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Yoga treatment for chronic non-specific low back pain (Review)

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[Intervention Review]

Yoga treatment for chronic non-specific low back pain

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ABSTRACT

Background

Non-specific low back pain is a common, potentially disabling condition usually treated with self-care and non-prescription medication. For chronic low back pain, current guidelines state that exercise therapy may be beneficial. Yoga is a mind-body exercise sometimes used for non-specific low back pain.

Objectives

To assess the effects of yoga for treating chronic non-specific low back pain, compared to no specific treatment, a minimal intervention (e.g. education), or another active treatment, with a focus on pain, function, and adverse events.

Search methods

We searched CENTRAL, MEDLINE, Embase, five other databases and four trials registers to 11 March 2016 without restriction of language or publication status. We screened reference lists and contacted experts in the field to identify additional studies.

Selection criteria

We included randomized controlled trials of yoga treatment in people with chronic non-specific low back pain. We included studies comparing yoga to any other intervention or to no intervention. We also included studies comparing yoga as an adjunct to other therapies, versus those other therapies alone.

Data collection and analysis

Two authors independently screened and selected studies, extracted outcome data, and assessed risk of bias. We contacted study authors to obtain missing or unclear information. We evaluated the overall certainty of evidence using the GRADE approach.

Main results

We included 12 trials (1080 participants) carried out in the USA (seven trials), India (three trials), and the UK (two trials). Studies were unfunded (one trial), funded by a yoga institution (one trial), funded by non-profit or government sources (seven trials), or did not report on funding (three trials). Most trials used Iyengar, Hatha, or Viniyoga forms of yoga. The trials compared yoga to no intervention or a non-exercise intervention such as education (seven trials), an exercise intervention (three trials), or both exercise and non-exercise interventions (two trials). All trials were at high risk of performance and detection bias because participants and providers were not

blinded to treatment assignment, and outcomes were self-assessed. Therefore, we downgraded all outcomes to 'moderate' certainty evidence because of risk of bias, and when there was additional serious risk of bias, unexplained heterogeneity between studies, or the analyses were imprecise, we downgraded the certainty of the evidence further.

For yoga compared to non-exercise controls (9 trials; 810 participants), there was low-certainty evidence that yoga produced small to moderate improvements in back-related function at three to four months (standardized mean difference (SMD) -0.40, 95% confidence interval (CI) -0.66 to -0.14; corresponding to a change in the Roland-Morris Disability Questionnaire of mean difference (MD) -2.18, 95% -3.60 to -0.76), moderate-certainty evidence for small to moderate improvements at six months (SMD -0.44, 95% CI -0.66 to -0.22; corresponding to a change in the Roland-Morris Disability Questionnaire of MD -2.15, 95% -3.23 to -1.08), and low-certainty evidence for small improvements at 12 months (SMD -0.26, 95% CI -0.46 to -0.05; corresponding to a change in the Roland-Morris Disability Questionnaire of MD -1.36, 95% -2.41 to -0.26). On a 0-100 scale there was very low- to moderate-certainty evidence that yoga was slightly better for pain at three to four months (MD -4.55, 95% CI -7.04 to -2.06), six months (MD -7.81, 95% CI -13.37 to -2.25), and 12 months (MD -5.40, 95% CI -14.50 to -3.70), however we pre-defined clinically significant changes in pain as 15 points or greater and this threshold was not met. Based on information from six trials, there was moderate-certainty evidence that the risk of adverse events, primarily increased back pain, was higher in yoga than in non-exercise controls (risk difference (RD) 5%, 95% CI 2% to 8%).

For yoga compared to non-yoga exercise controls (4 trials; 394 participants), there was very-low-certainty evidence for little or no difference in back-related function at three months (SMD -0.22, 95% CI -0.65 to 0.20; corresponding to a change in the Roland-Morris Disability Questionnaire of MD -0.99, 95% -2.87 to 0.90) and six months (SMD -0.20, 95% CI -0.59 to 0.19; corresponding to a change in the Roland-Morris Disability Questionnaire of MD -0.90, 95% -2.61 to 0.81), and no information on back-related function after six months. There was very low-certainty evidence for lower pain on a 0-100 scale at seven months (MD -20.40, 95% CI -25.48 to -15.32), and no information on pain at three months or after seven months. Based on information from three trials, there was low-certainty evidence for no difference in the risk of adverse events between yoga and non-yoga exercise controls (RD 1%, 95% CI -4% to 6%).

For yoga added to exercise compared to exercise alone (1 trial; 24 participants), there was very-low-certainty evidence for little or no difference at 10 weeks in back-related function (SMD -0.60, 95% CI -1.42 to 0.22; corresponding to a change in the Oswestry Disability Index of MD -17.05, 95% -22.96 to 11.14) or pain on a 0-100 scale (MD -3.20, 95% CI -13.76 to 7.36). There was no information on outcomes at other time points. There was no information on adverse events.

Studies provided limited evidence on risk of clinical improvement, measures of quality of life, and depression. There was no evidence on work-related disability.

Authors' conclusions

There is low- to moderate-certainty evidence that yoga compared to non-exercise controls results in small to moderate improvements in back-related function at three and six months. Yoga may also be slightly more effective for pain at three and six months, however the effect size did not meet predefined levels of minimum clinical importance. It is uncertain whether there is any difference between yoga and other exercise for back-related function or pain, or whether yoga added to exercise is more effective than exercise alone. Yoga is associated with more adverse events than non-exercise controls, but may have the same risk of adverse events as other back-focused exercise. Yoga is not associated with serious adverse events. There is a need for additional high-quality research to improve confidence in estimates of effect, to evaluate long-term outcomes, and to provide additional information on comparisons between yoga and other exercise for chronic non-specific low back pain.

PLAIN LANGUAGE SUMMARY

Yoga treatment for chronic non-specific low back pain

Review question

Does yoga improve back-related function and pain in people with chronic non-specific low back pain?

Background

Low back pain is a common health problem. For some people, it may last for three months or more and at this point it is termed 'chronic'. Yoga is sometimes used as a treatment for low back pain.

Search date

We searched medical databases for trials comparing yoga to any other treatment or to no treatment in adults (aged 18 years or greater). We also included trials comparing yoga added to other treatments, versus those other treatments alone. The evidence is current to March 2016.

Study characteristics

We included 12 trials with 1080 participants. Seven studies were carried out in the USA, three studies were carried out in India, and two studies were carried out in the UK. All studies measured changes in back-related function or pain. Few studies reported on quality of life or depression, and only about half of the studies said anything about harms.

Study funding sources

Three studies did not report the source of funding. One study reported not receiving any funding; one study was funded by a yoga institution; and seven studies were funded by charity, university, or government sources.

Key results

Seven studies compared yoga to non-exercise, which included no treatment, delayed yoga treatment, or education (e.g. booklets and lectures). Three studies compared yoga to back-focused exercise or similar exercise programmes. Two studies had three treatment groups and compared yoga, non-exercise, and back-focused exercise. One of the studies comparing yoga to back-focused exercise compared yoga plus back-focused exercise to back-focused exercise alone.

For yoga compared to non-exercise, there was low-certainty evidence that yoga was probably better in improving back function at three months, moderate-certainty evidence that yoga was probably better at six months, and low-certainty evidence that yoga was probably slightly better at 12 months. There was very-low- to moderate-certainty evidence for an improvement in pain at three, six, and 12 months, but the effects were not clinically important.

For yoga compared to back-focused exercise, there was very-low-certainty evidence that there may be little or no difference between yoga and non-yoga exercise in improving back function at three and six months and no information on back function at 12 months, there was very-low-certainty evidence for an improvement in pain at seven months, and there was no information on pain at three or 12 months. For yoga plus back-focused exercise compared to back-focused exercise alone, there was very-low-certainty evidence from one study (24 participants) and it is uncertain whether yoga added to exercise was better than exercise alone for back function or pain at 10 weeks. Back function and pain were not measured after 10 weeks.

The most common harms reported in the trials were increased back pain. There was moderate-certainty evidence that the risk of harms was higher in yoga than in non-exercise, and low-certainty that the risk of harms was similar between yoga and back-focused exercise. Yoga was not associated with a risk of serious adverse events.

There was little information on clinical improvement, quality of life and depression, and no evidence on work-related disability.

Certainty of the evidence

Participants in all the studies were aware of whether they were practicing yoga or not, and this may have influenced their reporting of changes in functioning, pain, and other measures. . In addition, some studies were very small, there were few studies in some comparisons, and the studies in some comparisons had inconsistent results. Therefore, we graded the certainty of the evidence 'moderate', 'low', or 'very low'.

SUMMARY OF FINDINGS FOR THE MAIN COMPARISON [Explanation]

Yoga compared with non-exercise controls for chronic non-specific low back pain

Patient or population: adults with chronic non-specific low back pain
Settings: mix of participants seeking medical care and participants in the community
Intervention: yoga
Comparison: non-exercise controls (e.g. waiting list, usual care, education)

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Non-exercise control	Yoga				
Back-specific function at short term (4 to 6 weeks) Oswestry Disability Index or the Roland-Morris Disability Questionnaire. Lower scores on both scales mean better function. Roland-Morris Disability Questionnaire used for illustrative risks	The baseline mean for the most representative study (Sherman 2011) was **9.0 (SD 5.0)***	The mean back-specific function in the intervention groups was **1.80 units lower** (2.84 to 0.76 lower) than in the control group	Not applicable	256 participants (5 studies)	⊕⊕⊕◯ **Low**[1,2]	Corresponding risk estimated using SMD of -0.45 (95% CI -0.71 to -0.19), which is a small to moderate effect size
Back-specific function at short-intermediate term (3 to 4 months) Oswestry Disability Index, the Roland-Morris Disability Questionnaire, or the Pain Disability Index. Lower scores on all scales	The baseline mean for the most representative study (Tilbrook 2011) was **7.75 (SD 4.72)***	The mean back-specific function in the intervention groups was **2.18 units lower** (3.60 to 0.76 lower) than in the control group	Not applicable	667 participants (7 studies)	⊕⊕◯◯ **Low**[1,4]	Corresponding risk estimated using SMD of -0.40 (95% CI -0.66 to -0.14), which is a small to moderate effect size

mean better function. Roland-Morris Disability Questionnaire used for illustrative risks						
Back-specific function at intermediate term (6 months) Oswestry Disability Index, the Roland-Morris Disability Questionnaire, or the Pain Disability Index. Lower scores on all scales mean better function. Roland-Morris Disability Questionnaire used for illustrative risks	The baseline mean for the most representative study (Tilbrook 2011) was **7.75 (SD 4.72)***	The mean back-specific function in the intervention groups was **2.15 units lower** (3.23 to 1.08 lower) than in the control group	Not applicable	630 participants (6 studies)	⊕⊕⊕◯ **Moderate**[1]	Corresponding risk estimated using SMD of -0.44 (95% CI -0.66 to -0.22), which is a small to moderate effect size
Back-specific function at long term (1 year) Oswestry Disability Index or the Roland-Morris Disability Questionnaire. Lower scores on both scales mean better function. Roland-Morris Disability Questionnaire used for illustrative risks	The baseline mean for the most representative study (Tilbrook 2011) was **7.75 (SD 4.72)***	The mean back-specific function in the intervention groups was **1.36 units lower** (2.41 to 0.26 lower) than in the control group	Not applicable	365 participants (2 studies)	⊕⊕◯◯ **Low**[1,2]	Corresponding risk estimated using SMD of -0.26 (95% CI -0.46 to -0.05), which is a small effect size
Pain at short term (4 to 6 weeks) Aberdeen Pain Scale (range 0 to 100) or a VAS scale (range 0 to 10). Scales were translated to a 0 to 100 scale	The baseline mean for the most representative study (Saper 2009) was **75 (SD 13)***	The mean pain in the intervention groups was **10.83 units lower** (20.85 to 0.81 lower) than in the control group	Not applicable	40 participants (2 studies)	⊕◯◯◯ **Very low**[1,2,3]	-

in which lower scores mean less pain						
Pain at short-intermediate term (3 to 4 months) Aberdeen Pain Scale (range 0 to 100) or a VAS scale (range 0 to 10 or 0 to 100). Scales were translated to a 0 to 100 scale in which lower scores mean less pain	The baseline mean for the most representative study (Tilbrook 2011) was **26.69 (SD 10.87)***	The mean pain in the intervention groups was **4.55 units lower** (7.04 to 2.06 lower) than in the control group	Not applicable	458 participants (5 studies)	⊕⊕⊕◯ **Moderate**[1]	-
Pain at intermediate term (6 months) Aberdeen Pain Scale (range 0 to 100) or a VAS scale (0 to 10 or 0 to 100). Scales were translated to a 0 to 100 scale in which lower scores mean less pain	The baseline mean for the most representative study (Tilbrook 2011) was **26.69 (SD 10.87)***	The mean pain in the intervention groups was **7.81 units lower** (13.37 to 2.25 lower) than in the control group	Not applicable	414 participants (4 studies)	⊕⊕◯◯ **Low**[1,4]	-
Pain at long term (1 year) Aberdeen Pain Scale (range 0 to 100) and a VAS scale (0 to 100) in which lower scores mean less pain	The baseline mean for the most representative study (Tilbrook 2011) was **26.69 (SD 10.87)***	The mean pain in the intervention groups was **5.40 units lower** (14.50 to 3.70 lower) than in the control group	Not applicable	355 participants (2 studies)	⊕◯◯◯ **Very low**[1,2,5]	-
Adverse events Participants were followed 6 to 12 months.	**Study population**		**RD 5%** (2% to 8%)	696 participants (6 studies)	⊕⊕⊕◯ **Moderate**[1]	Yoga participants had a higher risk of an adverse event.

	11 per 1000	**71 per 1000** (41 to 111)	

*The assumed risk is the baseline mean in the control group. When there was more than one study for an outcome, we chose the baseline control group mean from the included study that was a combination of the most representative study population and has the largest weighting in the overall result in Review Manager 5 (RevMan 2014). For back-related function, this was Sherman 2011 at short term and Tilbrook 2011 at short-intermediate, intermediate, and long term. For pain, this was Saper 2009 at short term and Tilbrook 2011 at short-intermediate, intermediate, and long term.
CI: confidence interval; **RD:** risk difference; **RR:** risk ratio; **SD:** standard deviation; **SMD:** standardized mean difference; **VAS:** visual analogue scale.

GRADE Working Group grades of evidence
High certainty: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate certainty: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low certainty: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low certainty: We are very uncertain about the estimate.

[1] Downgraded one level for risk of bias (there was no blinding of participants or providers, and outcome was self-assessed by participants).
[2] Downgraded one level for imprecision (< 400 participants, or CI included both a null effect and either appreciable benefit or appreciable harm).
[3] Downgraded one additional level for risk of bias because the analysis relied heavily on one small study (Cox 2010) with serious risks of bias in addition to lack of blinding.
[4] Downgraded one level for heterogeneity ($I^2 \geq 50\%$) that could not be explained.
[5] Downgraded one level for heterogeneity ($I^2 \geq 75\%$) that could be partly explained.

BACKGROUND

Description of the condition

Low back pain, defined as pain or discomfort in the area between the lower rib and the gluteal folds, is a common, potentially disabling condition (Koes 2006). One systematic review on the prevalence of low back pain reported adjusted summary estimates for point prevalence of 11.9% (standard deviation (SD) 2.0%) and one-month prevalence of 23.2% (SD 2.9%) (Hoy 2012). The US National Health Interview Survey (NHIS) estimated the three-month prevalence of low back pain as 26.4% (Deyo 2006). The unadjusted summary estimate from the systematic review for one-year prevalence was 38.0% (SD 19.4%) (Hoy 2012). Estimates of lifetime prevalence vary greatly in different regions of the world, and mean estimates range from 38.9% (Hoy 2012) to 85% (Balague 2012). Low back pain is associated with loss of work productivity, poor quality of life, and high medical expenses, and is a substantial economic burden on society (Deyo 2006; Dagenais 2008).

Back pain is sometimes associated with a likely aetiology (e.g. radiculopathy or spinal stenosis), but most low back pain cases are of unknown origin and are classified as non-specific (van Tulder 1997). Low back pain may also be classified according to the duration of pain as acute (less than four weeks), subacute (between four weeks and three months), or chronic (three months or greater) (van Tulder 2006; Chou 2007). Most episodes of low-back pain are mild (Cassidy 2005), and activity limitations are rare (Lawrence 2008). Symptoms often improve during the first six weeks (Buchbinder 2012; Costa 2012). A small subset of chronic and severe cases is responsible for much of the disability and related medical costs due to low back pain (Luo 2004). Low back pain is an intermittent and recurring condition. Among people with a resolved episode of low back pain, it is estimated that between 24% and 74% will have a recurrent episode within one year (Pengel 2003; Stanton 2008).

The usual treatment for low back pain is self-care and non-prescription medication such as paracetamol (acetaminophen) or non-steroidal anti-inflammatory drugs. For chronic low back pain, National Institute for Health and Care Excellence (NICE) guidelines, which are in the process of being updated as of September 2016, recommend exercise and some manual therapies in addition to non-prescription medication (NICE 2009). There are also guidelines suggesting that there is good evidence of moderate benefit for interdisciplinary rehabilitation (Chou 2009). The current evidence does not provide guidance on selecting one treatment approach over another or when specific treatments are warranted, and the best treatment approaches remain unclear (Haldeman 2008), while many treatments are costly and of unclear effectiveness (Deyo 2009).

Description of the intervention

Yoga is a mind-body practice originating from ancient India which has also become popular in the West over the last century (Saper 2004). There are many branches and styles of yoga practice, with varying philosophies and practices, but all may be characterized by the integration of physical poses (asanas) and controlled breathing (pranayama), and frequently also the incorporation of meditation (dhyana) (Hewitt 2001; Hayes 2010). According to the 2007 NHIS, the use of yoga in the US increased between 2002 and 2007, and in 2007 over 13 million adults had used yoga during the previous year (Barnes 2008; Birdee 2008). According to the 2012 NHIS, the use of yoga in the US increased further in subsequent years and in 2012 over 21 million adults had used yoga during the previous year (Cramer 2016a).

Therapeutic yoga is the use of yoga to help people with health problems manage their condition and reduce their symptoms (International Association of Yoga Therapists 2016). Yoga has been suggested as being useful in managing pain and associated disability across a range of conditions, including back pain (McCall 2007; Bussing 2012). In the 2002 NHIS Alternative Medicine Supplement survey over 10 million US adults described using yoga for health reasons; 10.5% of yoga users said that their use was for musculoskeletal conditions and 76% of these users reported that the yoga was helpful (Birdee 2008). In the 2012 NHIS, 19.7% of yoga users said their use was specifically for back pain (Cramer 2016a).

How the intervention might work

Several potential benefits have been proposed in relation to the practice of yoga in persistent pain conditions, including changes in physiological, behavioural and psychological factors (Wren 2011). Potential mechanisms for these changes include improved flexibility and muscular strength derived from practicing the physical poses of yoga, increased mental and physical relaxation derived from practicing controlled breathing or meditation exercises, and improved body awareness gained through both the physical and mental aspects of yoga (Sorosky 2008; Daubenmier 2012).

Why it is important to do this review

Yoga is one of several complementary therapies often used to treat low back pain, and in surveys people frequently report that it is helpful (Wolsko 2003; Birdee 2008). Several randomized controlled trials (RCTs) have tested the effectiveness of yoga in relieving the symptoms of low back pain. Since yoga is a commonly used therapy for a highly prevalent, recurrent, and bothersome health problem for which there are no clearly satisfactory treatments, and large RCTs are available, it is important to evaluate critically the current evidence for yoga as a treatment for low back pain.

OBJECTIVES

To assess the effects of yoga for treating chronic non-specific low back pain, compared to no specific treatment, a minimal intervention (e.g., education), or another active treatment, with a focus on pain, function, and adverse events.

METHODS

Criteria for considering studies for this review

Types of studies

We included RCTs. We excluded quasi-randomized trials. We did not restrict study eligibility by language or publication status.

Types of participants

We included trials in adults (aged 18 years or greater) with current chronic non-specific low back pain. We defined chronic low back pain as pain with a duration of three months or more (van Tulder 2006; Chou 2007). In our description of population and setting, we specified whether the participants were recruited from populations seeking medical care or from the community.

Types of interventions

We included studies of yoga as an intervention for low back pain. The study was required to specify that the intervention was 'yoga'. We excluded interventions based on yoga (e.g. stretching exercises based on yoga) but not characterized as yoga. We did not restrict studies according to the yoga tradition used, or according to the dose, frequency, or duration of the yoga intervention. However, we excluded studies examining yogic meditation or a yoga lifestyle without a physical practice component.

We included studies comparing yoga to any other intervention or to no intervention. We also included any studies comparing yoga as an adjunct to other therapies, versus those other therapies alone. The comparisons of interest were:

- yoga versus no treatment or a waiting list, a minimal intervention (e.g. booklets, lectures, or other educational interventions), or usual care (i.e. yoga compared to non-exercise controls);
- yoga versus another active intervention (e.g. yoga versus drugs), for which different types of active interventions were considered separately (e.g. yoga versus drugs, yoga versus manipulation) (i.e. yoga compared to exercise controls); and
- yoga plus any intervention versus that intervention alone, for which different types of cointervention were considered separately (e.g. yoga plus drugs versus drugs alone) (i.e. yoga as an add-on intervention to an exercise intervention).

Studies with cointerventions were allowed, if the cointerventions were comparable between intervention groups (e.g. both groups were allowed the use of pain medications).

Types of outcome measures

We chose outcome measures that were important in assessment of low back pain, so that this review may produce results that are easily compared to or combined with those of other systematic reviews of treatment for low back pain. All outcomes were assessed at short-term (closest to four weeks), short-intermediate term (closest to three months), intermediate-term (closest to six months), and long-term (closest to one year) time points.

Primary outcomes

- Back-specific functional status (e.g. as measured by the Roland-Morris Disability Questionnaire).
- Pain (e.g. as measured by the visual analogue scale (VAS) for pain).

Secondary outcomes

- Clinical improvement.
- Measures of mental or physical quality of life (e.g. as measured on the 36-item Short Form (SF-36)).
- Measures of work disability.
- Adverse events.

Search methods for identification of studies

Electronic searches

We used the search methods recommended by Lefebvre 2011 and Furlan 2015a to search the following databases from inception to 11 March 2016 without restrictions to language or publication status:

- Cochrane Central Register of Controlled Trials (CENTRAL, which includes the Cochrane Back and Neck group (CBN) trials register) (the Cochrane Library, 2016, Issue 2; Appendix 1);
- MEDLINE (OvidSP, 1946 to March week 1 2016; Appendix 1);
- MEDLINE In-Process & Other Non-Indexed Citations (OvidSP, 10 March 2016; Appendix 1);
- Embase (OvidSP, 1980 to 2016 week 10; Appendix 1);
- Cumulative Index to Nursing and Allied Health Literature (CINAHL) (EBSCO, 1981 to 11 March 2016; Appendix 1);
- PsycINFO (OvidSP, 2002 to March week 2 2016; Appendix 2);
- Allied and Complementary Medicine Database (AMED) (OvidSP, 1985 to March 2016; Appendix 2);

- CBN Trials Register (Cochrane Register of Studies (CRS)); Appendix 2);
- Cochrane Complementary Medicine Field Trials Specialized Register (Cochrane Register of Studies Online (CRSO)); Appendix 2);
- IndMED (Appendix 2);
- PubMed (Appendix 2);
- US National Institutes of Health ClinicalTrials.gov (Appendix 2);
- World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP; Appendix 2).

