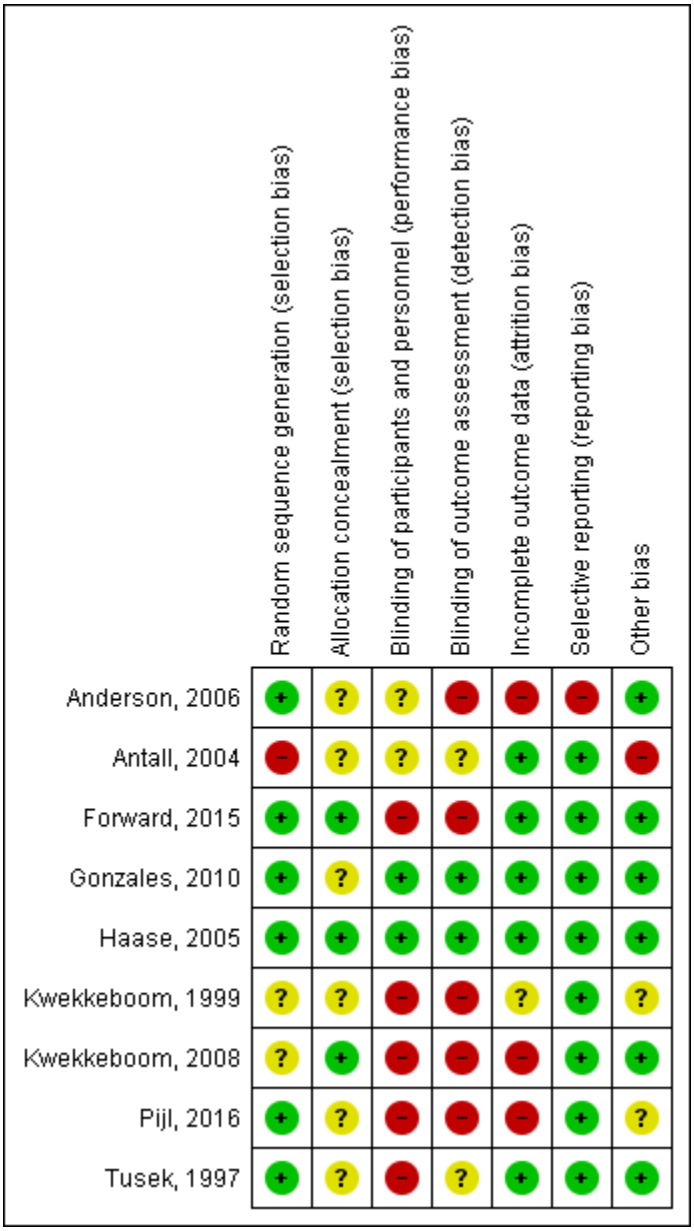
eFigure 10. RoB for Hypnosis Studies



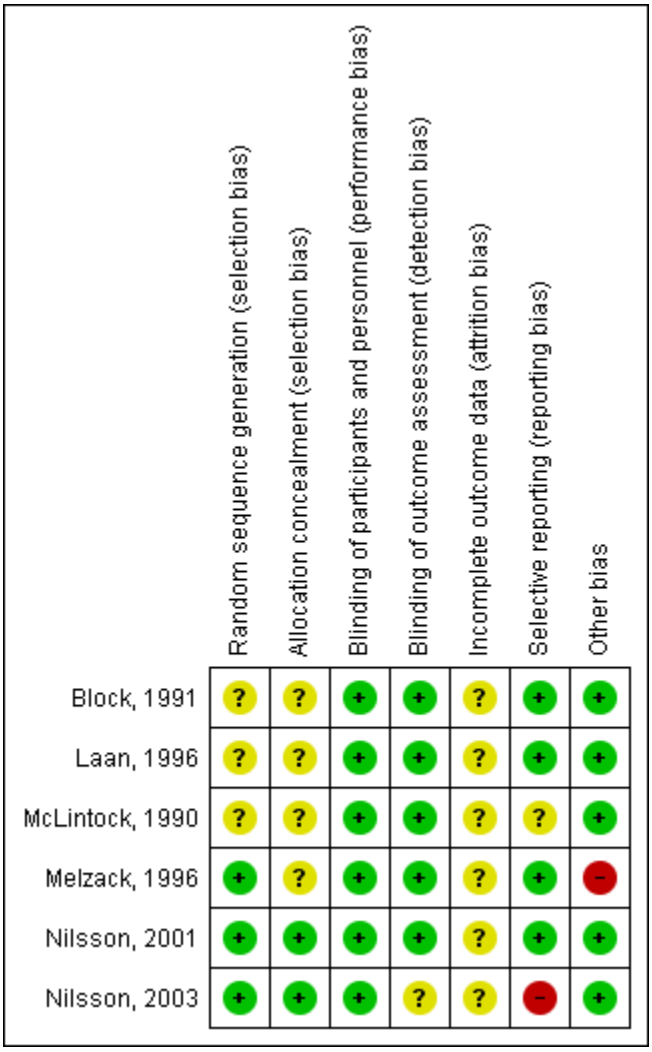
eFigure 11. RoB for Relaxation Studies



eFigure 12. RoB for Guided Imagery Studies



eFigure 13. RoB for Therapeutic Suggestion Studies



eFigure 14. RoB for CBT Studies