The searches were previously run in 2013 and 2014. In 2014, the ClinicalTrials.gov, WHO ICTRP, and a supplementary search of the CBN Specialized Register in the CRS were added to the search strategy. In 2016, the PubMed search was revised to capture studies not in MEDLINE using the strategy recommended by Duffy 2014. The Information Specialist of the CBN conducted all searches except for the Cochrane Complementary Medicine Field Specialized Register, which we searched through the CRSO.

Searching other resources

We screened the reference lists of included studies and contacted experts in the field (e.g. authors of included studies) for information on additional trials, including unpublished or ongoing studies.

Data collection and analysis

Selection of studies

Two authors (LSW and NS, KP, RV, or CD) independently screened the titles and abstracts of references retrieved from searches. We obtained the full text for references that either author considered to be potentially relevant. Two authors (LSW and NS, KP, RV, or CD) independently assessed the full-text references for inclusion according to the Criteria for considering studies for this review. Disagreements were resolved by consensus or by consultation with a third author.

Data extraction and management

One author (LSW) used a standardized and pilot-tested form to extract data on study characteristics, and a second author (KP) checked these data. Two authors (KP, LSW) independently extracted data on funding or sponsorship.

Two authors (LSW, NS) used a standardized and pilot-tested form to independently extract data on outcomes for each trial. If key information was missing from the study report, we contacted the report authors to obtain the information, and reported the results of these contacts in the Notes section of the Characteristics of included studies table. When back-related function was reported using multiple scales, we extracted data from, in order of preference, the Roland-Morris Disability Questionnaire and the Oswestry Disability Index. When pain data were reported on a scale other than 0 to 100 (e.g. 0 to 5, 0 to 10) we transformed the data into a 0 to 100 scale. When both endpoint and change data were available, we used endpoint data in our primary analysis. In cases where neither endpoint nor change data were available, one author (RV) used Plot Digitizer to extract endpoint values from figures (Jelicic 2016). We used these values together with the baseline SD in our primary analysis. In cases where study participants were lost to follow-up and intention-to-treat analyses were conducted using imputation alongside available case analyses, we used the imputed data for our primary analysis. In cases where both unadjusted and adjusted data were available, we used the adjusted data for our primary analysis. Disagreements on dually extracted information were resolved by consensus.

Assessment of risk of bias in included studies

Two authors (LSW, KP) independently assessed the risk of bias for each included study using the 13 'Risk of bias' items recommended by the CBN (Furlan 2015a). These items are an adaptation of the 'Risk of bias' criteria described in the*Cochrane Handbook of Systematic Reviews of Interventions* (Higgins 2011b). The description of each item and how to rate each item as 'low risk of bias', 'high risk of bias', or 'unclear risk of bias' are presented in Table 1 and Table 2. For rating compliance, we considered trials to be at low risk of bias if at least 50% of yoga participants were reported to have attended at least 50% of classes. Disagreements on risk of bias were resolved by consensus.

Lack of allocation concealment, failure to blind participants and outcome assessors, and a high dropout rate or a marked difference between intervention groups in numbers of dropouts or reasons for dropout are all empirically associated with bias (Furlan 2015a). For this review, we classified studies as having a high risk of bias if they had a high or unclear risk of bias for random allocation, allocation concealment, or incomplete outcome assessment, or a high risk of bias under 'Other bias'. We conducted a sensitivity analysis for the primary outcomes to explore the effects of including and excluding trials at high risk of bias (Sensitivity analysis).

Measures of treatment effect

We analyzed dichotomous outcomes (i.e. overall clinical improvement) by calculating the risk ratio (RR). We analyzed continuous outcomes (i.e. back-related function, pain, quality of life, depression) by calculating the mean difference (MD) or standardized mean difference (SMD), and when combining outcomes measured on different scales by calculating the SMD we did not combine endpoint and change values (Deeks 2011). We used the absolute risk difference (RD) to report adverse events. We expressed

the uncertainty with 95% confidence intervals (CI) for all estimates. We considered a minimum clinically important change on the 0 to 100 pain scale to be 15 (Ostelo 2008). For non-pain outcomes, we used Cohen's three levels for the size of between-group effects to classify the effect estimates as small (SMD less than 0.5), medium (SMD from 0.5 to less than 0.8), or large (SMD 0.8 or greater) (Cohen 1988). Measures of treatment effect are considered statistically significant when P is less than 0.05 or the 95% CI excludes one (for the RR) or zero (for the MD, SMD, or RD).

Unit of analysis issues

We planned to follow the guidance on cluster-randomized or cross-over trials in Chapters 16.3 and 16.4 of the *Cochrane Handbook of Systematic Reviews of Interventions* (Higgins 2011a), but we did not find any cluster-randomized or cross-over trials to include in this review.

Dealing with missing data

We contacted the first author or primary investigator for trials in which data for key study characteristics or primary outcomes were missing or incomplete.

Assessment of heterogeneity

Clinical heterogeneity (i.e. differences in study populations, interventions, and outcomes) between studies was assessed qualitatively. For studies that we judged to have sufficient clinical homogeneity to combine in a meta-analysis, we assessed statistical heterogeneity using the I^2 statistic, which describes the percentage of the variability in the effect estimate that is due to clinical or methodological heterogeneity rather than to chance. An I^2 value of 30% to 60% may represent moderate heterogeneity, a value of 50% to 90% may represent substantial heterogeneity, and a value of 75% to 100% may represent considerable heterogeneity (Deeks 2011).

Assessment of reporting biases

We planned to use funnel plots to assess the potential for small-study bias in meta-analyses in which at least 10 studies were included; however, no meta-analyses included 10 or more studies. We assessed the possibility of selective outcome reporting for each study as part of the 'Risk of bias' assessment.

Data synthesis

When the population, interventions, outcomes, and time of assessment were clinically comparable across trials, we carried out a meta-analysis using Review Manager 5 (RevMan 2014). We used a random-effects model because we expected some between-study variation. When the data were considered not sufficiently clinically similar to be combined in a meta-analysis, we described the results from clinically comparable trials qualitatively.

Regardless of whether sufficient data were available to use quantitative analyses to summarize the data, we assessed the overall certainty of the evidence for each comparison/outcome, using the GRADE approach, as recommended in the *Cochrane Handbook of Systematic Reviews of Interventions* (Higgins 2011a), and adapted in the updated CBN method guidelines (Furlan 2015a). Factors that may decrease the certainty of the evidence are: study design and risk of bias, inconsistency of results, indirectness (not generalizable), imprecision (sparse data), and other factors (e.g. reporting bias). The certainty of the evidence for a specific outcome was reduced by one level, according to the performance of the studies against each of these five factors. The factors and criteria are outlined in Appendix 3 (Furlan 2015b). We reported the GRADE certainty of the evidence in the Results.

Subgroup analysis and investigation of heterogeneity

We did not identify studies that tested yoga interventions without a mind component (i.e. studies that tested only the physical practice component of yoga and did not include meditation, relaxation, or breathing exercises). Therefore, we were unable to conduct planned subgroup analyses to evaluate the differences in outcomes between yoga interventions with and without a mind component. We were unable to carry out subgroup analyses of trials conducted in older (mean age 65 years or greater) versus younger populations, and trials conducted with participants who had major comorbidities (e.g. heart disease) versus trials conducted with participants who did not have these major comorbidities, as data for these subgroup analyses were not available. We planned to carry out a subgroup analysis of trials conducted in a lower socioeconomic status (SES) or lower-educated population versus a higher SES or higher-educated populations, and identified one trial conducted in a lower SES or lower-educated population (Saper 2009). However, to use a significance test to investigate whether the subgroup variable was associated with a statistically significant difference in outcomes between subgroups, it is necessary to have at least two trials in each subgroup (Deeks 2001), thus, this test was not appropriate.

Sensitivity analysis

For the primary outcomes, we compared analyses including and excluding trials at high risk of bias (as defined in Assessment of risk of bias in included studies) to explore the impact of risk of bias on estimates of treatment effects. We also used sensitivity analyses to explore the effects of using imputed versus available-case data, and the effects of using endpoint versus change data. For analyses that were carried out using endpoint data extracted from figures and SDs estimated from baseline SDs, we conducted generic inverse variance analyses using MDs and CIs, when such data were available, to test the robustness of analyses carried out using these different methods.

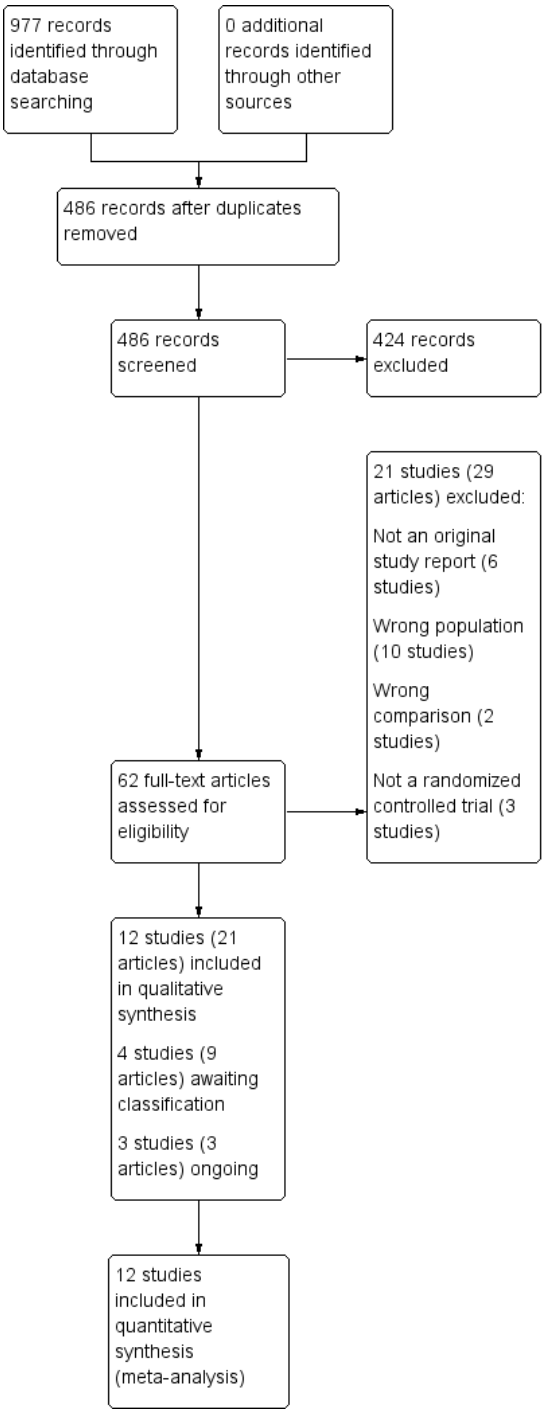
RESULTS

Description of studies

Results of the search

The searches retrieved 977 records. After deduplication, we screened titles and abstracts of 486 records and the full text of 62 records. We identified records corresponding to 40 studies, of which 12 studies met the inclusion criteria and were included in the review, 21 studies were excluded, four studies are awaiting classification, and three studies are ongoing. Many studies were associated with multiple reference records. In all cases the study rather than the reference was the unit of interest in the review. The flow of studies is presented in the PRISMA chart in Figure 1.

Figure 1. Study flow diagram.



Included studies

We included 12 parallel RCTs (1080 participants). Seven studies were conducted in the USA (Galantino 2004; Jacobs 2004; Sherman 2005; Williams 2005; Saper 2009; Williams 2009; Sherman 2011: 583 participants), three were conducted in India (Tekur 2008; Wattamwar 2013; Nambi 2014: 164 participants), and two were conducted in the UK (Cox 2010; Tilbrook 2011: 333 participants). All studies were clearly carried out between 2001 and 2012, except for two studies (Galantino 2004; Wattamwar 2013), which did not report the dates of study conduct. All trials were published in English.

We have provided details about each included trial in the Characteristics of included studies table. We have also provided detailed information about the study populations, study interventions and comparisons, and the intervention design and delivery in additional tables (Table 3; Table 4; Table 5; Table 6).

Participants

In 10 studies, the mean age of participants was reported to be between 43 and 48 years old, in one study the mean age was reported to be 34 years (Wattamwar 2013), and in one study the age of participants was not reported (Galantino 2004). The percentage of participants who were women was not reported in two studies (Jacobs 2004; Wattamwar 2013). Among the remaining studies, the percentage of women as 45% and 53% in the studies carried out in India, and ranged from 64% to 83% in the studies conducted outside India. Six trials reported race or ethnicity, and the percentage of participants reported to be 'Caucasian' or 'White' ranged from a low of 24% in Saper 2009 to 63.5% in Jacobs 2004 to between 80% and 93% in the remaining trials (Sherman 2005; Williams 2005; Williams 2009; Sherman 2011). Eight studies reported education level, and the majority of participants had completed at least some college level of education in each of those studies (Jacobs 2004; Sherman 2005; Williams 2005; Tekur 2008; Saper 2009; Williams 2009; Sherman 2011; Tilbrook 2011).

One study did not describe the source and methods of recruitment (Wattamwar 2013). In the other studies, participants were recruited from clinical populations (Sherman 2005; Tekur 2008; Cox 2010), from both clinical and community populations (Galantino 2004; Jacobs 2004; Nambi 2014; Saper 2009; Sherman 2011; Tilbrook 2011; Williams 2005), or from the community (Williams 2009). For studies in which participants were recruited through a mix of clinical and community outreach, the majority of those screened appeared to be self-referred from the community in Williams 2005 , and to be physician-referred potential participants in Tilbrook 2011; the mix of recruitment sources for those screened was not described for the other studies. Most studies were co-ordinated from a single clinical site; however, one study was carried out at two community health centre sites (Saper 2009), one study was carried out through 39 general medical practices (Tilbrook 2011), and two studies were carried out at a co-ordinated healthcare system with multiple clinical sites (Sherman 2005; Sherman 2011); the exact number of sites was not reported.

Interventions

Two of the studies had three comparison arms (Sherman 2005; Sherman 2011), and all other studies had two arms. Studies compared yoga to a waiting list or usual care (Galantino 2004; Jacobs 2004; Saper 2009; Williams 2009; Cox 2010; Tilbrook 2011), to a self-care book (Sherman 2005; Sherman 2011), to educational classes and written material (Williams 2005), or to exercise (Sherman 2005; Tekur 2008; Sherman 2011; Wattamwar 2013; Nambi 2014). Among the studies comparing yoga to a waiting list or usual care, three studies provided supplementary written advice or educational material to both intervention groups (Saper 2009; Cox 2010; Tilbrook 2011), and one study provided supplementary written material to the non-yoga intervention group only (Jacobs 2004).

The types of yoga varied between trials. The most common type of yoga was Iyengar yoga or a modification of Iyengar yoga. Study authors reported using Hatha yoga (Galantino 2004; Saper 2009), Iyengar yoga (Williams 2005; Williams 2009; Cox 2010; Nambi 2014), the 'Iyengar style of Hatha yoga' (Jacobs 2004), a combination of Iyengar and British Wheel of Yoga (described as Hatha yoga on the British Wheel of Yoga website) (Tilbrook 2011), a combination of Iyengar and 'traditional' yoga (Wattamwar 2013), Viniyoga (Sherman 2005; Sherman 2011), or 'Integrated Approach of Yoga Therapy (IAYT)' (Tekur 2008). All interventions included meditation, relaxation, or breathing exercises in addition to physical yoga poses.

For all but one study (Tekur 2008), the yoga intervention was one to three yoga classes per week, with each class lasting 45 to 90 minutes. In Tekur 2008, the study was carried out in a residential setting, and the yoga group practiced approximately two hours of yoga postures per day as well as practicing yogic meditation, breathing, and chanting, and receiving yogic lifestyle lectures.

Outcomes

All but one of the included studies assessed back-specific function (Nambi 2014), and all but one of the included studies assessed pain or pain-related outcomes (Galantino 2004). Back-specific function was assessed using the Roland-Morris Disability Questionnaire (Jacobs 2004; Sherman 2005; Saper 2009; Cox 2010; Sherman 2011; Tilbrook 2011), the Oswestry Low Back

Pain Questionnaire (Galantino 2004; Jacobs 2004; Tekur 2008; Williams 2009; Wattamwar 2013), or the Pain Disability Index (Williams 2005). Pain was assessed using a 0 to 5 scale (Wattamwar 2013), a 0 to 10 scale (Jacobs 2004; Williams 2005; Tekur 2008; Saper 2009; Nambi 2014), a 0 to 100 scale (Williams 2009), or the Aberdeen Back Pain Scale (Cox 2010; Tilbrook 2011). Two studies did not report pain but instead reported the pain-related outcome of 'symptom bothersomeness' (Sherman 2005; Sherman 2011). This measures "the extent to which participants' lives are affected by whatever level of pain they felt", a concept related to but not the same as pain (Sherman 2010). Five studies reported mental and physical quality of life (Jacobs 2004; Tekur 2008; Cox 2010; Tilbrook 2011; Nambi 2014), and three studies reported depression (Galantino 2004; Jacobs 2004; Williams 2009). Three studies reported some measure of clinical improvement (Saper 2009; Cox 2010; Sherman 2011), and eight studies mentioned the presence or absence of adverse events (Sherman 2005; Williams 2005; Tekur 2008; Saper 2009; Williams 2009; Sherman 2011; Tilbrook 2011; Nambi 2014).

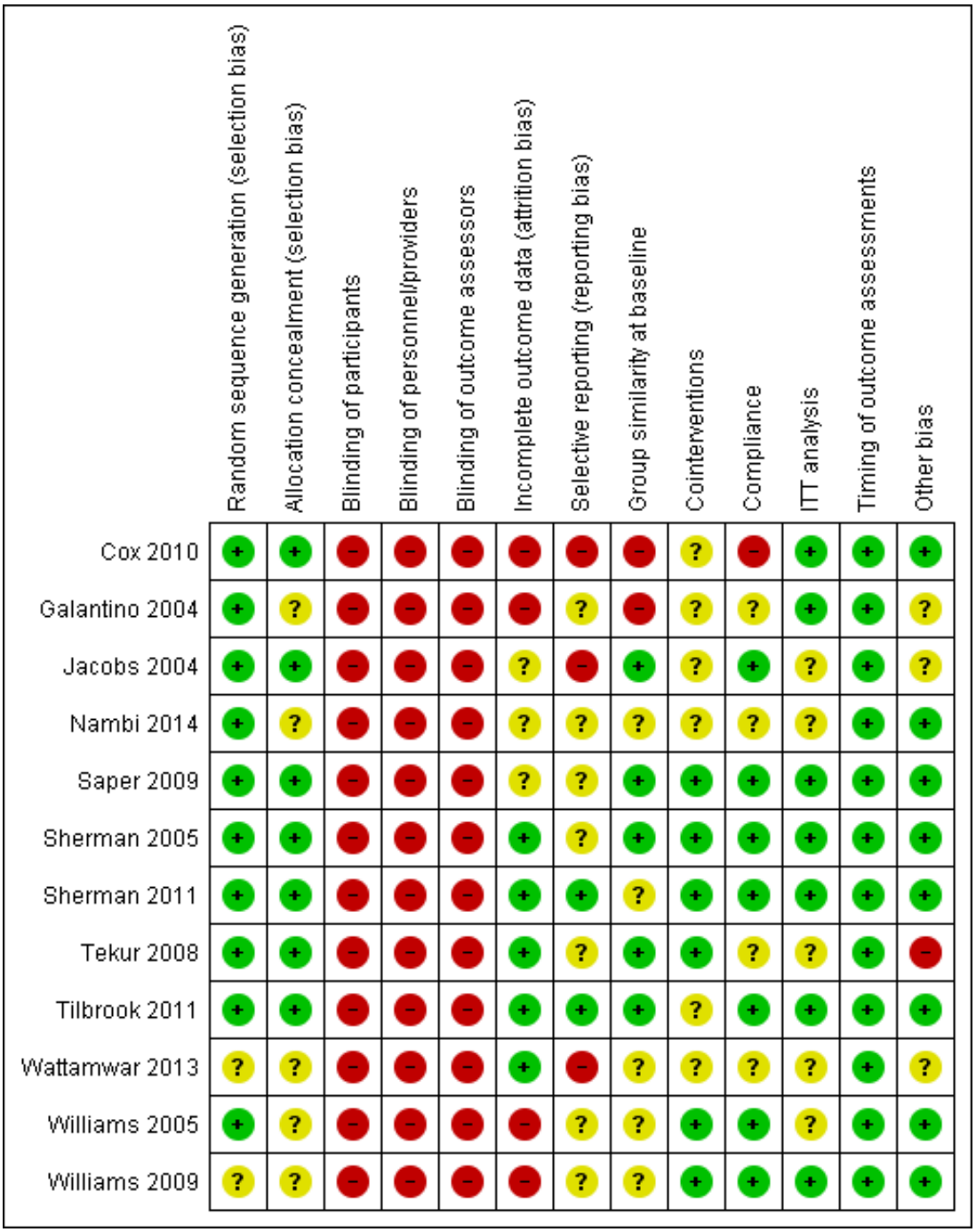
Excluded studies

We excluded three studies because they were not RCTs (Groessl 2012; Lee 2014; Patil 2015), and 10 studies because they were not carried out in populations with chronic non-specific low-back pain (Bindal 2007; Telles 2009; Pushpika 2010; Biggs 2012; CTRI/2012/11/003094; Hartfiel 2012; Michalsen 2012; Sakuma 2012; Monro 2014; Aboagye 2015). We also excluded one study because it compared different doses of yoga (Saper 2013), and one study because it compared different yoga techniques (Haldavnekar 2014). Finally, we excluded six references because they were not original study reports (Graves 2004; Borg-Olivier 2005; Anon 2006; Horng 2006; Anon 2009; Selfridge 2012). We have provided details about each of the excluded studies and the reasons for exclusion in the Characteristics of excluded studies table.

Risk of bias in included studies

A summary of the risk of bias for each article is shown in Figure 2.

Figure 2. Risk of bias summary: review authors' judgements about each risk of bias item for each included study.



Allocation

Seven studies were at low risk of selection bias (Jacobs 2004; Sherman 2005; Tekur 2008; Saper 2009; Cox 2010; Sherman 2011; Tilbrook 2011). Three studies reported methods of randomization but allocation concealment was not reported (Galantino 2004; Williams 2005; Nambi 2014), and two studies did not report details of randomization or allocation concealment (Williams 2009; Wattamwar 2013).

Blinding

No studies reported attempts to blind participants or providers. This included the studies that compared yoga to an exercise intervention, where there was no suggestion that the exercise intervention was intended to appear similar to yoga. Several studies reported that the people collecting outcome information from participants were blinded (Sherman 2005; Williams 2005; Tekur 2008; Williams 2009; Sherman 2011; Nambi 2014); however, the measures of pain, function, and quality of life, and the clinical improvement outcomes deriving from those measures, were based on self-reports by the participants, who were not themselves blinded. Therefore, we considered all studies to be at high risk of performance and detection bias.

Incomplete outcome data

Five studies were at low risk of attrition bias because they had little or no attrition, and if they had attrition the reasons for dropout did not appear to differ across intervention groups (Sherman 2005; Tekur 2008; Sherman 2011; Tilbrook 2011; Wattamwar 2013). Three studies were at unclear risk of attrition bias because attrition was fairly low but reasons for attrition were unclear or possibly related to outcomes, or it was unclear how missing data were handled (Jacobs 2004; Saper 2009; Nambi 2014). Four studies were at high risk of attrition bias because attrition was at least 20% in one or both intervention groups and there were questions about relationships between attrition and the intervention or about how missing data were handled (Galantino 2004; Williams 2005; Williams 2009; Cox 2010).

Selective reporting

When studies did not have registered or published protocols, we rated them as at unclear risk of bias, unless we observed outcome discrepancies between methods and results sections. The risk of reporting bias was low in two studies because reported outcomes were consistent with protocols (Sherman 2011; Tilbrook 2011), and high in three studies due to discrepancies between methods and results sections (Jacobs 2004; Cox 2010; Wattamwar 2013.

Group similarity at baseline

In five studies, comparison groups were similar in important prognostic characteristics , and we rated these studies at low risk of bias (Jacobs 2004; Sherman 2005; Tekur 2008; Saper 2009; Tilbrook 2011). There were important differences in baseline prognostic indicators between groups in two studies, which we rated at high risk of bias (Galantino 2004; Cox 2010). There were baseline differences that were of unclear importance in three studies, which we rated at unclear risk of bias (Williams 2005; Williams 2009; Sherman 2011), together with the studies for which we were unable to assess group similarity at baseline (Wattamwar 2013; Nambi 2014).

Cointerventions

We were unable to assess cointerventions in six studies (Galantino 2004; Jacobs 2004; Cox 2010; Tilbrook 2011; Wattamwar 2013; Nambi 2014), and in six studies the cointerventions were clearly similar between intervention groups (Sherman 2005; Williams 2005; Tekur 2008; Saper 2009; Williams 2009; Sherman 2011).

Compliance

Four studies did not report specific information on class attendance, and we rated them as unclear with respect to risk of bias related to compliance (Galantino 2004; Tekur 2008; Wattamwar 2013; Nambi 2014). Of the remaining studies, we rated one at high risk of bias because only 50% of participants attended any classes, and they attended fewer than 50% of available classes on average (Cox 2010), and we rated seven at low risk of bias because they reported that between 60% and 100% of participants attended at least 50% of classes on average (Jacobs 2004; Sherman 2005; Williams 2005; Saper 2009; Williams 2009; Sherman 2011; Tilbrook 2011).

Intention-to-treat analysis

We rated five studies that did not mention an intention-to-treat analysis at unclear risk of bias (Jacobs 2004; Williams 2005; Tekur 2008; Wattamwar 2013; Nambi 2014), and studies that stated an intention-to-treat analysis was carried out at low risk of bias. No study clearly failed to analyze participants in the groups to which they were randomized.

Timing of outcome assessments

Timing of outcome assessment was similar for all intervention groups within all studies, and we rated all studies at low risk of bias.

Other potential sources of bias

We rated studies at unclear risk of bias from funding sources when the trial report did not have any mention of funding (Galantino 2004; Jacobs 2004; Wattamwar 2013). We rated one study at high risk of bias because the trial was funded by a yoga research institution and college, the trial was carried out at the institution, and the authors were employees of the institution (Tekur 2008). All other studies were explicitly unfunded (Nambi 2014), or funded by charity (Tilbrook 2011), university (Cox 2010; Williams 2005), or government (Sherman 2005; Saper 2009; Williams 2009; Sherman 2011) sources, and we rated them at low risk of bias.

An additional potential source of bias in unblinded trials that may be related to performance and detection bias is treatment preference (McPherson 1997). If people who prefer to receive yoga consent to be randomized, some of them will receive the non-preferred treatment, and this may affect their willingness to continue in the study and comply with treatment. Treatment preference may also be related to expectations of treatment and may affect the participants' subjective interpretation of whether they are benefiting from the treatment. Therefore, it is possible that either through better compliance or through placebo or other psychological processes, participants in an unblinded trial who are allocated to a preferred treatment for which they have good expectations of benefit may experience better outcomes, particularly if those outcomes are self-assessed.

A first step in assessing the impact of expectations and treatment preference on treatment outcomes is to collect this information at baseline. Among the studies included in this review, three studies asked about treatment preference (Sherman 2005; Sherman 2011; Tilbrook 2011), and five studies assessed treatment expectations (Jacobs 2004; Sherman 2005; Williams 2009; Sherman 2011; Tilbrook 2011). However, only one study examined whether there was a relationship between expectations or treatment preference and outcomes (Tilbrook 2011). The authors reported that "the effect of treatment [on back-related function] did not vary by baseline intervention preference (P for interaction = 0.39)."

Individual studies have limited power to detect interactions between participant preferences and treatment. To address this limitation, researchers carried out an individual participant data meta-analysis of participant preferences among people in musculoskeletal trials (Preference Collaborative Review Group 2008). The meta-analysis did not show that participants allocated to non-preferred treatment were more likely to drop out. However, assessment of outcomes among 1398 participants in the trials did show that participants allocated to a preferred treatment had significantly better outcomes than participants who were indifferent to their treatment assignment, and non-significantly better outcomes than participants who were allocated to a non-preferred treatment (Preference Collaborative Review Group 2008). It appears that preferences and expectations may play a role in participant-reported outcomes, but further research on operationalizing preferences and expectations is necessary before the potential influence of these factors in outcomes can be understood (Tran 2015).

Based on low risk of bias for the areas of allocation, attrition bias, and other risk of bias, we classified three studies at a lower risk of bias when carrying out sensitivity analyses by risk of bias (Sherman 2005; Sherman 2011; Tilbrook 2011).

Effects of interventions

See: **Summary of findings for the main comparison** Yoga compared with non-exercise controls for chronic non-specific low back pain; **Summary of findings 2** Yoga compared with exercise controls for chronic non-specific low back pain; **Summary of findings 3** Yoga compared with exercise controls for chronic non-specific low back pain - brief and intensive residential intervention; **Summary of findings 4** Yoga plus exercise compared with exercise alone for chronic non-specific low back pain

We compared yoga to non-exercise controls (no treatment, a waiting list, usual care, or an educational intervention), yoga to exercise controls, and yoga as an add on treatment to an exercise intervention. See: Summary of findings for the main comparison; Summary of findings 2; Summary of findings 4.

Yoga compared to non-exercise controls

Three studies compared a yoga intervention to a waiting list (Galantino 2004; Jacobs 2004; Williams 2009); two studies compared a yoga intervention to a self-care book (Sherman 2005; Sherman 2011); three studies compared a yoga intervention plus a self-care book to a self-care book alone (Saper 2009; Cox 2010; Tilbrook 2011); and one study compared yoga plus newsletters, handouts, and lectures to newsletters, handouts, and lectures alone (Williams 2005). We analyzed these studies together (total 790 participants) because we believe that the yoga and control conditions are clinically comparable across studies.

Primary outcomes

Back-specific functional status

Nine trials examined the effect of yoga compared with non-exercise controls on back-related function (Galantino 2004; Jacobs 2004; Sherman 2005; Williams 2005; Saper 2009; Williams 2009; Cox 2010; Sherman 2011; Tilbrook 2011) (Analysis 1.1). There was low-certainty evidence that yoga was better than non-exercise controls at four to six weeks (SMD -0.45, 95% CI -0.71 to -0.19; I^2 = 0%; 5 studies, 256 participants; Analysis 1.1.1), three to four months (SMD -0.40, 95% CI -0.66 to -0.14; I^2 = 54%; 7 studies, 667 participants; Analysis 1.1.2), and 12 months (SMD -0.26, 95% CI -0.46 to -0.05; I^2 = 0%; 2 studies, 365 participants; Analysis 1.1.4), and moderate-certainty evidence that yoga is better at six months (SMD -0.44, 95% CI -0.66 to -0.22; I^2 = 34%;

6 studies, 630 participants; Analysis 1.1.3). The certainty of the evidence was downgraded at four to six weeks for risk of bias and imprecision, at three to four months for risk of bias and heterogeneity, at six months for risk of bias, and at 12 months for risk of bias and imprecision. When the overall results for back-related function at three to four months (SMD -0.40, 95% CI -0.66 to -0.14; I^2 = 54%; 7 studies, 667 participants; Analysis 1.1.2) were compared to a sensitivity analysis including only studies at lower risk of bias, the estimate of effect was slightly more beneficial and there was no heterogeneity (SMD -0.49, 95% CI -0.68 to -0.31; I^2 = 0%; 3 studies, 480 participants; Analysis 4.3.2), suggesting that the estimate of effect in the main analysis may be conservative. The effect size at each time point was low to moderate, as Cohen's effect size of 0.50 or larger is considered moderate.

Pain

Six trials examined the effect of yoga compared with non-exercise controls on pain (Jacobs 2004; Williams 2005; Saper 2009; Williams 2009; Cox 2010; Tilbrook 2011) (Analysis 1.2). At four to six weeks, three to four months, and six months, the effect of yoga on pain was statistically significant but did not meet the predefined criterion for clinical importance of 15 points on a 0 to 100 scale. There was very low-certainty evidence at four to six weeks (MD -10.83, 95% CI -20.85 to -0.81; I^2 = 0%; 2 studies, 40 participants; Analysis 1.2.1), moderate-certainty evidence at three to four months (MD -4.55, 95% CI -7.04 to -2.06; I^2 = 0%; 5 studies, 458 participants; Analysis 1.2.2), and low-certainty evidence at six months (MD -7.81, 95% CI -13.37 to -2.25; I^2 = 64%; 4 studies, 414 participants; Analysis 1.2.3). The certainty of the evidence was downgraded at four to six weeks for very serious risk of bias and imprecision, at three to four months for risk of bias, and at six months for risk of bias and inconsistency. There is very low-certainty evidence for no statistically or clinically significant difference in pain between yoga and non-exercise controls at 12 months (MD -5.40, 95% CI -14.50 to 3.70; I^2 = 79%; 2 studies, 355 participants; Analysis 1.2.4). The effect estimate at 12 months was rated as very-low-certainty evidence because of risk of bias, inconsistency, and imprecision.

Secondary outcomes

Clinical improvement

Compared to non-exercise controls, yoga participants were more than twice as likely to experience clinical improvement at four to six weeks (RR 2.62, 95% CI 1.22 to 5.67; I^2 = 0%; 2 studies, 141 participants; Analysis 1.3.1), three to four months (RR 3.18, 95% CI 1.86 to 5.44; I^2 = 0%; 3 studies, 168 participants; Analysis 1.3.2), and six months (RR 2.53, 95% CI 1.36 to 4.71; 1 study, 128 participants; Analysis 1.3.3). Each estimate was statistically significant; however, the evidence was low certainty because of risk of bias and imprecision. We found no studies that looked at clinical improvement at long term.

Quality of life

Evidence on physical quality of life, mental quality of life, and depression was limited and of low or very-low certainty due to risk of bias and imprecision. There was a small but statistically significant increase in physical quality of life at six months (SMD 0.26, 95% CI 0.01 to 0.50; 1 study, 259 participants; Analysis 1.4.3) that was rated low certainty for risk of bias and imprecision. A large and statistically significant decrease in depression at four to six weeks (SMD -1.23, 95% CI -2.39 to -0.06; 1 study, 16 participants; Analysis 1.6.1) was rated very-low certainty because of very serious risk of bias and imprecision. Low- to moderate-sized decreases in depression at six months (SMD -0.47, 95% CI -0.89 to -0.05; 1 study, 90 participants; Analysis 1.6.3) and 12 months (SMD -0.50, 95% CI -0.92 to -0.08; 1 study, 90 participants; Analysis 1.6.4) were statistically significant but rated low certainty because of risk of bias and imprecision. No other effects were statistically significant.

Work-related disability

We found no studies that looked at work-related disability.

Adverse events

One study reported "no adverse events due to yoga" but also reported that one yoga participant discontinued because yoga exacerbated low-back pain (Williams 2009). One study reported that a yoga participant who had a history of severe pain in response to physical activity developed severe back pain that was possibly or probably related to yoga (Tilbrook 2011). This study, and the remaining studies comparing yoga to non-exercise controls (Sherman 2005; Williams 2005; Saper 2009; Sherman 2011), reported several non-serious adverse events, primarily increased back pain. Some of the adverse events were explicitly described as either unrelated or perhaps related to yoga, but the relationship between adverse events and yoga was not consistently assessed. People practicing yoga had a greater risk of adverse events than people in the non-exercise groups (RD 0.05, 95% CI 0.02 to 0.08; I^2 = 7%; 6 trials, 696 participants; moderate-certainty evidence; Analysis 1.7). The certainty of evidence for this estimate was downgraded for risk of bias (lack of blinding).

Three studies did not report the presence or absence of adverse events (Galantino 2004; Jacobs 2004; Cox 2010).

Yoga compared to exercise controls

Four studies compared a yoga intervention to an exercise intervention (e.g. physical therapy) (Sherman 2005; Tekur 2008; Sherman 2011; Nambi 2014). The intervention in one study was four weeks

of weekly yoga classes (Nambi 2014), and the intervention in two studies was 12 weeks of weekly yoga classes (Sherman 2005; Sherman 2011). The yoga intervention in the fourth study was a one-week residential programme of daily yoga as part of a comprehensive back pain treatment programme (Tekur 2008). We analyzed Tekur 2008 separately because of the brief duration, residential setting, and high intensity of the study interventions (see 'Yoga compared to exercise controls - brief and intensive residential intervention').

Primary outcomes

Back-specific functional status

Two studies examined the effect of yoga compared with exercise on back-related function (Sherman 2005; Sherman 2011) (Analysis 2.1). There was very low-certainty evidence showing little or no difference between yoga and exercise at six weeks (SMD -0.02, 95% CI -0.41 to 0.37; I^2 = 50%; 2 studies, 248 participants; Analysis 2.1.1), three months (SMD -0.22, 95% CI -0.65 to 0.20; I^2 = 57%; 2 studies, 249 participants; Analysis 2.1.2), and six months (SMD -0.20, 95% CI -0.59 to 0.19; I^2 = 50%; 2 studies, 249 participants; Analysis 2.1.3). The certainty of the evidence was downgraded at each time point for risk of bias, imprecision, and inconsistency that could not be explained. We found no studies that looked at back-specific function at long term.

Pain

One study examined the effect of yoga compared with exercise on pain (Nambi 2014) (Analysis 2.2). Although the reported effect of yoga on pain was clinically and statistically significant at four weeks (MD -15.00, 95% CI -19.90 to -10.10; 1 study, 54 participants; Analysis 2.2.1) and seven months (MD -20.40, 95% CI -25.48 to -15.32; 1 study, 54 participants; Analysis 2.2.2), the evidence was downgraded to very-low-certainty because of very serious risk of bias and imprecision. We found no studies that looked at pain at long term.

Secondary outcomes

Clinical improvement

One study compared clinical improvement with yoga versus exercise (Sherman 2011). There was very-low-certainty evidence for little or no effect of yoga on clinical improvement at six weeks (RR 1.02, 95% CI 0.67 to 1.57; 1 study, 164 participants; Analysis 2.3.1) and three months (RR 1.30, 95% CI 0.96 to 1.75; 1 study, 162 participants; Analysis 2.3.2), and low-certainty evidence at six months (RR 0.99, 95% CI 0.73 to 1.33; 1 study, 163 participants; Analysis 2.3.3). The certainty of evidence at six weeks and three months was downgraded for risk of bias and serious imprecision, and the certainty of the evidence at six months was downgraded for risk of bias and imprecision. We found no studies that looked at clinical improvement at long term.

Quality of life

One study looked at physical and mental quality of life at four weeks and seven months (Nambi 2014) (Analysis 2.4; Analysis 2.5). Although the reported effect of yoga on physical quality of life was large and statistically significant at four weeks (SMD 1.68, 95% CI 1.06 to 2.31; 1 study, 54 participants; Analysis 2.4.1) and seven months (SMD 1.34, 95% CI 0.75 to 1.94; 1 study, 54 participants; Analysis 2.4.2), as was the improvement in mental quality of life at four weeks (SMD 0.79, 95% CI 0.24 to 1.35; 1 study, 54 participants; Analysis 2.5.1) and seven months (SMD 1.33, 95% CI 0.74 to 1.92; 1 study, 54 participants; Analysis 2.5.2), the evidence for each comparison was downgraded to very-low certainty because of very serious risk of bias and imprecision. We fund no studies that looked at depression.

Work-related disability

We found no studies that looked at work-related disability.

Adverse events

One study mentioned that one person withdrew from the yoga group due to a herniated disc, and two people withdrew from the yoga group due to fears that yoga would aggravate symptomatic osteoarthritis (Nambi 2014). One study described one yoga participant as discontinuing yoga because some postures precipitated migraine headache (Sherman 2005), and one study described several mild or moderate adverse events, primarily increased back pain, in both the exercise and yoga groups (Sherman 2011). There was low-certainty evidence that there may be little to no difference in risk of adverse events between people practicing yoga and people practicing other exercise treatments (RD 0.01, 95% CI 0.04 to 0.06; I^2 = 0%; 3 trials, 314 participants; Analysis 2.6). The certainty of the evidence was downgraded for risk of bias and imprecision.

Yoga compared to exercise controls - brief and intensive residential intervention

Primary outcomes

Back-specific functional status

One trial compared the effects of brief and intensive yoga and exercise interventions on back-related function (Tekur 2008). Although the effect of yoga on back-related function at one week was large and statistically significant, the certainty of the evidence was downgraded to very low because of serious risk of bias and imprecision (SMD -1.25, 95% CI -1.73 to -0.77; 1 study, 80 participants; Analysis 2.1.4). There was no information on outcomes beyond the end of the study at one week.

Pain

One trial compared the effects of brief and intensive yoga and exercise interventions on pain (Tekur 2008). Although the effect of yoga on pain at one week was large and statistically significant, the certainty of the evidence for both effects was downgraded to very low because of serious risk of bias and imprecision (MD -14.50, 95% -22.92 to -6.08; 1 study, 80 participants; Analysis 2.2.3). There was no information on outcomes beyond the end of the study at one week.

Secondary outcomes

Clinical improvement

Tekur 2008 did not report clinical improvement.

Quality of life

Although the effect of yoga was large and statistically significant for both physical quality of life (SMD 1.06, 95% CI 0.59 to 1.53; 1 study, 80 participants; Analysis 2.4.3) and mental quality of life (SMD 0.87, 95% CI 0.41 to 1.33; 1 study, 80 participants, Analysis 2.5.3) in Tekur 2008, the certainty of the evidence for both effects was downgraded to very low because of very serious risk of bias and imprecision. There was no information on clinical improvement, depression, or work-related disability.

Work-related disability

Tekur 2008 did not report work-related disability.

Adverse events

Tekur 2008 reported that there were no adverse events in either intervention group.

Yoga as an add-on intervention to an exercise intervention

One study compared yoga plus exercise to exercise alone (Wattamwar 2013). The study compared three weekly occupational therapy classes (characterized as back school therapy and mat and exercise ball exercises) to two weekly occupational therapy classes and one weekly yoga class. We analyzed this study (24 participants) separately from the other yoga and exercise comparisons because the combination of yoga and occupational therapy was unlike any of the other yoga comparisons with exercise, in which only yoga was provided to the intervention group and the non-yoga exercise was only provided to the comparison group.

Primary outcomes

Back-specific functional status

There was no statistically significant benefit for back-specific function at 10 weeks (SMD -0.60, 95% CI -1.42 to 0.22; 1 study, 24 participants; Analysis 3.1). The certainty of the evidence was downgraded to very low for very serious risk of bias and imprecision. There was no information on outcomes beyond the end of the study at 10 weeks.

Pain

There was no statistically significant benefit for pain at 10 weeks (MD -3.20, 95% CI -13.76 to 7.36; 1 study, 24 participants; Analysis 3.2). The certainty of the evidence was downgraded to very low for very serious risk of bias and imprecision. There was no information on outcomes beyond the end of the study at 10 weeks.

Secondary outcomes

Clinical improvement

Wattamwar 2013 did not report clinical improvement.

Quality of life

Wattamwar 2013 did not report quality of life.

Work-related disability

Wattamwar 2013 did not report work-related disability.

Adverse events

Wattamwar 2013 did not report adverse events.

Subgroup and sensitivity analyses

Our sensitivity analyses based on complete cases either did not result in differences from our primary analyses or resulted in increased benefits of yoga, which is consistent with participants who benefit from yoga remaining in treatment and available for follow-up (Analysis 4.1; Analysis 4.5; Analysis 4.12; Analysis 5.1).

Our sensitivity analyses by change scores did not reveal any marked differences from our primary analyses (Analysis 4.2; Analysis 4.6; Analysis 4.9; Analysis 4.11; Analysis 4.13).

Sensitivity analysis restricting included studies to those at lower risk of bias did not reveal any marked differences between analyses including and excluding studies at higher risk of bias, with two exceptions (Sherman 2005; Sherman 2011; Tilbrook 2011) (Analysis 4.3; Analysis 4.7; Analysis 4.10). In the comparison of yoga and non-exercise controls, analyses of pain at intermediate term (Analysis 1.2.3) and long term (Analysis 1.2.4) showed markedly lower effect estimates when included studies were restricted to those at low risk of bias (intermediate term: Analysis 4.6.3, long term: Analysis 4.6.4). This may be due to the longer duration of yoga treatment in the trials deemed to be higher risk of bias (Williams 2005; Williams 2009), reflecting that the benefits of 16 or 24 weeks of treatment are greater at six or 12 months after randomization than are any benefits of 12 weeks of treatment. Otherwise, the effect estimates in the sensitivity analyses were similar, indicating that the overall results for analyses including a mix of studies at higher and lower risk of bias are robust to influence from study risk of bias.

A sensitivity analysis of back-related function using generic inverse variance was consistent with endpoint analyses for back-related function, with one exception (Analysis 4.4; Analysis 5.2). In the comparison of yoga and exercise controls, the endpoint analysis of back-related function at short term (Analysis 2.1.1) included two trials (Sherman 2005; Sherman 2011), but it was not possible to include data from one of those trials in the generic inverse variance analysis (Sherman 2005) (Analysis 5.2.1). Therefore, the analyses were not comparable.

Sensitivity analyses of pain outcomes using SMDs (Analysis 4.8; Analysis 5.3; Analysis 6.1) were broadly consistent with analyses using MDs of pain outcomes rescaled to a 100-point scale and compared to a minimum clinically important reduction of 15 points on that scale. In analyses with I^2 values above zero, the I^2 statistic was slightly higher when the MD was used, but there was no difference in statistical significance between the MD and the SMD. When MDs were at an absolute value of 10.83 or less, the absolute values of the SMDs ranged from 0.65 to 0.23. When MDs were at an absolute value of 14.50 or more, the absolute values of the SMDs ranged from 0.75 to 2.14. The cutoff point of 15 for clinical significance therefore appears at the border of a large effect size according to Cohen's (SMD 0.8 or greater).

A subgroup analysis by SES status of trial participants reveal no systematic differences between trials in higher and lower SES status populations (Analysis 4.14). Outcomes were positive in all studies, and it was not possible to determine whether the lack of statistical significance for outcomes in the low SES trial was due to the small sample size in that trial, to different effects of yoga in low SES populations, or to chance.

ADDITIONAL SUMMARY OF FINDINGS [*Explanation*]

Yoga compared with exercise controls for chronic non-specific low back pain

Patient or population: adults with chronic non-specific low back pain
Settings: mix of participants seeking medical care and participants in the community
Intervention: yoga
Comparison: exercise controls

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Non-exercise control	Yoga				
Back-specific function at short term (6 weeks) Roland-Morris Disability Questionnaire. Lower scores mean better function	The baseline mean for the most representative included study (Sherman 2011) was **8.6 (SD 4.0)**	The mean back-specific function in the intervention group was **0.11 units lower** (1.71 lower to 1.50 higher) than in the control group	Not applicable	248 participants (2 studies)	⊕◯◯◯ **Very low**[1,2,3]	Corresponding risk estimated using SMD of -0.02 (95% CI -0.41 to 0.37)
Back-specific function at intermediate term (3 months) Roland-Morris Disability Questionnaire. Lower scores mean better function	The baseline mean for the most representative included study (Sherman 2011) was **8.6 (SD 4.0)***	The mean back-specific function in the intervention groups was **0.99 units lower** (2.87 lower to 0.90 higher) than in the control group	Not applicable	249 participants (2 studies)	⊕◯◯◯ **Very low**[1,2,3]	Corresponding risk estimated using SMD of -0.22 (95% CI -0.65 to 0.20).
Back-specific function at intermediate term (6 months) Roland-Morris Disability Questionnaire. Lower scores	The baseline mean for the most representative included study (Sherman 2011) was **8.6 (SD 4.0)***	The mean back-specific function in the intervention groups was **0.90 units lower** (2.61 lower to 0.81 higher) than in the control	Not applicable	249 participants (2 studies)	⊕◯◯◯ **Very low**[1,2,3]	Corresponding risk estimated using SMD of -0.20 (95% CI -0.59 to 0.19)

mean better function		group				
Pain at short term (4 weeks) VAS 10-cm scale, which was translated to a 0 to 100 scale in which lower scores mean less pain	The baseline mean for the included study (Nambi 2014) was **67.3 (SD 9.0)**	The mean pain in the intervention groups was **15.00 units lower** (19.90 to 10.10 lower) than in the control group	Not applicable	54 participants (1 study)	⊕◯◯◯ **Very low**[1,2,4]	-
Pain at short-intermediate term (3 to 4 months)	-	-	-	-	-	Not reported in any study.
Pain at intermediate term (7 months) VAS 10-cm scale, which was translated to a 0 to 100 scale in which lower scores mean less pain	The baseline mean for the included study (Nambi 2014) was **67.3 (SD 9.0)**	The mean pain in the intervention groups was **20.40 units lower** (25.48 to 15.32 lower) than in the control group	Not applicable	54 participants (1 study)	⊕◯◯◯ **Very low**[1,2,4]	-
Adverse events Participants were followed 6 to 12 months.	**Study population**		**RD 1%** (-4% to 6%)	314 participants (3 studies)	⊕⊕◯◯ **Low**[1,2]	Yoga and exercise participants had a similar risk of an adverse event
	90 per 1000	**100 per 1000** (60 to 160)				

*The assumed risk is the baseline mean in the control group. When there was more than one study, we chose the baseline control group mean from the study that is a combination of the most representative study population and has the largest weighting in the overall result in Review Manager 5 (RevMan 2014). For back-specific function at short and intermediate term, this is Sherman 2011.
CI: confidence interval; **RD:** risk difference; **RR:** risk ratio; **SD:** standard deviation; **SMD:** standardized mean difference; **VAS:** visual analogue scale.

GRADE Working Group grades of evidence
High certainty: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate certainty: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low certainty: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low certainty: We are very uncertain about the estimate.

[1] Downgraded one level for risk of bias (there was no blinding of participants or providers, and outcome was self-assessed by participants).

[2] Downgraded one level for imprecision (< 400 participants or CI included both a null effect and either appreciable benefit or appreciable harm).

[3] Downgraded one level for heterogeneity (I^2 > 50%) that could not be explained.

[4] Downgraded one additional level for risk of bias because the analysis relied entirely on a single study (Nambi 2014) with serious risks of bias in addition to lack of blinding.

Yoga compared with exercise controls for chronic non-specific low back pain - brief and intensive residential intervention

Patient or population: adults with chronic non-specific low back pain
Settings: residential holistic health centre
Intervention: yoga in an intensive integrated physical, mental, and physiological yoga programme
Comparison: exercise and education in an intensive programme with no yoga components

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Non-exercise control	Yoga				
Back-specific function at very short term (1 week) Oswestry Low Back Pain Questionnaire. Lower scores mean better function	The baseline mean for the included study (Tekur 2008) was **38.9 (SD 13.27)**	The mean back-specific function in the intervention group was **17.05 units lower** (22.96 to 11.14 lower) than in the control group	Not applicable	80 participants (1 study)	⊕◯◯◯ **Very low**[1,2]	Risk in yoga group corresponded to an SMD of -1.25 (95% CI -1.73 to -0.77)
Pain at very short term (1 week) VAS 10-cm scale, which was translated to a 0 to 100 scale in which lower scores mean less pain	The baseline mean for the included study (Tekur 2008) was **58.8 (SD 21.5)**	The mean pain in the intervention groups was **14.50 units lower** (22.92 to 6.08 lower) than in the control group	Not applicable	80 participants (1 study)	⊕◯◯◯ **Very low**[1,2]	-
Adverse events	-		-	-	-	The study reported that there were no adverse events in either group

*The assumed risk is the baseline mean in the control group.
CI: confidence interval; **SD:** standard deviation; **SMD:** standardised mean difference; **VAS:** visual analogue scale

GRADE Working Group grades of evidence
High certainty: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate certainty: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low certainty: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low certainty: We are very uncertain about the estimate.

[1] Downgraded two levels for risk of bias (one level for no blinding of participants or providers, and outcome was self-assessed by participants, and one level for risk of bias from funding).
[2] Downgraded one level for imprecision (< 400 participants or CI included a null and an important effect).

Yoga plus exercise compared with exercise alone for chronic non-specific low back pain

Patient or population: adults with chronic non-specific low back pain
Settings: occupational therapy centre
Intervention: yoga + exercise
Comparison: exercise alone (back school)

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Non-exercise control	Yoga				
Back-specific function at short-intermediate term (10 weeks) Oswestry Low Back Pain Questionnaire. Lower scores mean better function	The baseline mean for the included study (Wattamwar 2013) was not reported	The mean back-specific function in the intervention group was **3.68 units lower** (8.44 lower to 1.08 higher) than in the control group	Not applicable	24 participants (1 study)	⊕◯◯◯ **Very low**[1,2]	Risk in yoga group corresponded to an SMD of -0.60 (95% CI -1.42 to 0.22)
Pain at short-intermediate term (10 weeks) Oswestry Disability Index Pain item (range 0 to 5), and it was transformed to a 0 to 100 scale in which lower scores mean less pain	The baseline mean for the included study (Wattamwar 2013) was not reported	The mean pain in the intervention groups was **3.20 units lower** (13.76 lower to 7.36 higher) than in the control group	Not applicable	24 participants (1 study)	⊕◯◯◯ **Very low**[1,2]	-
Adverse events	-		-	-	-	The study did not look at adverse events.

*The assumed risk is the baseline mean in the control group.
CI: confidence interval.

GRADE Working Group grades of evidence
High certainty: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate certainty: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low certainty: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low certainty: We are very uncertain about the estimate.

[1] Downgraded two levels for risk of bias (one level for no blinding of participants or providers, and outcome was self-assessed by participants, and one level for unclear or high risk of bias for all assessments other than attrition and timing of outcome measurement).
[2] Downgraded one level for imprecision (< 400 participants or CI included a null and an important effect).

DISCUSSION

Summary of main results

Yoga compared to non-exercise controls

We found evidence that yoga results in a small-to-moderate improvement in back-related function at short, short-to-intermediate, intermediate, and long term. The evidence was of moderate certainty at intermediate term, but it was of low certainty at earlier and later time points. We also found evidence that yoga may result in small improvements in pain at short, short-to-intermediate, intermediate, and long term. The evidence on pain was of moderate certainty at short-to-intermediate term, but low certainty at intermediate term, and very-low certainty at short and long term. Differences in pain were not clinically significant at any time point. We found low-certainty evidence that overall clinical improvement was more than twice as likely with yoga, but there was very sparse evidence on mental and physical quality of life or depression. There was moderate-certainty evidence that adverse events, primarily exacerbation of back pain, were more common in yoga than in non-exercise control groups, although not all studies reported assessing adverse events. Yoga was not associated with serious adverse events.

Yoga compared to exercise controls

There may be little or no difference between yoga and non-yoga exercise with regard to back-related function at short, short-to-intermediate, and intermediate term. The available evidence was of very-low certainty because of risk of bias, inconsistency, and imprecision. We found one study reporting clinically and statistically significant benefits for pain with yoga at intermediate term, but the evidence on pain was very-low certainty because of serious risk of bias and imprecision. The evidence on the comparison between yoga and non-yoga exercise was sparse overall, and we found no studies that looked at back-related function or pain at long term. We found little information on overall clinical improvement or quality of life. There was low-certainty evidence that the risk of adverse events in yoga and non-yoga exercise groups was similar, although not all studies assessed adverse events. No serious adverse events were reported.

One small study (80 participants) compared an intensive one-week residential yoga programme to an intensive one-week residential exercise programme, and found a large improvement in back-related function and pain for yoga compared to non-yoga at the end of treatment (Tekur 2008). However, the certainty of evidence on this comparison was very low due to serious risk of bias and imprecision.

Yoga as an add-on intervention to an exercise intervention

For yoga added to exercise compared to exercise alone, we found one very small study (24 participants) that compared yoga plus occupational therapy to occupational therapy alone for 10 weeks (Wattamwar 2013). The evidence is very low certainty due to serious risk of bias and imprecision, and we are uncertain about the effects of yoga added to exercise. There was no mention of other outcomes or adverse events and no follow-up of participants beyond the 10 weeks of the intervention.

Overall completeness and applicability of evidence

The trials included in this review were carried out in the US, India, and the UK, with a mix of primary care and community participants. The type of yoga was primarily Iyengar and some other mixed Hatha yoga practices, and the yoga interventions were specifically designed for people with low-back pain. The instructors had a range of yoga training backgrounds and experience with people with low-back pain. The results of this review could be generalized across multiple Hatha yoga practices and sources of participants (primary care or community), however there is little or no trial evidence from low SES populations, older populations, or populations with serious comorbidities. We found inconsistent reporting of adverse events, with some studies not mentioning safety outcomes, which makes it difficult to assess the balance of benefits and harms for the practice of yoga. It should be noted that the yoga interventions were designed specifically for people with low-back pain and classes were supervised by instructors with good levels of training, and therefore this evidence of benefit and lack of serious harms would not necessarily apply to all yoga practices or to yoga undertaken without trained guidance.

Quality of the evidence

None of the included studies blinded participants or providers to treatment assignment, and all outcomes were self-reported. Therefore, all studies were at high risk of performance and detection bias, and we judged none of the evidence of 'high' certainty. Some comparisons between yoga and we judged non-exercise controls for back-related function and pain produced estimates of moderate certainty. However, most outcomes were downgraded for imprecision (few participants) and some were downgraded for inconsistency (heterogeneity between studies), and therefore most comparisons between yoga and non-exercise controls were of low or very low certainty.

The number of studies on yoga versus exercise controls was small and some studies had serious risks of bias, and the evidence for this comparison was therefore of low or very low certainty due to imprecision and risk of bias. There was only one study on yoga

as an add-on intervention to an exercise intervention, and the certainty of the evidence for this comparison was very low because of very serious risk of bias and imprecision.

Although some heterogeneity was expected, many analyses displayed unexplained heterogeneity that required downgrading the evidence. Potential sources of heterogeneity, including the characteristics of the yoga and control interventions, and the duration of treatment and follow-up, were difficult to explore through subgroup analysis because of the complex patterns of variation between the trials. We had planned to compare yoga interventions with and without a mind component but found no interventions clearly carried out without a mind component. Although the style of yoga was most frequently characterized as Iyengar, most yoga interventions were specially modified or developed for the trials and we could not identify patterns of yoga postures to use for subgrouping. It should be noted that research indicates that randomized trials of yoga with different yoga styles do not differ in their odds of reaching positive conclusions (Cramer 2016b). Regarding the intensity of the yoga intervention, most studies provided weekly yoga classes, and we analysed separately the yoga trial that was very intensive and provided daily yoga. We considered subgroup analyses by type of non-exercise intervention, but found this difficult because, with the exception of Galantino 2004 for short -term outcomes and Williams 2005 for longer-term outcomes, all non-exercise control groups were provided with educational materials, which were not always well-described. Furthermore, in some trials (e.g. Jacobs 2004; Saper 2009), the intervention group also received educational materials, while in other trials they did not. Finally, seven trials reported outcomes at long-term follow-up after the end of yoga classes: three months after treatment (Sherman 2005; Williams 2005; Saper 2009; Sherman 2011), six months after treatment (Williams 2009; Nambi 2014), and nine months after treatment (Tilbrook 2011). In all but one trial (Williams 2009), all outcomes at intermediate term were measured in participants who were no longer on treatment. Although it is possible that effects of interventions would decrease with increasing time off treatment, and we hypothesized that this was one reason for observing a smaller effect size for pain at six months in higher-certainty studies that also had shorter treatment durations, we did not observe the same relationship for back-related function. It was not possible to separate the issue of treatment duration and study quality, and we also could not discern any general relationship between effect size and time after end of treatment.

Potential biases in the review process

We did not examine comparisons for publication bias using funnel plots because no comparison had the required minimum of 10 studies. Although we carried out extensive searches for studies, and contacted authors of identified studies to obtain unpublished information as well as clarifications of published data, we cannot rule out the possibility of publication bias. Specifically, we found one study that may have been completed over two years ago, but for which we were unable to find any usable results (Saper 2015). We cannot rule out the possibility that this and additional studies that are unknown to us have not been published and that their results might be less positive than the results we found in published studies. We also note that the three studies carried out in India were at high risk of bias, and that Indian trials of yoga have been found to be more positive than non-Indian trials (Cramer 2015a).

Agreements and disagreements with other studies or reviews

Despite some differences in specific included studies, outcomes assessed, and choices of outcome time points, our findings are in broad agreement with other reviews of yoga treatment for low back pain (Posadzki 2011; Cramer 2013; Hill 2013; Holtzman 2013; Ward 2013; Crow 2015). Yoga appears to be more effective than non-exercise interventions and either as effective or slightly more effective than non-yoga exercise interventions. This review agrees with previous reviews in finding that the evidence for comparisons with non-exercise controls is clearer and the benefits of yoga are larger, while any advantage of yoga over non-yoga exercise is relatively uncertain.

Although RCTs are not good sources of information on rare adverse events, our review was also consistent with a previous systematic review of the safety of yoga in finding that yoga results in more adverse events than psychological or educational interventions but the same number of adverse events as non-yoga exercise (Cramer 2015b).

AUTHORS' CONCLUSIONS

Implications for practice

We found moderate-certainty evidence that yoga is more effective than non-exercise controls for back-related functioning at intermediate term (six months) and for pain at short-to-intermediate term (three to four months). We found low to very low-certainty evidence that yoga may be more effective for back-related function and pain at other time points. Differences for pain were not clinically significant at any time point, and differences for back function were small to moderate. It is uncertain whether yoga might be more effective than other exercises for back-related functioning or pain. It appears that yoga is not associated with serious adverse events. If yoga is more effective than a non-exercise intervention, and as effective as other exercise interventions, the choice to use yoga may depend on availability, cost, and participant or provider preference. All yoga interventions that were tested were specifically designed for treatment of low back pain, and were provided by experienced teachers, factors which may be related to both effectiveness and safety. This review does not include studies comparing

different types or doses of yoga, and does not provide information on particular types or regimens of yoga practice.

Implications for research

There is a need for additional research testing yoga versus non-exercise controls to improve the confidence in the estimates of effect. Current trials provide relatively little information on the effects of yoga on pain, and on outcomes at long term. Also, most trials testing yoga versus non-exercise controls have been carried out in well-educated, middle and upper socioeconomic status (SES) populations in the US or UK. Therefore, there is a need for further trials in a range of populations, including low SES populations, older people, and populations with comorbidities. One of the studies awaiting classification was carried out in a low SES population (Saper 2015), and one was carried out in older people (NCT01303588). Additional studies carried out in Europe, India, and East Asia might test the relevance of yoga in populations in different healthcare settings and with different approaches to yoga. Finally, there is limited evidence on the comparative effects of yoga and non-yoga exercise regimens, and additional high-certainty studies testing yoga versus non-yoga exercise would be useful in clarifying the comparative benefits of these therapies, what elements of yoga might be of most benefit, and what types of people might be most suited to using yoga to manage back pain. These studies should be of low risk of bias and should include reporting on adverse events. Trials should also include measurement of depression and quality of life, to investigate whether the mind component of yoga is effective in improving these patient-important outcomes, and should include long-term follow-up to demonstrate whether yoga is likely to be acceptable and effective in usual clinical practice. There is also a need for additional methodological research in this field, particularly into the potential influence of people's preferences and expectations on outcomes within randomized trials of yoga.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Cox 2010

Methods	Randomized controlled parallel-group trial
Participants	20 participants with low-back pain Settings: trial run from 1 primary care practice. Location of yoga intervention delivery not described Country: England Recruitment: GP records from a single practice. Inclusion criteria: men and women aged 18 to 65 years, visiting GP in the previous 18 months for low-back pain, a score of $\geq$ 4 on the Roland-Morris Disability scale, available to attend yoga classes, possess sufficient physical mobility to participate in the intervention Exclusion criteria: pregnancy, psychosis or recent substance abuse, already participating in yoga, already in a trial for low-back pain, not currently experiencing an episode of low-back pain, previous spinal surgery, or clinical indications of serious spinal or neurological pathology
Interventions	**Yoga group:** 12 weekly 75-min Iyengar yoga classes including relaxation and pain-relieving postures, and poses to improve posture, flexibility, strength, and mobility. Each class had a primary theme (e.g. Sukkha - relaxation and comfort) Home practice: "Yoga students were each given a yoga manual and yoga mat, weekly practice handouts and encouraged to practice yoga at home, as well as taught to have better awareness of posture, movement and correct breathing." The frequency and duration of suggested home practice was not described **Back Book group:** control group received a booklet with advice on how to manage low-back pain (*The Back Book*. London: The Stationery Office; 2007) and continued their usual care Common interventions: both the Back Book and the Yoga group received the booklet and usual care Cointerventions: no mention of included or excluded cointerventions Duration and follow-up: interventions were provided for 12 weeks and follow-up ended directly after the end of the intervention
Outcomes	Back-specific function (Roland-Morris Disability Questionnaire) reported at 4 and 12 weeks Back pain (Aberdeen Back Pain Scale) reported at 4 and 12 weeks Quality of life - mental (SF-12 Mental Component score) reported at 4 and 12 weeks Quality of life - physical (SF-12 Physical Component score) reported at 4 and 12 weeks Clinical improvement (number of participants reporting no low-back pain) reported at 4 and 12 weeks Other outcomes collected: EQ-5D health index, Pain Self-Efficacy Questionnaire, number of days spent in bed due to low-back pain, number of days with restricted activity attributed to low-back pain, and whether medication was used for low-back pain over the previous 4 weeks

Cox 2010 (*Continued*)

Notes	Adverse events: no discussion of safety or adverse events. Measurement of expectations or treatment preferences at baseline: none Unpublished data: Dr Holger Cramer sent LSW standard deviations for the change values, data previously obtained from Dr Helen Tilbrook, on 26 November. Dr Catherine Hewitt sent endpoint data to LSW on 9 March 2016 Funding: university. "This study was funded by York Trials Unit, Department of Health Sciences, University of York."

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Used computer-generated random numbers to randomize participants
Allocation concealment (selection bias)	Low risk	Randomization carried out by an independent data manager.
Blinding of participants	High risk	No blinding as compared with usual care alone; outcomes based on self-assessment
Blinding of personnel/providers	High risk	No blinding of personnel/providers.
Blinding of outcome assessors	High risk	Self-reported outcomes were collected by mail from the participants, who were not blinded
Incomplete outcome data (attrition bias) All outcomes	High risk	Attrition > 30% in yoga group and it was unclear how missing data were handled
Selective reporting (reporting bias)	High risk	Outcome not mentioned in methods was reported in results (current low back pain) and outcome mentioned in methods was not reported in results (days spent in bed). No protocol available
Group similarity at baseline	High risk	Usual care group were older and had longer duration of back pain
Cointerventions	Unclear risk	Not possible to assess; usual care not defined.
Compliance	High risk	"Of the ten patients allocated to receive yoga, five (50%) did not attend any one session. ... Two patients attended two sessions, two patients attended four sessions and one patient attended five sessions"

Cox 2010 (*Continued*)

ITT analysis	Low risk	Authors state ITT analysis was done.
Timing of outcome assessments	Low risk	Outcome assessment at set points.
Other bias	Low risk	Funded by university.

Galantino 2004

Methods	Randomized controlled parallel-group trial
Participants	22 participants with chronic low-back pain Settings: setting for trial and location of yoga intervention delivery not described Country: USA Recruitment: self-referral through newspaper advertisements and referral through health-care practitioners Inclusion criteria: men and women aged 30 to 65 years with back pain for > 6 months and > 2 previous conservative medical interventions (physical therapy and chiropractic) without prolonged relief Exclusion criteria: current history of chronic systemic disease, previous yoga experience, changes in pain medication during the past 14 days
Interventions	**Yoga group:** formal 1-hour Hatha yoga class was held twice per week for 6 weeks Home practice: suggested 1 hour per day but this was not mandated or monitored **Control group:** "no treatment during the observation period." Common interventions: usual care continued for both groups. Cointerventions: changes in pain medication were not allowed during the study Duration and follow-up: interventions were provided for 6 weeks and there was an additional follow-up at 3 months for yoga participants only
Outcomes	Back-specific function (Oswestry Disability Index) reported at 6 weeks Depression (Beck Depression Inventory) reported at 6 weeks. Other outcomes collected: Sit and Reach Test and Functional Reach Test
Notes	Adverse events: no discussion of safety or adverse events. Measurement of expectations or treatment preferences at baseline: none Funding: not reported.

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Used random numbers to generate sequence.
Allocation concealment (selection bias)	Unclear risk	No details reported in publication.

Galantino 2004 (*Continued*)

Blinding of participants	High risk	No blinding as control participants received no treatment; outcomes based on self-assessment
Blinding of personnel/providers	High risk	No blinding.
Blinding of outcome assessors	High risk	Participants were not blinded and self-reported the outcomes. No mention of blinding of those who collected the information on outcomes from the participants
Incomplete outcome data (attrition bias) All outcomes	High risk	Attrition > 30% in control group. 6/11 control group participants had missing outcomes and were treated as 'failures' in a dichotomous analysis
Selective reporting (reporting bias)	Unclear risk	No protocol available.
Group similarity at baseline	High risk	Beck Depression Inventory substantially higher in control group
Cointerventions	Unclear risk	Not possible to assess; recorded by participants but not reported
Compliance	Unclear risk	No information on class attendance.
ITT analysis	Low risk	ITT analysis was stated.
Timing of outcome assessments	Low risk	Outcome assessments at a set point.
Other bias	Unclear risk	Funding not reported.

Jacobs 2004

Methods	Randomized controlled parallel-group trial
Participants	52 participants with chronic non-specific low-back pain Settings: setting for trial and location of yoga intervention delivery not described Country: USA Recruitment: self-referral through flyers and posters in inner-city primary care clinics and advertisements in newsletters for university and medical employees, and healthcare practitioner referrals from clinic conferences of large inner-city clinics Inclusion criteria: men and women aged 18 to 65 years who had made ≥ 3 visits to a health provider for non-specific mechanical low-back pain in the previous 12 months, have had pain symptoms for ≥ 6 months and score ≥ 3 out of 10 on the Visual Analogue Pain Scale for pain over the past week Exclusion criteria: back pain secondary to malignancy, infectious disease, inflammatory

	spondyloarthropathies, vertebral fracture or dislocation, acute radicular syndrome, or severe neurological signs, systemic or visceral causes of pain, any severe concurrent illness, pregnancy, back-related compensation or litigation, history of back surgery, regular participation (> 1/week) in Iyengar yoga for the past 3 months, plans to move out of the study region within the next 9 months, life expectancy of ≤ 9 months
Interventions	**Yoga group:** 90-min Iyengar yoga classes held twice a week for 12 weeks. "[The yoga intervention consists of] a pre-defined set of postures from which the yoga teacher may select individual poses in varying sequences for each of the 23 yoga classes." "Twenty-eight asanas (postures) were selected, including mandatory poses to be practiced daily." Home practice: prescribed for 30 min on 5 days/week. Participants were provided an illustrated pamphlet explaining the poses and "a yoga mat, block, belts, and blankets for their home-based practice." **Control group:** waiting list and received a "back pain educational booklet" not otherwise specified Common interventions: usual care continued for both groups. Cointerventions: no mention of permitted or restricted cointerventions Duration and follow-up: interventions were provided for 12 weeks and there was an additional follow-up at 6 months
Outcomes	Back-specific function (Roland-Morris Disability Questionnaire) reported at 3 months (unpublished data) Back-specific function (Oswestry Disability Index) reported at 3 months (unpublished data) Pain Depression (CES-Depression) reported at 3 months (unpublished data) Quality of life - mental (SF-36 Emotional Well-Being) reported at 3 months (unpublished data) Quality of life - physical (SF-36 Physical Functioning) reported at 3 months (unpublished data) Other outcomes collected (unpublished data): bothersomeness of back pain during past 4 weeks, mean low-back pain over the past 4 weeks, worst back pain over last 4 weeks, best back pain over last 4 weeks, insomnia, PANAS-PA, PANAS-NA, STAIS, STAIT, SF-36 Physical Role Limitations, SF-36 Emotional Role Limitations, SF-36 Energy/Fatigue, SF-36 Social Functioning, SF-36 Pain, SF-36 General Health, biological markers, healthcare utilization, drug usage
Notes	Adverse events: no discussion of safety or adverse events. Measurement of expectations or treatment preferences at baseline: "To better ascertain how clinical response is modulated by baseline expectation, we ascertained baseline expectation of improvement from yoga and found no differences between groups [at baseline] (Table 3)." Unpublished data: Dr Michael Acree e-mailed a spreadsheet of endpoint data for completers to LSW on 27 April 2015 Funding: not reported.

Risk of bias

Bias	Authors' judgement	Support for judgement

Jacobs 2004 (*Continued*)

Random sequence generation (selection bias)	Low risk	Used random number generator.
Allocation concealment (selection bias)	Low risk	Allocation by co-ordinator according to a pre-established randomization list
Blinding of participants	High risk	No blinding as waiting list control used; outcomes based on self-assessment
Blinding of personnel/providers	High risk	No blinding.
Blinding of outcome assessors	High risk	Participants were not blinded and self-reported the outcomes. No mention of blinding of those who collected the information on outcomes from the participants
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Total attrition 16% and only completers analysis was done. Reasons for attrition not given although attrition was similar across intervention groups
Selective reporting (reporting bias)	High risk	Outcome data never published. We obtained all retrievable summary data directly from the analysis file by request of the study authors. Some primary and secondary outcomes were mentioned in the study report and not included in the outcome file (e.g. pharmaceutical drug usage for back pain, biological markers of stress, and healthcare utilization)
Group similarity at baseline	Low risk	Matched on most important factors.
Cointerventions	Unclear risk	Not possible to assess.
Compliance	Low risk	"Overall, 64% of participants assigned to receive the immediate yoga intervention attended yoga classes throughout the 3 month intervention period. On average, these participants attended 15 (66%) classes over the 3-month trial period."
ITT analysis	Unclear risk	Details of analysis not reported.
Timing of outcome assessments	Low risk	Outcome assessment at set points.
Other bias	Unclear risk	Funding not reported.

Nambi 2014

Methods	Randomized controlled parallel-group trial
Participants	60 participants with chronic non-specific low-back pain Settings: based at the outpatient department of a physiotherapy college. Location of yoga intervention delivery appeared to be the outpatient department as no other settings were described Country: India. Recruitment: self-referral and healthcare practitioner referral through pamphlets and flyers Inclusion criteria: men and women aged ≥ 18 years who were ambulatory and had a history of non-specific low-back pain persisting for ≥ 3 months Exclusion criteria: lower back pain due to nerve root compression, disc prolapse, spinal stenosis, tumour, spinal infection, ankylosing spondylosis, spondylolisthesis, kyphosis or structural scoliosis, or a widespread neurological disorder, surgical candidacy, back-related litigation or compensation, cardiopulmonary problems, pregnancy, BMI > 35, major depression, substance abuse, yoga practice
Interventions	**Yoga group:** weekly 60-min Iyengar yoga classes for 4 weeks. A series of 29 postures were used, including forward bends, twists, and inversions but excluding back bends. Poses progressed from simpler to more challenging over time. "A variety of props were used including sticks, mats, belts, blocks, chairs, wall ropes, benches, boxes, stools, trestle, and weights." Home practice: requested 30 min, 5 days/week during the intervention **Exercise group:** participants were asked to practice individually prescribed exercises for strengthening and stretching the abdominal or back muscles (or both) for 4 weeks, beginning with 5 repetitions for 3 days/week and increasing to 15 repetitions for 5 days/week. Exercise sessions were preceded by warm-up exercises consisting of stretching and relaxation Common interventions: both groups received 1-hour lecture and handouts on physical therapy for chronic low-back pain 2 weeks before the beginning of the intervention Cointerventions: exercise group participants were asked not to participate in other exercises for their low back Duration and follow-up: interventions were provided for 4 weeks and there was an additional follow-up at 6 months after programme completion (7 months after randomization)
Outcomes	Current pain (10-cm VAS scale) reported at 4 weeks and 7 months Mean days of mental distress in the previous 30 days at 4 weeks and 7 months Mean days of physical distress in the previous 30 days at 4 weeks and 7 months Other outcomes collected: days of mental distress and physical distress were also dichotomized into frequent (≥ 14 days) and infrequent (< 14 days) distress at 4 weeks and 7 months; days of activity limitations (how many days did poor physical or mental health keeps you from doing your usual activities, such as self-care, work, or recreation?) was assessed for the previous 30 days at 4 weeks and 6 months and dichotomized into frequent (≥ 14 days) and infrequent (< 14 days) limitations
Notes	Adverse events: there was no specific discussion of overall safety or adverse events. However, it was mentioned that 1 person withdrew from the yoga group due to a herniated disc, and 2 people withdrew from the yoga group due to fears that yoga would aggravate

	symptomatic osteoarthritis Measurement of expectations or treatment preferences at baseline: none Funding: authors declared that study was not funded. "Source of Support: Nil" "Conflict of Interest: None declared."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Used random number generating table.
Allocation concealment (selection bias)	Unclear risk	No details reported.
Blinding of participants	High risk	No blinding as control was exercise; outcomes based on self-assessment
Blinding of personnel/providers	High risk	No blinding.
Blinding of outcome assessors	High risk	"Data collectors were blind to the subject's treatment status." However, participants were not blinded and self-reported all outcomes
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Low attrition rates but reasons for withdrawal in yoga group possibly related to outcome
Selective reporting (reporting bias)	Unclear risk	Protocol not available.
Group similarity at baseline	Unclear risk	Limited demographic data reported.
Cointerventions	Unclear risk	Not mentioned in inclusion/exclusion criteria or results.
Compliance	Unclear risk	4 yoga participants did not complete the trial but there was no information about class participation
ITT analysis	Unclear risk	No mention of ITT.
Timing of outcome assessments	Low risk	Outcome assessment at set points.
Other bias	Low risk	Authors declared that study was not funded.

Saper 2009

Methods	Randomized controlled parallel-group trial
Participants	30 participants with moderate to severe chronic non-specific low-back pain Study was run from 2 community health centres. Yoga classes were held at 1 of the 2 community health centres Country: USA. Recruitment: self-referral and healthcare practitioner referral through flyers in the health centres and surrounding community, radio and newspaper advertisements, and presentations and e-mails to healthcare providers. Letters sent by providers to participants identified from the community health centre electronic medical records as seen in the last 2 years with a low-back pain diagnosis Inclusion criteria: men and women aged 18 to 64 years with current low-back pain persisting for at least 12 weeks, and mean low-back pain intensity for the 2 weeks before enrolment rated at least 4 on a 0- to 10-rating scale. "Sufficient understanding of English to follow class instructions and complete surveys was required." Exclusion criteria: "yoga use in the previous year; new pain medicine or other low back pain treatments started within the previous month or anticipated to begin in the next 6 months; pregnancy; back surgery in the previous 3 years; nonmuscular pathologies (e.g., spinal canal stenosis, spondylolisthesis, infection, malignancy, fracture); severe or progressive neurological deficits; sciatica pain equal to or greater than back pain; active substance or alcohol abuse; serious systemic disease, medical, or psychiatric comorbidities precluding yoga practice; active or planned worker's compensation, disability, or personal injury claims; and inability to attend classes at the times and location offered."
Interventions	**Yoga group:** 12 weekly 75-min Hatha yoga classes were divided into 4 × 3-week themed segments followed a standardized protocol in which each class began and ended with Svasana relaxation and breathing exercises, and included a selection from 22 or 23 other yoga postures depending on the class Home practice: "Home practice for 30 minutes daily was strongly encouraged. We provided participants with an audio CD of the protocol; a portable CD player; a handbook describing and depicting the exercises; and a yoga mat, strap, and block." **Usual care group:** participants continued usual care and were offered the yoga intervention after the 26 weeks of follow-up Common interventions: both groups continued to receive their usual medical care and medications and received a copy of *The Back Pain Helpbook* (Moore 1999). Cointerventions: both groups were discouraged from beginning any new back pain treatments during the study Duration and follow-up: interventions were provided for 12 weeks and there was an additional follow-up at 26 weeks
Outcomes	Back-specific function (Roland-Morris Disability Questionnaire) reported at 6, 12, and 26 weeks Mean pain for the previous week (0 = no pain to 10 = worst possible pain) reported at 6, 12, and 26 weeks Global improvement (dichotomized into improved vs no change or worse) reported at 12 weeks Other outcomes collected: SF-36 Mental health component (not reported in results); SF-36 Physical health component (not reported in results); changes in medication use at 6 and 12 months

Notes	Adverse events: "One yoga participant reported transient worsening of low back pain that improved after discontinuing yoga. No other significant adverse events were reported." Measurement of expectations or treatment preferences at baseline: none Unpublished data: Dr Robert Saper e-mailed endpoint data for pain and back-related function at 6 weeks to LSW on 4 November 2014 Funding: US NIH. "Dr Saper is supported by a Career Development Award (K07 AT002915-04) from the National Center for Complementary and Alternative Medicine (NCCAM), National Institutes of Health (NIH), Bethesda, Maryland. Dr Phillips is supported by a Mid-career Investigator Award (5K24AT000589-08) from NCCAM, NIH. NCCAM had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; or preparation, review, or approval of the manuscript for submission."

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Used computer-generated permuted block to generate sequence.
Allocation concealment (selection bias)	Low risk	Opaque, sequentially numbered envelopes prepared by a biostatistician with no contact with participants
Blinding of participants	High risk	No blinding as used waiting list control; outcomes based on self-assessment
Blinding of personnel/providers	High risk	No blinding.
Blinding of outcome assessors	High risk	"All study participants met in person with unblinded research staff members to complete paper questionnaires at baseline, 6, and 12 weeks." Participants were not blinded and self-reported the outcomes, with the assistance of unblinded study staff
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Low attrition rates (3% at 12 weeks; 23% at 26 weeks) but reasons unclear and rate differed between groups
Selective reporting (reporting bias)	Unclear risk	Outcomes reported as per protocol on ClinicalTrials.gov. However, SF-36 was in protocol and in paper methods, but only lack of statistical significance was reported in results
Group similarity at baseline	Low risk	Groups matched on most important indicators.

Saper 2009 (*Continued*)

Cointerventions	Low risk	Use of non-study treatments by yoga group was 27% and control group was 40% (P = 0.7) up to 12 weeks and by yoga group was 87% and control group 100% between 12 and 26 weeks
Compliance	Low risk	"Yoga participants attended a median of 8 classes (range 0-12)..."
ITT analysis	Low risk	All randomized participants were analysed in the group to which they were randomized and an ITT analysis with LOCF imputation for 1 missing yoga participant was carried out at 12 weeks and 7 missing yoga participants at 26 weeks
Timing of outcome assessments	Low risk	Outcome assessment at set time points.
Other bias	Low risk	Government funding.

Sherman 2005

Methods	Randomized controlled parallel-group trial
Participants	101 participants with chronic non-specific low-back pain Setting: trial run through an integrated healthcare system. Yoga classes were held at health system facilities (number of facilities not stated) Country: USA. Recruitment: invitations describing study sent by researchers to people with primary care provider visits between 3 and 15 months before the study for treatment of back pain. Self-referral through advertisements in a health plan consumer magazine Inclusion criteria: men and women aged 20 to 64 years with a recent primary care visit for low-back pain Exclusion criteria: people with back pain that was complicated (e.g. sciatica), potentially attributable to underlying disease or conditions (e.g. pregnancy), minimal (rating < 3 on a 'bothersomeness' scale of 0 to 10), had been treated with yoga or exercise in the past year, or was currently being treated with other interventions. People were excluded if they had a possible disincentive to improve (e.g. were receiving worker's compensation), had severe or unstable medical or psychiatric conditions or dementia, had contraindications to the intervention (e.g. symptoms consistent with severe disc disease), were unable to participate in classes or unwilling to practice at home, or were unable to speak or understand English Duration and follow-up: interventions were provided for 12 weeks and there was an additional follow-up at 26 weeks
Interventions	**Yoga group:** 12 weekly 75-min Viniyoga classes, each with a specific focus: "relaxation; strength building, flexibility, and large-muscle movement; asymmetric poses; strengthening the hip muscles; lateral bending; integration; and customizing a personal practice.

	" "[A]ll the sessions emphasized use of postures and breathing for managing low back symptoms...." "[P]ostures were selected from a core of 17 relatively simple postures...." "Each class included a question-and-answer period, an initial and final breathing exercise, 5-12 postures, and a guided deep relaxation." Home practice: daily home practice was encouraged and yoga participants received CDs "to guide them through the postures with the appropriate mental focus...." **Exercise group:** 12 weekly 75-min exercise classes. The exercise intervention was designed by a physiotherapist and was likely different from previous physiotherapy. The exercise sessions began with an educational talk, then simple warm-ups and a series of 7 aerobic exercises and 10 strengthening exercises, ending with stretching exercises and a short, unguided period of deep breathing. Daily home practice was encouraged and exercise participants received a handout to assist them in home practice **Self-care group:** a copy of an evidence-based book of self-care strategies (Moore 1999) was mailed to participants. Common interventions: all participants continued to have "access to all medical care provided by their insurance plan." Cointerventions: no specific mention of allowed or restricted cointerventions
Outcomes	Back-specific function (Roland-Morris Disability Questionnaire) reported at 6, 12, and 26 weeks Other outcomes collected: Bothersomeness of pain during the previous week (0 = "not at all bothersome" and 10 = "extremely bothersome"); SF-36 Mental Health component (not reported in results); SF-36 Physical Health component (not reported in results); changes in medication use at 6 and 12 months
Notes	Adverse events: "No serious adverse events were reported. One participant discontinued yoga classes because postures that required her to move her head below her heart precipitated her migraine headaches. One participant in the exercise class strained her back during class and sought care from a chiropractor." Measurement of expectations or treatment preferences at baseline: "Participants were asked to describe their current pain and to rate their expectations for each intervention. " Table 1 showed median expectation of helpfulness for each treatment in each group: median of 8 for exercise and yoga in both the exercise and yoga groups, a median of 8.5 for exercise and 9 for yoga in the self-care group, and a median of 4 or 5 for self-care in each intervention group. The preferred treatment was also shown in Table 1. It was exercise for 26% to 33%, yoga for 27% to 44%, and other for 28% to 40%. "They reported similar expectations of helpfulness from yoga or exercise but had lower expectations for the book." Unpublished data: Dr Karen Sherman e-mailed LSW on 23 November 2015 that she did not have group means and standard deviations available from her trial Funding: US National Institutes of Health (NIH). "Grant Support: By the National Center for Complementary and Alternative Medicine (grant R21AT 001215) and the National Institute for Arthritis and Musculoskeletal and Skin Diseases (grant P60AR48093) . Potential Financial Conflicts of Interest: None disclosed"

Risk of bias

Bias	Authors' judgement	Support for judgement

Sherman 2005 (*Continued*)

Random sequence generation (selection bias)	Low risk	Computer-generated random assignments were used.
Allocation concealment (selection bias)	Low risk	A researcher not involved in participant recruitment or randomization placed assignments in opaque sequentially numbered envelopes
Blinding of participants	High risk	No blinding as control interventions were conventional exercise or self-care book; outcomes based on self-assessment
Blinding of personnel/providers	High risk	No blinding.
Blinding of outcome assessors	High risk	"Interviewers who were masked to the treatment assignments conducted telephone interviews at baseline and at 6, 12, and 26 weeks after randomization." However, participants were not blinded and self-reported the outcomes
Incomplete outcome data (attrition bias) All outcomes	Low risk	Very low attrition rates (total 6% at 26 weeks) although there was no description of how missing data were handled
Selective reporting (reporting bias)	Unclear risk	Clinical outcomes reported as per description on ClinicalTrials.gov, where there was not a formal statement of primary and secondary outcomes but a statement that the trial will report "symptoms, function, quality of life, and utilization and costs of back pain related care." However, utilization and costs were not mentioned in the study report
Group similarity at baseline	Low risk	Groups matched on most important indicators.
Cointerventions	Low risk	Use of non-study treatments matched initially and reduced in yoga group compared with control groups
Compliance	Low risk	36/36l yoga participants attended at least 1 class and the median number attended was 9 out of a possible 12. For exercise, 33/35 participants attended at least 1 class and the median number attended was 8. Class attendance was similar for yoga and exercise

Sherman 2005 (*Continued*)

		groups
ITT analysis	Low risk	All randomized participants were stated to be analysed in the group to which they were randomized
Timing of outcome assessments	Low risk	Outcome assessment at set time points.
Other bias	Low risk	Study funded by government source.

Sherman 2011

Methods	Randomized controlled parallel-group trial
Participants	228 participants with chronic non-specific low-back pain. Setting: trial run through an integrated healthcare system. 7 cohorts of classes were held in 6 different cities. Yoga classes were held at the health system facilities (exact number of facilities not stated) Country: USA Recruitment: invitations mailed to people with primary care visits for back pain, advertisements in a health plan consumer magazine, and direct-mail postcards. For 4 cohorts, augmentation of recruitment through outreach to general population (methods not described) Inclusion criteria: men and women aged 20 to 64 years with low-back pain Exclusion criteria: people with back pain that was attributable to a specific cause (e.g. spondylolisthesis), or an underlying condition (e.g. pregnancy), complex (e.g. sciatica) , minimally painful (i.e. rating of < 3 on a 'bothersomeness' scale of 0 to 10), or not chronic (i.e. duration < 3 months). People were excluded if they had contraindications to the interventions (e.g. severe disc disease), had major depression, were unable to give informed consent or participate in interviews owing to mental or medical issues (e.g. dementia) or an inability to speak English, or were unable to participate in classes or unwilling to practice at home Duration and follow-up: interventions were provided for 12 weeks and there was an additional follow-up at 26 weeks
Interventions	**Yoga group:** 12 weekly 75-min Viniyoga classes. The Viniyoga intervention was the same as that used in an earlier trial (Sherman 2005). Classes included breathing exercises, a set of 5 to 11 postures, and guided deep relaxation. "Six distinct and progressive classes were taught in pairs." Home practice: encouraged for 20 min on non-class days. Yoga participants received a handout and CD to assist them in home practice **Exercise group:** 12 weekly 75-min exercise classes. The exercise intervention was adapted from the intervention used in an earlier trial (Sherman 2005). Classes included aerobic exercises, stretches, and strengthening exercises. Home practice was encouraged for 20 min on non-class days. Exercise participants received a handout and DVD to assist them in home practice **Self-care group:** participants received a copy of a book (Moore 1999) providing information on causes of back pain and advice on how to manage pain

Sherman 2011 (*Continued*)

	Common interventions: all intervention groups continued to have "access to medical care provided by their insurance plan." Cointerventions: no specific mention of allowed or restricted cointerventions
Outcomes	Back-specific function (Roland-Morris Disability Questionnaire) reported at 6, 12, and 26 weeks Clinical improvement (dichotomous variable measuring whether low-back pain was improved, yes/no) reported at 6, 12, and 26 weeks Other outcomes collected: bothersomeness of pain during the previous week (0 = "not at all bothersome" and 10 = "extremely bothersome"); 30% improvement in outcomes; 50% improvement in outcomes; very satisfied with overall care for lower back pain; days of activity restriction (not presented in study results); days in bed (not presented in study results); work loss (not presented in study results)
Notes	Adverse events: "Of the 87 yoga and 75 stretching class attendees, 13 in each group reported a mild or moderate adverse experience possibly related to treatment (mostly increased back pain), and 1 yoga attendee experienced a herniated disk. One of 45 persons randomized to self-care reported increased pain after doing recommended exercises." Measurement of expectations or treatment preferences at baseline: "Before randomization, information on sociodemographic characteristics, back pain history, and treatment-related beliefs was collected." Table 1 showed the median expectation of helpfulness for each treatment in each group: it was a median of 8 for yoga and exercise for all groups and a median of 4 for self-care for all groups. The preferred treatment was also shown in Table 1. It was yoga for 26% to 32%, exercise for 17% to 22%, and other for 51% to 53% in the intervention groups Funding: US NIH. "Financial Disclosure: None reported. Funding/Support: This study was funded by Cooperative Agreement Number U01 AT003208 from the National Center for Complementary and Alternative Medicine (NCCAM). Discussions with several NCCAM staff influenced the study design." Additional notes: we extracted data from the online supplement to the Annals 2011 publication, choosing the adjusted 2-step imputed data from eTable 4

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated randomization used.
Allocation concealment (selection bias)	Low risk	Randomization schedule generated by statistician; inaccessible to staff
Blinding of participants	High risk	No blinding as control interventions were conventional exercise or self-care book; outcomes based on self-assessment
Blinding of personnel/providers	High risk	No blinding.

Sherman 2011 (*Continued*)

Blinding of outcome assessors	High risk	"Telephone interviews were conducted by masked interviewers at baseline and at 6, 12, and 26 weeks after randomization." However, participants were not blinded and self-reported the outcomes
Incomplete outcome data (attrition bias) All outcomes	Low risk	Low attrition rates; authors also conducted a secondary analysis using a single imputation method to assess the sensitivity of the complete case results to loss to follow-up. The sensitivity analysis was provided online and was consistent with the primary outcomes
Selective reporting (reporting bias)	Low risk	Outcomes reported as per published trial protocol. Note: several mediating variables mentioned in protocol not reported in primary publication
Group similarity at baseline	Unclear risk	Groups matched on most important indicators except that yoga group had greater back pain dysfunction
Cointerventions	Low risk	No between-group differences in back pain-related healthcare visits; medication use matched initially and decreased in yoga and exercise (active intervention) groups
Compliance	Low risk	95% of yoga participants attended at least 1 class and they attended a median of 8 out of a possible 12 classes. 82% of exercise participants attended at least 1 class and they attended a median of 9 classes. 65% (yoga) and 59% (exercise) attended at least 8 classes
ITT analysis	Low risk	Statement that ITT analysis was carried out.
Timing of outcome assessments	Low risk	Outcome assessment at set time points.
Other bias	Low risk	Funded by government source.

Tekur 2008

Methods	Randomized controlled parallel-group trial
Participants	80 participants with chronic non-specific low-back pain Setting: trial run through a residential holistic health centre. Yoga classes held at the health centre Country: India Recruitment: "The patients were recruited by advertisements, newsletters, self referrals, word-of-mouth, or referrals by medical practitioners." Inclusion criteria: men and women aged 18 to 60 years with low-back pain (with or without pain radiating to the legs) $\geq$ 3 months in duration Exclusion criteria: people with back pain that was attributable to organic spinal pathology (e.g. malignancy) or chronic spinal infection (checked by x-ray). People were excluded if they had severe obesity or critical illness Duration and follow-up: interventions were provided for 7 days and follow-up ended on the final day of the intervention
Interventions	**Yoga group:** an intensive 1-week residential yoga programme. "The practices consisted of asanas for back pain (yoga postures), pranayama, relaxation techniques, meditation, and lectures on yogic lifestyle, devotional sessions and stress management through yogic counseling." The intervention was provided throughout the day for 7 consecutive days, and included approximately 2 hours/day of yoga postures as well as yogic meditation, breathing, chanting, and lectures. There was no home practice **Exercise group:** intensive 1-week residential programme of non-yogic physical exercises. "The practices consisted of a set of physical movements ... as well as nonyogic safe breathing exercises and lectures on scientific information...." Classes were supervised by the trained physiatrist. The intervention was provided throughout the day for 7 consecutive days, and included approximately 2 hours/day of exercise practices. There was no home practice Common interventions: no other interventions in common. Cointerventions: no specific mention of allowed or restricted cointerventions
Outcomes	Back-specific function (Oswestry Disability Index, range 0 to 100) reported at 1 week Pain (Horizontal 10-cm straight line on a white sheet, range 0 to 10) reported at 1 week Quality of life - physical (WHOQOL-BREF Physical Health (7 items), "the range of scores is 4-20 for each domain") reported at 1 week Quality of life - mental (WHOQOL-BREF Psychological Health domain (6 items), "the range of scores is 4-20 for each domain") reported at 1 week Other outcomes collected: spinal mobility, State-Trait Anxiety Inventory (STAI), Beck's Depression Inventory, sit and reach measures, perceived stress, straight leg raising test, and WHOQOL-BREF Social and Environmental area domains
Notes	Adverse events: "No adverse events or side-effects seen in either of the groups." Measurement of expectations or treatment preferences at baseline: none Funding: Swami Vivekananda Yoga Research Foundation.

Risk of bias

Bias	Authors' judgement	Support for judgement

Tekur 2008 (*Continued*)

Random sequence generation (selection bias)	Low risk	Computer-generated random numbers used.
Allocation concealment (selection bias)	Low risk	Containers were used to conceal the sequence until interventions were assigned
Blinding of participants	High risk	No blinding as control was exercise; pain, functioning, and quality of life were self-assessed
Blinding of personnel/providers	High risk	No blinding.
Blinding of outcome assessors	High risk	"The statistician who did the randomization and analysis of data and the researcher who enrolled the subjects, assigned them to groups, and carried out the assessments were blinded to the subjects' treatment status." However, participants were not blinded and outcomes were self-reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	Low attrition rate among participants randomized (13% per group) was prior to beginning of treatment and there was no attrition among participants who began treatment; reasons for drop-out similar and not related to outcome
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable.
Group similarity at baseline	Low risk	Groups matched on most important indicators.
Cointerventions	Low risk	"Both groups had the same daily routine with matched interventions."
Compliance	Unclear risk	Daily sessions under supervision but no numbers of attendees reported
ITT analysis	Unclear risk	No reason to think that participants were not analyzed in the groups they were assigned to; however, this was not explicitly stated
Timing of outcome assessments	Low risk	Outcome assessment at set time points.
Other bias	High risk	Funding was from the yoga college and research institution, and the study authors were employees of the institution

Tilbrook 2011

Methods	Randomized controlled parallel-group trial
Participants	313 participants with chronic non-specific low-back pain Setting: 39 general practices. Yoga classes were held in 13 non-National Health Service premises in 5 geographic areas Country: England Recruitment: "Participating general medical practices searched patient databases and mailed out an invitation packet to all individuals aged 18 to 65 years who had a visit for low back pain in the past 18 months; database searches were undertaken in 2 waves. In addition, during the second wave of recruitment, advertisements were also placed in local media." Inclusion criteria: men and women aged 18 to 65 years with low-back pain (i.e. musculoskeletal pain bounded by the lowest ribs and gluteal folds) in the previous 18 months, a score of $\geq$ 4 on the Roland-Morris Disability Questionnaire, and ability to attend 1 of the yoga classes Exclusion criteria: "Patients were excluded if they 1) did not return a baseline questionnaire (second recruitment wave only), 2) had performed yoga in the previous 6 months, 3) could not get off the floor unaided, 4) could not use stairs, 5) were pregnant, 6) had life-threatening comorbid conditions, 7) had previously undergone spinal surgery, 8) had severe documented psychiatric problems or alcohol dependency, and 9) had indications of serious spinal neurologic abnormality (1 or more of the following: difficulty passing urine; numbness around their back passage, genitals, or inner thighs; numbness, pins and needles, or weakness in both legs; or unsteadiness on feet)." Duration and follow-up: interventions were provided for 12 weeks and there was an additional follow-up at 12 months
Interventions	**Yoga group:** 12 weekly 75-min yoga classes. "Classes consisted of an introduction to the weekly theme; pain-relieving or settling-in relaxing poses; a programme of seated, standing, prone, and supine poses; educative postural advice; and 5 to 15 minutes of relaxation." Home practice: "Participants were encouraged to undertake yoga for 30 minutes daily or to practice at least 2 times per week, and to use the [relaxation] compact disc." **Usual care group:** participants received a copy of a booklet on managing low-back pain (Burton 2002), and continued to receive usual care. Common interventions: both groups received a copy of the back pain booklet (Burton 2002), and continued to receive usual care. Cointerventions: no specific mention of included or excluded cointerventions
Outcomes	Back-specific function (Roland-Morris Disability Questionnaire) reported at 3, 6, and 12 months Back pain (Aberdeen Back Pain Scale) reported at 3, 6, and 12 months Quality of life - mental (SF-12 Mental Component score) reported at 3, 6, and 12 months Quality of life - physical (SF-12 Physical Component score) reported at 3, 6, and 12 months Other outcomes collected: self-efficacy scores on the Pain Self-Efficacy Questionnaire, ratings on the EQ-5D Health Index, number of days spent in bed and number of days with restricted activity, and economic data including medication use over the previous

	4 weeks and other healthcare use
Notes	Adverse events: "Twelve of 156 (8%) yoga participants and 2 of 157 (1%) usual care participants reported adverse events. In the yoga group, 1 adverse event was classified by the authors as serious and possibly or probably related to yoga (the participant experienced severe pain but had a history of severe pain after any physical activity); the remaining 11 were classified as nonserious and mostly related to increased pain. In the usual care group, 2 serious adverse events occurred." Measurement of expectations or treatment preferences at baseline: "Secondary outcomes were … 8) beliefs, expectations, and preferences for treatment at baseline (22, 23)." Table 1 showed that expectation that yoga works was 57% in yoga group and 55% in usual care group. Belief that yoga works was 60% in yoga group and 52% in usual care group. Intervention preference was 72% yoga, 3% usual care, and 25% indifferent in yoga group, and 61% yoga, 4% usual care, and 35% indifferent in usual care. For the primary outcome of back-related function, "the effect of treatment did not vary by baseline intervention preference (P for interaction = 0.39)." Unpublished data: Dr Helen Tilbrook and Dr Catherine Hewitt clarified the numbers of participants for analyses in an e-mail to LSW on 3 March 3 2015 and sent endpoint values for back-related function, pain, physical quality of life, and mental quality of life to LSW by e-mail on 21 December 2015 Funding: "This trial was funded by Arthritis Research UK and sponsored by the University of York."

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated randomization used.
Allocation concealment (selection bias)	Low risk	Computer-generated randomization used. Participant details entered into randomization database by trial co-ordinators and secretary who were blinded to the allocation sequence
Blinding of participants	High risk	No blinding as comparison was usual care; outcomes based on self-assessment
Blinding of personnel/providers	High risk	No blinding.
Blinding of outcome assessors	High risk	"The statistician was blinded to randomized group." However, participants were not blinded and outcomes were self-reported

Tilbrook 2011 (*Continued*)

Incomplete outcome data (attrition bias) All outcomes	Low risk	Low attrition rate, reasons stated, and sensitivity analyses for best/worst-case scenarios were carried out
Selective reporting (reporting bias)	Low risk	Primary and secondary outcomes as per published trial protocol
Group similarity at baseline	Low risk	Groups matched on main prognostic indicators and cointerventions at baseline
Cointerventions	Unclear risk	No details of cointerventions during intervention period.
Compliance	Low risk	"Ninety-three (60%) participants attended at least 3 of the first 6 classes and at least any other 3 classes (adhered)"
ITT analysis	Low risk	ITT analysis carried out and best/worst-case analyses used for missing data
Timing of outcome assessments	Low risk	Outcome assessment at set time points.
Other bias	Low risk	Funded by arthritis charity.

Wattamwar 2013

Methods	Randomized controlled parallel-group trial
Participants	24 participants with chronic non-specific low-back pain Setting: setting of trial was not described. Yoga classes were held at an Iyenger Yoga centre Country: India Recruitment: not described. Inclusion criteria: ambulatory men and women aged 20 to 50 years with a history of low-back pain and symptom duration > 3 months Exclusion criteria: low-back pain attributable to any pathology, a history of trauma, or any neurological condition Duration and follow-up: interventions were provided for 10 weeks and there was no additional follow-up
Interventions	**Yoga group:** 1 × 45- to 60-min session of Iyengar-based yoga - using props - per week for 10 weeks. 2 × 45- to 60-min occupational therapy sessions were also received each week. This was the same as the occupational therapy received by the control group, except that some simple asanas and pranayamas were added to the occupational therapy sessions for the yoga group Home practice: back exercises with additional simple asanas and pranayamas was suggested. Frequency and duration of this home practice was not described **Occupational therapy group:** 3 × 45- to 60-min occupational therapy sessions each week for 10 weeks. The therapy was described as mostly back school therapy and consisted

	of education, mat exercises, and Swiss ball exercises. A home programme of back exercises was suggested Common interventions: no additional interventions. Cointerventions: no specific mention of included or excluded cointerventions
Outcomes	Back-specific function (Oswestry Disability Index) reported at 10 weeks. The Oswestry Disability Index consists of 10 questions each rated on a 0 to 5 scale (higher score is worse function). Usually the individual scores are summed and multiplied by 2 to produce an overall rating on a 0 to 100 scale. The study authors provided each of the individual mean differences and an overall mean difference, for each group. Based on these data, it appears that the study authors did not multiply the total by 2 and the reported Oswestry total is on a scale of 0 to 50. Therefore, we multiplied the totals by 2 for data entry in this review Back pain (pain intensity subscore of the Oswestry Disability Index, scale was 0 to 5; higher values indicated greater pain) reported at 10 weeks Other outcomes collected: Roland-Morris Disability Questionnaire (outcome not extractable), changes in range of motion of thoraco-lumbar spine, and change in muscle strength of abdominals and back extensors
Notes	Adverse events: no discussion of overall safety or adverse events Measurement of expectations or treatment preferences at baseline: none Unpublished data: Dr Ravi Wattamwar was contacted to clarify sample size and standard deviations of change or confidence interval for Roland-Morris Disability Questionnaire on 2 April 2015. He replied to the e-mail but did not forward the information Funding: not reported.

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Randomisation by lottery method with replacement.
Allocation concealment (selection bias)	Unclear risk	No details of allocation process.
Blinding of participants	High risk	No blinding as comparison was occupational therapy without adjuvant yoga; outcomes based on self-assessment
Blinding of personnel/providers	High risk	No blinding.
Blinding of outcome assessors	High risk	No mention of blinding for those who collected the outcomes. Participants were not blinded and outcomes were self-reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	No attrition.

Wattamwar 2013 (*Continued*)

Selective reporting (reporting bias)	High risk	Roland-Morris Disability Questionnaire was incompletely reported. Protocol not available
Group similarity at baseline	Unclear risk	Limited demographic data reported.
Cointerventions	Unclear risk	No details of cointerventions.
Compliance	Unclear risk	No information on class attendance.
ITT analysis	Unclear risk	No attrition and no reason to think that participants were not analyzed in the groups they were assigned to; however, this was not explicitly stated
Timing of outcome assessments	Low risk	Outcome assessment at set time points.
Other bias	Unclear risk	Funding not reported.

Williams 2005

Methods	Randomized controlled parallel-group trial
Participants	60 participants with chronic non-specific low-back pain Setting: setting of trial was not described. Yoga was delivered in a community yoga studio Country: USA Recruitment: "Subjects were recruited through physician and self-referral. Local physicians were informed about the study through lectures and mailed announcements. The project was announced to the public through flyers, public radio, and local university list serve for faculty and staff." Inclusion criteria: ambulatory English-speaking men and women aged > 18 years with a history of low-back pain and symptom duration > 3 months Exclusion criteria: low-back pain attributable to "nerve root compression, disc prolapse, spinal stenosis, tumor, spinal infection, alkylosing spondylosis, spondylolisthesis, kyphosis or structural scoliosis, or a widespread neurological disorder." People were also excluded if they were "pre-surgical candidates, were involved in litigation or compensation, displayed a compromised cardiopulmonary system, were pregnant, had a body mass index >35, were experiencing major depression or substance abuse and were practitioners of yoga." People were excluded if they would not agree to "forgo other forms of CAM during the study" Duration and follow-up: interventions were provided for 16 weeks and there was an additional follow-up at 3 months after end of treatment (7 months after randomization)
Interventions	**Yoga group:** 1 × 90-min Iyengar yoga class per week for 16 weeks. Classes used supine, seated, and standing poses; forward bends, twists, and inversions; and progressed from simple to more challenging poses. A range of props were used. The yoga group also received 16 weekly newsletters, written by physiotherapy students, on back care Home practice: encouraged to practice at home for 30 min/day, 5 days/week

Williams 2005 (*Continued*)

	Education group: 16 weekly newsletters, written by physiotherapy students, on back care Common interventions: all participants could continue usual medical care for low-back pain. 2 weeks before the beginning of the 16-week study period, both groups received 2 × 1-hour lectures on low-back pain and were given instructional handouts Cointerventions: participants were only eligible for the study if they agreed to "forgo other forms of CAM during the study"
Outcomes	Back-specific function (Pain Disability Index) reported at 16 weeks and 7 months Back pain (VAS from Short Form-McGill Pain Questionnaire) reported at 16 weeks and 7 months Other outcomes collected: pain-related fears to movement, beliefs associated with adjustment to chronic pain, coping strategies, perception of self-efficacy, spinal range of motion, and changes from baseline in medications reported at baseline
Notes	Adverse events: 1 adverse event in the yoga group, "a subject with symptomatic osteoarthritis who was diagnosed with a herniated disc during the study..." "Review of the adverse event by a medical panel summoned by the Institutional Review Board determined that it was unrelated to the performance of yoga postures." 1 older participant in the educational control group died Measurement of expectations or treatment preferences at baseline: none Funding; university funding. "This project was funded by the Clinical Studies request for proposals at West Virginia University."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Randomisation by random number generating program.
Allocation concealment (selection bias)	Unclear risk	No details of allocation process.
Blinding of participants	High risk	No blinding as comparison was an educational intervention; outcome based on self-assessment
Blinding of personnel/providers	High risk	No blinding.
Blinding of outcome assessors	High risk	Participants were not blinded and outcomes were self-reported. "Data collectors were blind to the subject's treatment status. "
Incomplete outcome data (attrition bias) All outcomes	High risk	Attrition was 20% in control group and 33% in yoga group at 16 weeks; 2 withdrawals were linked to the yoga intervention

Williams 2005 (*Continued*)

Selective reporting (reporting bias)	Unclear risk	Protocol not available.
Group similarity at baseline	Unclear risk	"Higher functional ability on the BPSES [Back Pain Self-Efficacy Scale] (P=0.005) , lower catastrophizing as a coping strategy (P=0.007), and less perceived disability (P=0.002) and harm (P=0.02) on the SOPA [Survey of Pain Attitudes] by the yoga group compared to the control group. "
Cointerventions	Low risk	No difference in medication use at baseline; drug use in yoga group reduced; postintervention assessment showed non-significant differences in medical or non-medical treatment, or lifestyle changes
Compliance	Low risk	"Of the 20 subjects completing the yoga intervention [out of 30 randomized], an attendance rate of 91.9% was achieved for the 16-week protocol."
ITT analysis	Unclear risk	No mention of ITT; non-completers compared with completers.
Timing of outcome assessments	Low risk	Outcome assessment at set time points.
Other bias	Low risk	Funded by university.

Williams 2009

Methods	Randomized controlled parallel-group trial
Participants	90 participants with chronic non-specific low-back pain Setting: setting of trial was not described. Yoga was delivered in a yoga studio Country: USA Recruitment: self-referral. Details of recruitment not described Inclusion criteria: English-speaking men and women aged 18 to 70 years with a history of low-back pain and symptom duration > 3 months. Participants were required to live within a 1-hour drive of study site, to be insured by a participating provider, to have a BMI < 37, and to be able to get up and down from the floor and rise to a standing position without assistance. Back pain-related eligibility criteria were a score of 10 to 60 on the Oswestry Disability Index and a score of 3 cm to 8 cm on the VAS scale. Participants were required to agree not to get chiropractic, massage, Pilates, acupuncture, or any other yoga treatment during the study. Participants were required to agree that if they were randomized to yoga therapy they would attend a minimum number of yoga classes and practice at home

	Exclusion criteria: low-back pain attributable to "spinal stenosis with pseudoclaudication, abdominal or spine tumors, spinal infection, osteoporosis with vertebral fractures, ankylosing spondylitis, spondylolisthesis w/radiculopathy, structural kyphosis or scoliosis, radicular pain with weakness or loss of reflexes, failed back syndrome." People were also excluded if they were presurgical candidates, pregnant, undergoing cancer treatment, had confirmed fibromyalgia, an abdominal hernia, a compromised cardiopulmonary system, major depression, widespread neurological disorder, or substance abuse issues. People were excluded if they were currently involved in back-related litigation or a workers' compensation case, or had practiced yoga once per week for at least 3 months within the last year Duration and follow-up: interventions were provided for 24 weeks and there was an additional follow-up at 24 weeks after end of treatment (48 weeks after randomization)
Interventions	**Yoga group:** 2 × 90-min Iyengar yoga classes per week for 24 weeks. Home practice: "Participants were also directed to practice 30 minutes of yoga at home on nonclass days and were supplied with props, a DVD, and an Iyengar yoga instruction manual with photographs and instructions." **Self-directed standard medical care group:** usual medical care. Common interventions: none Cointerventions: participants were only eligible for the study if they agreed to forgo chiropractic, massage, Pilates, acupuncture, or any other yoga treatment during the study
Outcomes	Back-specific function (Oswestry Disability Index) reported at 12, 24, and 48 weeks Back pain (VAS 0 to 100) reported at 12, 24, and 48 weeks. Other outcomes collected: depression and self-reported medication usage
Notes	Adverse events: "One adverse event was reported during the 6-month follow-up period in association with physical therapy, not the yoga intervention." It is unclear which group this adverse event occurred in. Figure 1 also shows that 1 yoga participant discontinued because yoga exacerbated low-back pain Measurement of expectations or treatment preferences at baseline: in Table 3 the means (SEM) of treatment expectancy for yoga on an 11-point scale were 7.8 (0.23) for the yoga group and 8.1 (0.21) for the standard medical care group, and the means (SEM) of treatment expectancy for standard medical care were 4.8 (0.32) for the yoga group and 4.7 (0.24) for the standard medical group (all scores were prerandomization but postrandomization scores are also given). The study authors reported that "dropouts had lower post randomization expectation for [standard medical care] treatment (P= 0.016) than completers." Note that there were 12 yoga participants and 4 standard medical care participants who dropped out Funding: US NIH. "Federal funds were received in support of this work. No benefits in any form have been or will be received from a commercial party related directly or indirectly to the subject of this manuscript." "Supported by the National Institutes of Health's National Center for Complementary and Alternative Medicine (NIH-NCCAM), grant (no.1 R21 AT001679-01A2)."

Risk of bias

Bias	Authors' judgement	Support for judgement

Williams 2009 (*Continued*)

Random sequence generation (selection bias)	Unclear risk	Random sequence generation methods not reported; 3 of those randomized declined and were replaced
Allocation concealment (selection bias)	Unclear risk	Eligible participants given envelopes with allocation but unclear who prepared these, who gave them to participants, and whether the envelopes were sealed and opaque
Blinding of participants	High risk	No blinding as comparison was standard medical care; outcome measures based on self-assessment
Blinding of personnel/providers	High risk	No blinding.
Blinding of outcome assessors	High risk	Participants completed "assessment instruments with a research assistant blinded to the participants' group assignment." However, participants were not blinded and outcomes were self-reported
Incomplete outcome data (attrition bias) All outcomes	High risk	Missing outcome data were high in yoga group (20% at 12 weeks and 28% at 24 weeks) but low in usual care group (4% at 12 weeks and 9% at 24 weeks)
Selective reporting (reporting bias)	Unclear risk	Protocol not available.
Group similarity at baseline	Unclear risk	Groups were similar on indicators other than duration of low back pain (control group had longer duration of low back pain)
Cointerventions	Low risk	Cointerventions were allowed and there were no statistically significant differences between groups in use of medications at baseline
Compliance	Low risk	"On average, yoga completers (n=31 [of 43 randomised]) attended 42.5 +/- 0.4 of 48 classes (88.5%)..."
ITT analysis	Low risk	"For intention-to-treat analyses, missing baseline data were replaced by group means while missing data at 12 and 24 weeks were replaced using the last observation carried forward."

Williams 2009 (*Continued*)

Timing of outcome assessments	Low risk	Outcome assessment at set time points.
Other bias	Low risk	Funded by government source.

BMI: body mass index; CES: Center for Epidemiologic Studies; EQ-5D: EuroQol-5D; GP: general practitioner; ITT: intention to treat; min: minute; LOCF: last observation carried forward; NIH: National Institutes of Health; PANAS-PA: Positive and Negative Affect Schedule-Positive Affect; PANAS-NA: Positive and Negative Affect Schedule-Negative Affect; SEM: standardized error of the mean; SF-12: 12-item Short Form; SF-36: 36-item Short Form; STAI: State-Trait Anxiety Inventory; STAIS: State-Trait Anxiety Inventory - State Anxiety; STAIT: State-Trait Anxiety Inventory - Trait Anxiety; VAS: visual analogue scale; WHOQOL-BREF: World Health Organization Quality of Life - BREF.

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Aboagye 2015	Wrong study population.
Anon 2006	Not an original study report.
Anon 2009	Not an original study report.
Biggs 2012	Participants appeared to have a mix of subacute and chronic low-back pain, numbers unclear; study author did not respond to request for clarification. Wrong study population
Bindal 2007	Participants had back pain but type and duration was unclear; study author did not respond to request for clarification. Wrong study population
Borg-Olivier 2005	Not an original study report.
CTRI/2012/11/003094	Wrong study population.
Graves 2004	Not an original study report.
Groessl 2012	Not a randomized controlled trial.
Haldavnekar 2014	Wrong comparison.
Hartfiel 2012	Wrong study population.
Horng 2006	Not an original study report.
Lee 2014	Not a randomized controlled trial.

(*Continued*)

Michalsen 2012	Participants had back pain but type and duration was unclear; study author did not respond to request for clarification. Wrong study population
Monro 2014	Wrong study population.
Patil 2015	Not a randomized controlled trial.
Pushpika 2010	Participants had back pain but type and duration was unclear; study author did not respond to request for clarification. Wrong study population
Sakuma 2012	Participants had back pain but type and duration was unclear; unable to contact study authors for clarification. Wrong study population
Saper 2013	Wrong comparison.
Selfridge 2012	Not an original study report.
Telles 2009	Wrong study population.

Characteristics of studies awaiting assessment *[ordered by study ID]*

Kim 2014

Methods	RCT
Participants	Back pain
Interventions	Yoga
Outcomes	"VAS, algometer, Oswestry low back pain disability index (ODI), Roland Morris disability questionnaire (RMDQ), and fear avoidance beliefs questionnaire (FBQ) scores."
Notes	Participants have had low-back pain for ≥ 2 months. Author was e-mailed in February 2016 to clarify whether pain was chronic non-specific

Kumar 2011

Methods	RCT
Participants	Back pain
Interventions	Yoga
Outcomes	"Physical (HRV [heart rate variability], abdominal respiration rate, flexibility of spine) and psychological assessments (level of anxiety, back pain and stress level using analog scale) along with MRI [magnetic resonance imaging] testing. "

Kumar 2011 (*Continued*)

Notes	Participants have had low-back pain for ≥ 2 months. Author was e-mailed in February 2016 to clarify whether pain meets review criteria of chronic and non-specific

NCT01303588

Methods	RCT
Participants	Men and women aged ≥ 65 years with chronic low-back pain for ≥ 6 months
Interventions	Yoga, Qigong, waiting list
Outcomes	Primary outcome is Functional Rating Index at 3 months.
Notes	NCT01303588

Saper 2015

Methods	RCT
Participants	Adults with current non-specific low-back pain persisting for ≥ 12 weeks
Interventions	Yoga, physical therapy, education
Outcomes	Primary outcomes are pain and back-related function
Notes	NCT01343927

RCT: randomized controlled trial; VAS: visual analogue scale.

Characteristics of ongoing studies *[ordered by study ID]*

NCT02224183

Trial name or title	Yoga vs. Education for Veterans with Chronic Low Back Pain
Methods	RCT
Participants	Veteran of any branch of military service
Interventions	Yoga, education
Outcomes	Primary outcomes are pain and back-related function
Starting date	March 2015

NCT02224183 (*Continued*)

Contact information	Robert.Saper@bmc.org
Notes	NCT02224183

NCT02524158

Trial name or title	Yoga Therapy to Improve Function Among Veterans with Chronic Low Back Pain
Methods	RCT
Participants	Veterans with chronic low-back pain > 6 months
Interventions	Yoga, delayed treatment control
Outcomes	Primary outcome is back-related function
Starting date	April 2013
Contact information	Principal investigator is Erik J Groessl, PhD BA BS, VA San Diego Healthcare System, San Diego, CA
Notes	NCT02524158

NCT02552992

Trial name or title	Yoga for Chronic Low Back Pain and Its Mechanism of Action: Impact of Strength and Stretch (YoMA II)
Methods	RCT
Participants	Adults with chronic low-back pain lasting > 6 months
Interventions	Yoga, self-directed mind body education
Outcomes	Primary outcome is back-related function
Starting date	January 2015
Contact information	No contacts or locations provided; however, trial is based at University of California, San Francisco
Notes	NCT02552992

RCT: randomized controlled trial.

DATA AND ANALYSES

Comparison 1. Yoga versus non-exercise control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Back-specific function	9		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 Back-specific function at short term (4 to 6 weeks)	5	256	Std. Mean Difference (IV, Random, 95% CI)	-0.45 [-0.71, -0.19]
1.2 Back-specific function at short-intermediate term (3 to 4 months)	7	667	Std. Mean Difference (IV, Random, 95% CI)	-0.40 [-0.66, -0.14]
1.3 Back-specific function at intermediate term (6 months)	6	630	Std. Mean Difference (IV, Random, 95% CI)	-0.44 [-0.66, -0.22]
1.4 Back-specific function at long term (12 months)	2	365	Std. Mean Difference (IV, Random, 95% CI)	-0.26 [-0.46, -0.05]
2 Pain	6		Mean Difference (IV, Random, 95% CI)	Subtotals only
2.1 Pain at short term (4 to 6 weeks)	2	40	Mean Difference (IV, Random, 95% CI)	-10.83 [-20.85, -0.81]
2.2 Pain at short-intermediate term (3 to 4 months)	5	458	Mean Difference (IV, Random, 95% CI)	-4.55 [-7.04, -2.06]
2.3 Pain at intermediate term (6 months)	4	414	Mean Difference (IV, Random, 95% CI)	-7.81 [-13.37, -2.25]
2.4 Pain at long term (12 months)	2	355	Mean Difference (IV, Random, 95% CI)	-5.40 [-14.50, 3.70]
3 Clinical improvement	3		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
3.1 Clinical improvement at short term (4 to 6 weeks)	2	141	Risk Ratio (M-H, Random, 95% CI)	2.62 [1.22, 5.67]
3.2 Clinical improvement at short-intermediate term (3 months)	3	168	Risk Ratio (M-H, Random, 95% CI)	3.18 [1.86, 5.44]
3.3 Clinical improvement at intermediate term (6 months)	1	128	Risk Ratio (M-H, Random, 95% CI)	2.53 [1.36, 4.71]
4 Physical quality of life	3		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
4.1 Physical quality of life at short-term (4 weeks)	1	13	Std. Mean Difference (IV, Random, 95% CI)	0.74 [-0.43, 1.91]
4.2 Physical quality of life at short-intermediate term (3 months)	3	323	Std. Mean Difference (IV, Random, 95% CI)	0.22 [-0.00, 0.44]
4.3 Physical quality of life at intermediate term (6 months)	1	259	Std. Mean Difference (IV, Random, 95% CI)	0.26 [0.01, 0.50]
4.4 Physical quality of life at long term (12 months)	1	264	Std. Mean Difference (IV, Random, 95% CI)	0.17 [-0.07, 0.41]
5 Mental quality of life	3		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
5.1 Mental quality of life at short term (4 weeks)	1	13	Std. Mean Difference (IV, Random, 95% CI)	-0.86 [-2.04, 0.33]

5.2 Mental quality of life at short-intermediate term (3 months)	3	323	Std. Mean Difference (IV, Random, 95% CI)	0.20 [-0.02, 0.41]
5.3 Mental quality of life at intermediate term (6 months)	1	259	Std. Mean Difference (IV, Random, 95% CI)	0.20 [-0.04, 0.45]
5.4 Mental quality of life at long term (12 months)	1	264	Std. Mean Difference (IV, Random, 95% CI)	0.07 [-0.17, 0.31]
6 Depression	3		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
6.1 Depression at short term (6 weeks)	1	16	Std. Mean Difference (IV, Random, 95% CI)	-1.23 [-2.39, -0.06]
6.2 Depression at short-intermediate term (3 months)	2	132	Std. Mean Difference (IV, Random, 95% CI)	-0.15 [-0.49, 0.19]
6.3 Depression at intermediate term (6 months)	1	90	Std. Mean Difference (IV, Random, 95% CI)	-0.47 [-0.89, -0.05]
6.4 Depression at long term (12 months)	1	90	Std. Mean Difference (IV, Random, 95% CI)	-0.50 [-0.92, -0.08]
7 Adverse events	6	696	Risk Difference (M-H, Random, 95% CI)	0.05 [0.02, 0.08]

Comparison 2. Yoga versus exercise

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Back-specific function	3		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 Back-specific function at short term (6 weeks)	2	248	Std. Mean Difference (IV, Random, 95% CI)	-0.02 [-0.41, 0.37]
1.2 Back-specific function at short-intermediate term (3 months)	2	249	Std. Mean Difference (IV, Random, 95% CI)	-0.22 [-0.65, 0.20]
1.3 Back-specific function at intermediate term (6 months)	2	249	Std. Mean Difference (IV, Random, 95% CI)	-0.20 [-0.59, 0.19]
1.4 Back-specific function at short term (1 week) - intensive intervention	1	80	Std. Mean Difference (IV, Random, 95% CI)	-1.25 [-1.73, -0.77]
2 Pain	2		Mean Difference (IV, Random, 95% CI)	Subtotals only
2.1 Pain at short term (4 weeks)	1	54	Mean Difference (IV, Random, 95% CI)	-15.0 [-19.90, -10.10]
2.2 Pain at intermediate term (7 months)	1	54	Mean Difference (IV, Random, 95% CI)	-20.40 [-25.48, -15.32]
2.3 Pain at short term (1 week) - intensive intervention	1	80	Mean Difference (IV, Random, 95% CI)	-14.5 [-22.92, -6.08]
3 Clinical improvement	1		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
3.1 Clinical improvement at short term (6 weeks)	1	164	Risk Ratio (M-H, Random, 95% CI)	1.02 [0.67, 1.57]
3.2 Clinical improvement at short-intermediate term (3 months)	1	162	Risk Ratio (M-H, Random, 95% CI)	1.30 [0.96, 1.75]

3.3 Clinical improvement at intermediate term (6 months)	1	163	Risk Ratio (M-H, Random, 95% CI)	0.99 [0.73, 1.33]
4 Physical quality of life	2		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
4.1 Physical quality of life at short term (4 weeks)	1	54	Std. Mean Difference (IV, Random, 95% CI)	1.68 [1.06, 2.31]
4.2 Physical quality of life at intermediate term (7 months)	1	54	Std. Mean Difference (IV, Random, 95% CI)	1.34 [0.75, 1.94]
4.3 Physical quality of life at short term (1 week) - intensive intervention	1	80	Std. Mean Difference (IV, Random, 95% CI)	1.06 [0.59, 1.53]
5 Mental quality of life	2		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
5.1 Mental quality of life at short term (4 weeks)	1	54	Std. Mean Difference (IV, Random, 95% CI)	0.79 [0.24, 1.35]
5.2 Mental quality of life at intermediate term (7 months)	1	54	Std. Mean Difference (IV, Random, 95% CI)	1.33 [0.74, 1.92]
5.3 Mental quality of life at short term (1 week) - intensive intervention	1	80	Std. Mean Difference (IV, Random, 95% CI)	0.87 [0.41, 1.33]
6 Adverse events	3	314	Risk Difference (M-H, Random, 95% CI)	0.01 [-0.04, 0.06]

Comparison 3. Yoga plus exercise versus exercise alone

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Back-specific function at short-intermediate term (10 weeks)	1	24	Std. Mean Difference (IV, Random, 95% CI)	-0.60 [-1.42, 0.22]
2 Pain at short-intermediate term (10 weeks)	1	24	Mean Difference (IV, Random, 95% CI)	-3.20 [-13.76, 7.36]

Comparison 4. Sensitivity and subgroup analyses for yoga versus non-exercise control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Back-specific function sensitivity analyses (complete case)	9		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 Back-specific function at short term (4 to 6 weeks) using complete case data	5	247	Std. Mean Difference (IV, Random, 95% CI)	-0.45 [-0.72, -0.19]
1.2 Back-specific function at short-intermediate term (3 to 4 months) using complete case data	7	630	Std. Mean Difference (IV, Random, 95% CI)	-0.49 [-0.73, -0.25]

1.3 Back-specific function at intermediate term (6 months) using complete case data	6	596	Std. Mean Difference (IV, Random, 95% CI)	-0.57 [-0.82, -0.32]
1.4 Back-specific function at long term (12 months) using complete case data	2	340	Std. Mean Difference (IV, Random, 95% CI)	-0.32 [-0.61, -0.03]
2 Back-specific function sensitivity analyses (change values)	4		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
2.1 Back-specific function at short term (4 to 6 weeks) using change values	1	13	Std. Mean Difference (IV, Random, 95% CI)	-0.39 [-1.52, 0.74]
2.2 Back-specific function at short-intermediate term (3 to 4 months) using change values	4	435	Std. Mean Difference (IV, Random, 95% CI)	-0.35 [-0.54, -0.16]
2.3 Back-specific function at intermediate term (6 months) using change values	2	390	Std. Mean Difference (IV, Random, 95% CI)	-0.32 [-0.52, -0.12]
2.4 Back-specific function at long term (12 months) using change values	2	390	Std. Mean Difference (IV, Random, 95% CI)	-0.34 [-0.55, -0.14]
3 Back-specific function sensitivity analyses (higher-quality studies)	3		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
3.1 Back-specific function at short term (4 to 6 weeks) limited to higher-quality studies	2	200	Std. Mean Difference (IV, Random, 95% CI)	-0.43 [-0.75, -0.10]
3.2 Back-specific function at short-intermediate term (3 to 4 months) limited to higher-quality studies	3	480	Std. Mean Difference (IV, Random, 95% CI)	-0.49 [-0.68, -0.31]
3.3 Back-specific function at intermediate term (6 months) limited to higher-quality studies	3	475	Std. Mean Difference (IV, Random, 95% CI)	-0.41 [-0.70, -0.12]
3.4 Back-specific function at long term (12 months) limited to higher-quality studies	1	275	Std. Mean Difference (IV, Random, 95% CI)	-0.23 [-0.47, 0.01]
4 Back-specific function sensitivity analyses using generic inverse variance	9		Std. Mean Difference (Random, 95% CI)	Subtotals only
4.1 Back-specific function at short term (4 to 6 weeks)	5	256	Std. Mean Difference (Random, 95% CI)	-0.45 [-0.71, -0.19]
4.2 Back-specific function at short-intermediate term (3 to 4 months)	7	667	Std. Mean Difference (Random, 95% CI)	-0.42 [-0.71, -0.14]
4.3 Back-specific function at intermediate term (6 months)	6	630	Std. Mean Difference (Random, 95% CI)	-0.48 [-0.73, -0.23]
5 Pain sensitivity analyses (complete case)	6		Mean Difference (IV, Random, 95% CI)	Subtotals only

5.1 Pain at short-intermediate term (3 to 4 months) using complete case data	5	433	Mean Difference (IV, Random, 95% CI)	-4.88 [-7.41, -2.35]
5.2 Pain at intermediate term (6 months) using complete case data	4	389	Mean Difference (IV, Random, 95% CI)	-9.73 [-17.34, -2.13]
5.3 Pain at long term (12 months) using complete case data	2	330	Mean Difference (IV, Random, 95% CI)	-7.99 [-22.30, 6.33]
6 Pain sensitivity analyses (change values)	4		Mean Difference (IV, Random, 95% CI)	Subtotals only
6.1 Pain at short term (4 to 6 weeks) using change scores	1	13	Mean Difference (IV, Random, 95% CI)	-8.39 [-15.60, -1.18]
6.2 Pain at short-intermediate term (3 to 4 months) using change scores	4	406	Mean Difference (IV, Random, 95% CI)	-3.00 [-10.15, 0.15]
6.3 Pain at intermediate term (6 months) using change scores	2	363	Mean Difference (IV, Random, 95% CI)	-7.08 [-18.29, 4.12]
6.4 Pain at long term (12 months) using change scores	2	363	Mean Difference (IV, Random, 95% CI)	-5.30 [-15.49, 4.89]
7 Pain sensitivity analyses (higher-quality studies)	1		Mean Difference (IV, Random, 95% CI)	Subtotals only
7.1 Pain at short-intermediate term (3 to 4 months) limited to higher-quality studies	1	268	Mean Difference (IV, Random, 95% CI)	-4.41 [-7.22, -1.60]
7.2 Pain at intermediate term (6 months) limited to higher-quality studies	1	259	Mean Difference (IV, Random, 95% CI)	-2.97 [-6.16, 0.22]
7.3 Pain at long term (12 months) limited to higher-quality studies	1	265	Mean Difference (IV, Random, 95% CI)	-1.41 [-4.58, 1.76]
8 Pain sensitivity analyses (standardized mean difference)	6		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
8.1 Pain at short term (4 to 6 weeks)	2	40	Std. Mean Difference (IV, Random, 95% CI)	-0.65 [-1.30, -0.00]
8.2 Pain at short-intermediate term (3 to 4 months)	5	458	Std. Mean Difference (IV, Random, 95% CI)	-0.32 [-0.51, -0.14]
8.3 Pain at intermediate term (6 months)	4	414	Std. Mean Difference (IV, Random, 95% CI)	-0.48 [-0.79, -0.18]
8.4 Pain at long term (12 months)	2	355	Std. Mean Difference (IV, Random, 95% CI)	-0.31 [-0.76, 0.15]
9 Physical quality of life sensitivity analyses (change values)	2		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
9.1 Physical quality of life at short term (4 weeks) using change scores	1	13	Std. Mean Difference (IV, Random, 95% CI)	0.10 [-1.02, 1.22]
9.2 Physical quality of life at short-intermediate term (3 months) using change scores	2	284	Std. Mean Difference (IV, Random, 95% CI)	0.12 [-0.11, 0.36]

9.3 Physical quality of life at intermediate term (6 months) using change scores	1	271	Std. Mean Difference (IV, Random, 95% CI)	0.13 [-0.11, 0.37]
9.4 Physical quality of life at long term (12 months) using change scores	1	271	Std. Mean Difference (IV, Random, 95% CI)	0.08 [-0.16, 0.32]
10 Physical quality of life sensitivity analyses (higher-quality studies)	1		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
10.1 Physical quality of life at short-intermediate term (3 months) limited to higher-quality studies	1	267	Std. Mean Difference (IV, Random, 95% CI)	0.28 [0.03, 0.52]
11 Mental quality of life sensitivity analyses (change values)	2		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
11.1 Mental quality of life at short term (4 weeks) using change scores	1	13	Std. Mean Difference (IV, Random, 95% CI)	-0.46 [-1.59, 0.68]
11.2 Mental quality of life at short-intermediate term (3 months) using change scores	2	284	Std. Mean Difference (IV, Random, 95% CI)	0.19 [-0.05, 0.42]
11.3 Mental quality of life at intermediate term (6 months) using change scores	1	271	Std. Mean Difference (IV, Random, 95% CI)	0.18 [-0.05, 0.42]
11.4 Mental quality of life at long term (12 months) using change scores	1	271	Std. Mean Difference (IV, Random, 95% CI)	0.04 [-0.20, 0.28]
12 Depression sensitivity analyses (complete case)	2		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
12.1 Depression at short-intermediate term (3 months) using complete case data	2	107	Std. Mean Difference (IV, Random, 95% CI)	-0.22 [-0.68, 0.25]
12.2 Depression at intermediate term (6 months) using complete case data	1	65	Std. Mean Difference (IV, Random, 95% CI)	-0.75 [-1.26, -0.25]
12.3 Depression at long term (12 months) using complete case data	1	65	Std. Mean Difference (IV, Random, 95% CI)	-0.59 [-1.09, -0.09]
13 Depression sensitivity analyses (change values)	1		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
13.1 Depression at short-intermediate term (3 months) using change scores	1	90	Std. Mean Difference (IV, Random, 95% CI)	-0.58 [1.00, -0.15]
13.2 Depression at intermediate term (6 months) using change scores	1	90	Std. Mean Difference (IV, Random, 95% CI)	-0.82 [-1.26, -0.39]
13.3 Depression at long term (12 months) using change scores	1	90	Std. Mean Difference (IV, Random, 95% CI)	-0.30 [-0.72, 0.12]

14 Subgroup analysis by socioeconomic status (SES) for back-specific function and pain	7		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
14.1 Back-specific function at 4 to 6 weeks: participants not low SES	3	216	Std. Mean Difference (IV, Random, 95% CI)	-0.54 [-0.96, -0.13]
14.2 Back-specific function at 4 to 6 weeks: participants low SES	1	27	Std. Mean Difference (IV, Random, 95% CI)	-0.40 [-1.16, 0.37]
14.3 Back-specific function at 6 to 7 months: participants not low SES	5	607	Std. Mean Difference (IV, Random, 95% CI)	-0.45 [-0.69, -0.20]
14.4 Back-specific function at 6 to 7 months: participants low SES	1	23	Std. Mean Difference (IV, Random, 95% CI)	-0.58 [-1.46, 0.29]
14.5 Pain at 6 to 7 months: participants not low SES	3	391	Std. Mean Difference (IV, Random, 95% CI)	-0.49 [-0.87, -0.12]
14.6 Pain at 6 to 7 months: participants low SES	1	23	Std. Mean Difference (IV, Random, 95% CI)	-0.56 [-1.43, 0.32]

Comparison 5. Sensitivity analyses for yoga versus exercise

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Back-specific function sensitivity analyses (complete case)	2		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 Back-specific function at short term (6 weeks) using complete case data	2	229	Std. Mean Difference (IV, Random, 95% CI)	-0.02 [-0.42, 0.39]
1.2 Back-specific function at short-intermediate term (3 months) using complete case data	2	228	Std. Mean Difference (IV, Random, 95% CI)	-0.24 [-0.63, 0.14]
1.3 Back-specific function at intermediate term (6 months) using complete case data	2	229	Std. Mean Difference (IV, Random, 95% CI)	-0.22 [-0.56, 0.12]
2 Back-specific function sensitivity analyses using generic inverse variance	2		Std. Mean Difference (Random, 95% CI)	Subtotals only
2.1 Back-specific function at short term (4 to 6 weeks)	1	183	Std. Mean Difference (Random, 95% CI)	0.13 [-0.16, 0.42]
2.2 Back-specific function at short-intermediate term (3 to 4 months)	2	249	Std. Mean Difference (Random, 95% CI)	-0.23 [-0.67, 0.21]
2.3 Back-specific function at intermediate term (6 months)	2	249	Std. Mean Difference (Random, 95% CI)	-0.18 [-0.53, 0.17]
3 Pain sensitivity analyses (standardized mean difference)	2		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only

3.1 Pain at short term (4 weeks)	1	54	Std. Mean Difference (IV, Random, 95% CI)	-1.62 [-2.24, -1.00]
3.2 Pain at intermediate term (7 months)	1	54	Std. Mean Difference (IV, Random, 95% CI)	-2.14 [-2.82, -1.46]
3.3 Pain at short term (1 week) - intensive intervention	1	80	Std. Mean Difference (IV, Random, 95% CI)	-0.75 [-1.20, -0.29]

Comparison 6. Sensitivity analyses for yoga plus exercise versus exercise alone

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Pain sensitivity analysis (standardized mean difference)	1		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 Pain at short-intermediate term (10 weeks)	1	24	Std. Mean Difference (IV, Random, 95% CI)	-0.23 [-1.04, 0.57]

Analysis 1.1. Comparison 1 Yoga versus non-exercise control, Outcome 1 Back-specific function.

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 1 Yoga versus non-exercise control

Outcome: 1 Back-specific function

Study or subgroup	Yoga N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
1 Back-specific function at short term (4 to 6 weeks)							
Cox 2010	5	6.2 (4.82)	8	7.25 (3.99)		5.4 %	-0.23 [-1.35, 0.90]
Galantino 2004	11	21.15 (10.18)	5	38.91 (17.56)		4.8 %	-1.32 [-2.50, -0.14]
Saper 2009	14	10.1 (5.7)	13	12.46 (5.8)		11.6 %	-0.40 [-1.16, 0.37]
Sherman 2005	36	4.81 (4.5)	27	7.63 (4)		25.7 %	-0.65 [-1.16, -0.14]
Sherman 2011	92	5.8 (4.3458)	45	7.1 (3.9942)		52.5 %	-0.31 [-0.66, 0.05]
Subtotal (95% CI)	**158**		**98**			**100.0 %**	**-0.45 [-0.71, -0.19]**
Heterogeneity: Tau² = 0.0; Chi² = 3.45, df = 4 (P = 0.49); I² =0.0%							
Test for overall effect: Z = 3.39 (P = 0.00070)							
2 Back-specific function at short-intermediate term (3 to 4 months)							
Cox 2010	6	9 (8.49)	9	6.33 (4.33)		5.1 %	0.40 [-0.65, 1.45]

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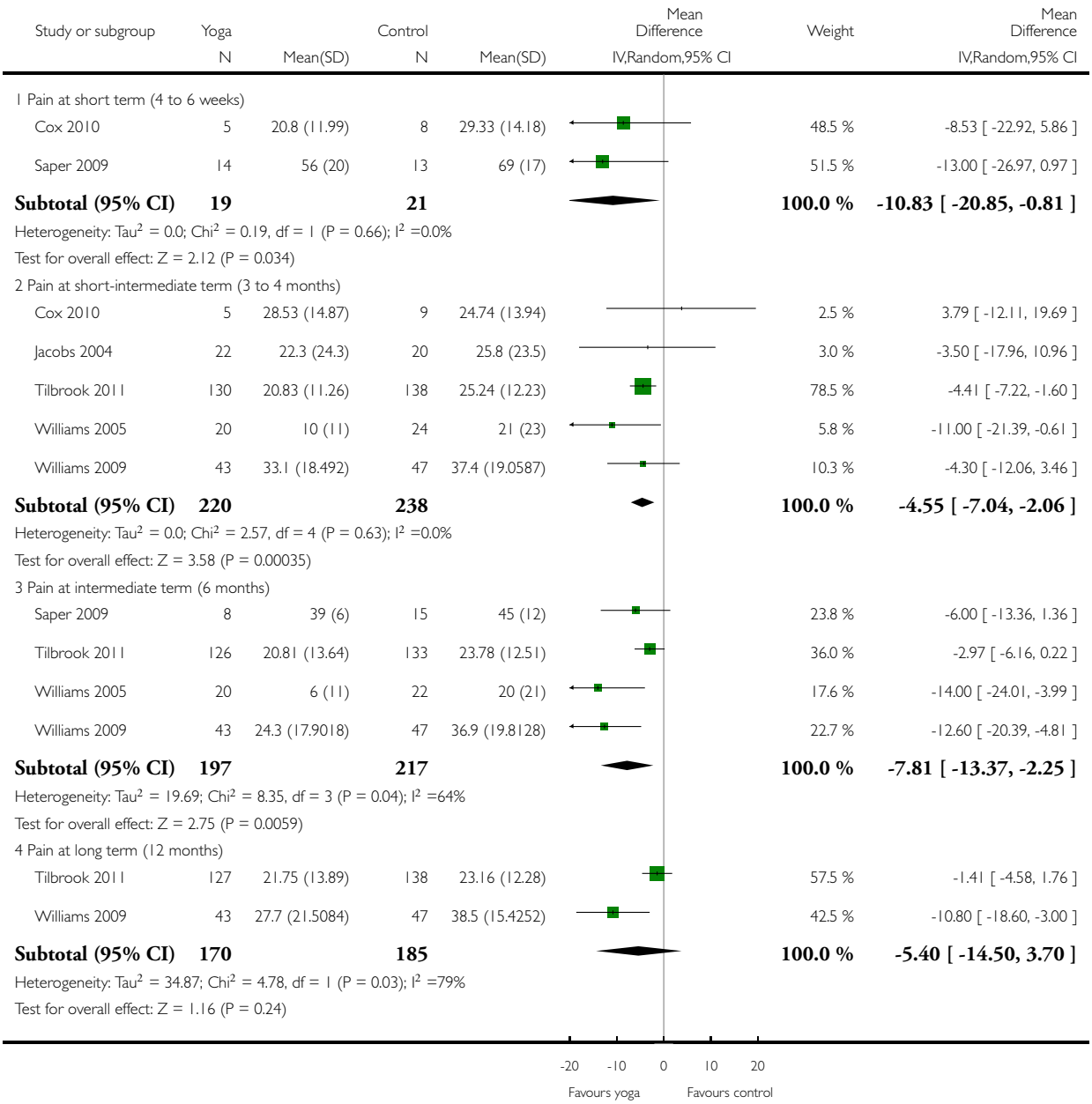
Study or subgroup	Yoga N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
Jacobs 2004	18	4.67 (4.35)	20	4.85 (3.77)		10.7 %	-0.04 [-0.68, 0.59]
Sherman 2005	36	3.08 (4.5)	30	6.34 (4)		14.1 %	-0.75 [-1.25, -0.25]
Sherman 2011	92	4.3 (4.3458)	45	6.6 (3.3285)		18.7 %	-0.57 [-0.93, -0.20]
Tilbrook 2011	136	5.15 (4.88)	141	7.24 (5.45)		23.6 %	-0.40 [-0.64, -0.16]
Williams 2005	20	3.3 (5.1)	24	12.8 (11.9)		10.8 %	-0.99 [-1.62, -0.36]
Williams 2009	43	22.2 (10.49)	47	22.2 (10.9)		16.9 %	0.0 [-0.41, 0.41]
Subtotal (95% CI)	**351**		**316**			**100.0 %**	**-0.40 [-0.66, -0.14]**
Heterogeneity: Tau^2 = 0.06; Chi^2 = 13.06, df = 6 (P = 0.04); I^2 =54%							
Test for overall effect: Z = 2.98 (P = 0.0028)							
3 Back-specific function at intermediate term (6 months)							
Saper 2009	8	6.6 (2.6)	15	8.3 (2.9)		5.6 %	-0.58 [-1.46, 0.29]
Sherman 2005	34	2.99 (4.5)	29	6.61 (4)		13.3 %	-0.84 [-1.35, -0.32]
Sherman 2011	92	4.1 (4.8287)	45	5.7 (3.3285)		21.6 %	-0.36 [-0.72, 0.00]
Tilbrook 2011	138	4.85 (4.75)	137	6.07 (4.89)		32.0 %	-0.25 [-0.49, -0.02]
Williams 2005	20	3.9 (5.3)	22	12.7 (11.4)		9.5 %	-0.96 [-1.60, -0.31]
Williams 2009	43	17.9 (10.49)	47	20.8 (10.28)		18.0 %	-0.28 [-0.69, 0.14]
Subtotal (95% CI)	**335**		**295**			**100.0 %**	**-0.44 [-0.66, -0.22]**
Heterogeneity: Tau^2 = 0.02; Chi^2 = 7.61, df = 5 (P = 0.18); I^2 =34%							
Test for overall effect: Z = 3.96 (P = 0.000076)							
4 Back-specific function at long term (12 months)							
Tilbrook 2011	135	5.22 (5.27)	140	6.43 (5.23)		75.5 %	-0.23 [-0.47, 0.01]
Williams 2009	43	19.3 (12.72)	47	23.5 (12.32)		24.5 %	-0.33 [-0.75, 0.08]
Subtotal (95% CI)	**178**		**187**			**100.0 %**	**-0.26 [-0.46, -0.05]**
Heterogeneity: Tau^2 = 0.0; Chi^2 = 0.18, df = 1 (P = 0.67); I^2 =0.0%							
Test for overall effect: Z = 2.43 (P = 0.015)							

Analysis 1.2. Comparison 1 Yoga versus non-exercise control, Outcome 2 Pain.

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 1 Yoga versus non-exercise control

Outcome: 2 Pain

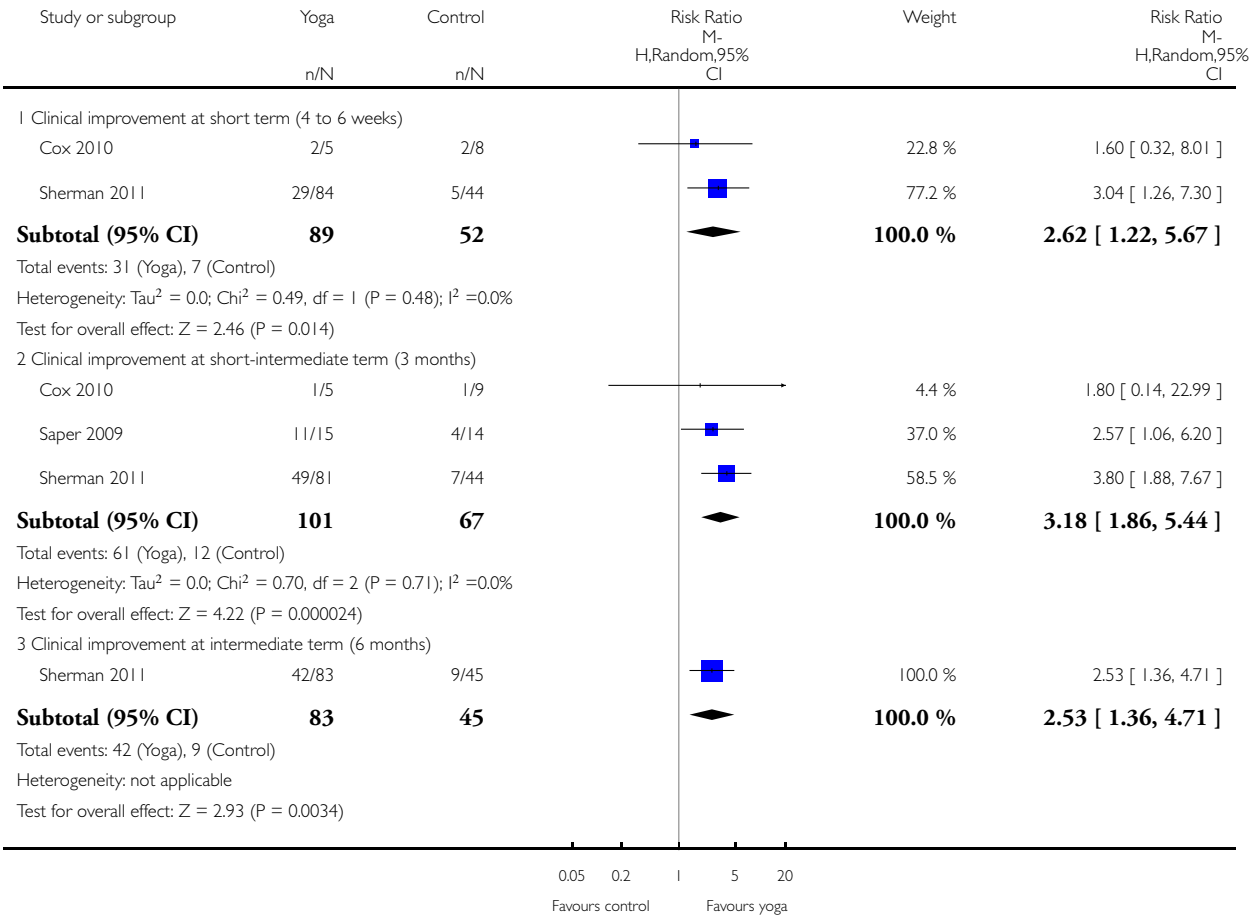


Analysis 1.3. Comparison 1 Yoga versus non-exercise control, Outcome 3 Clinical improvement.

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 1 Yoga versus non-exercise control

Outcome: 3 Clinical improvement

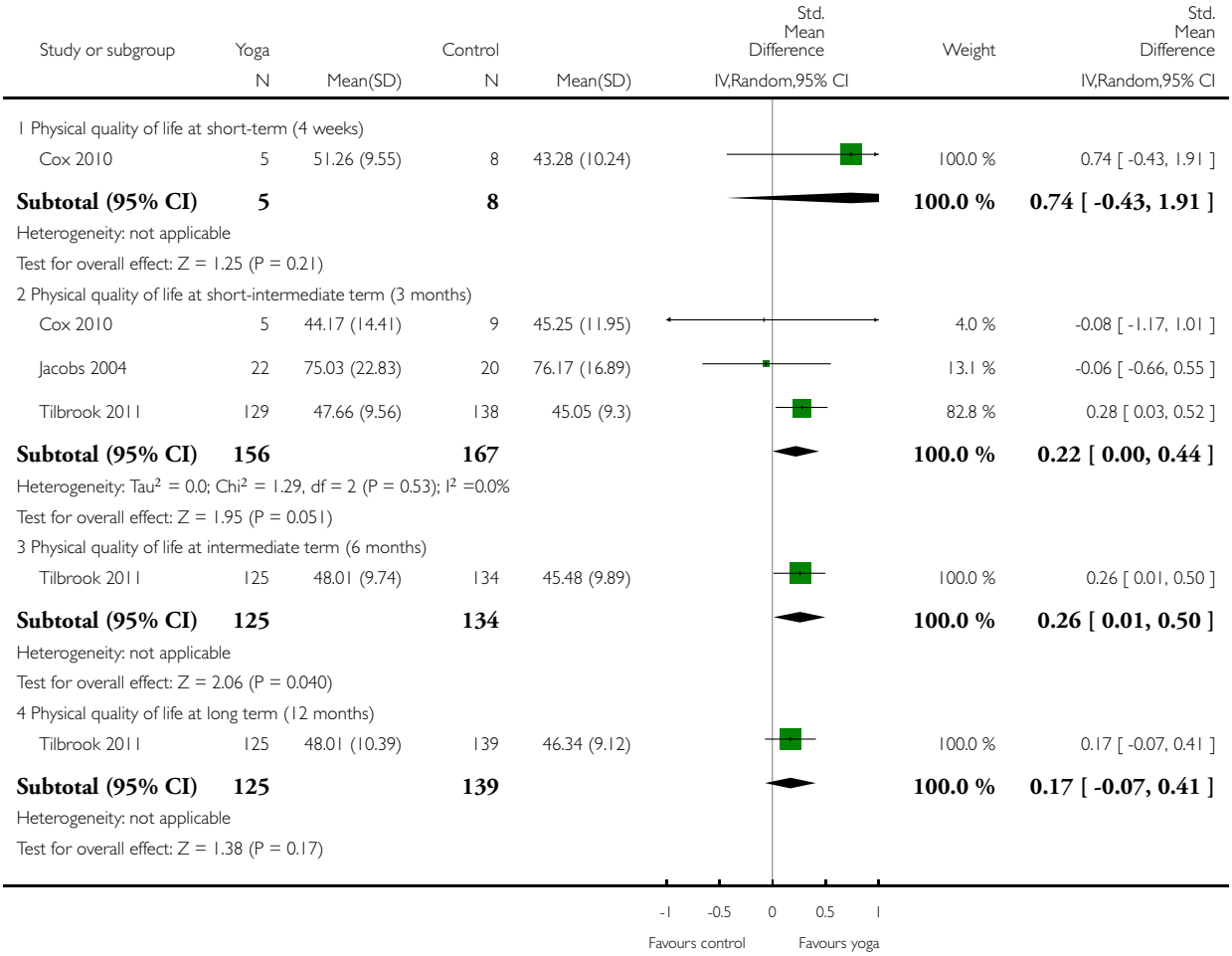


Analysis 1.4. Comparison 1 Yoga versus non-exercise control, Outcome 4 Physical quality of life.

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 1 Yoga versus non-exercise control

Outcome: 4 Physical quality of life

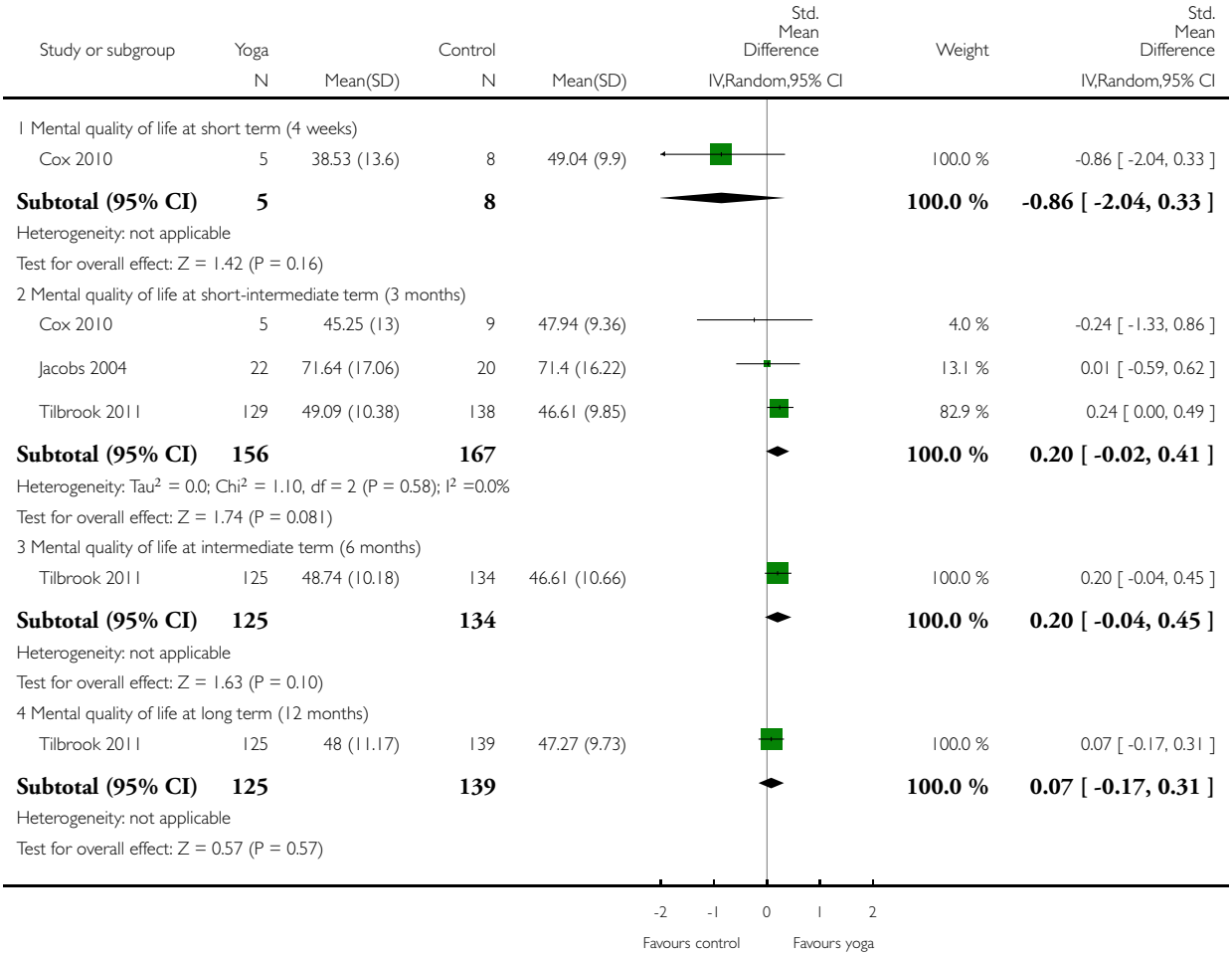


Analysis 1.5. Comparison 1 Yoga versus non-exercise control, Outcome 5 Mental quality of life.

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 1 Yoga versus non-exercise control

Outcome: 5 Mental quality of life

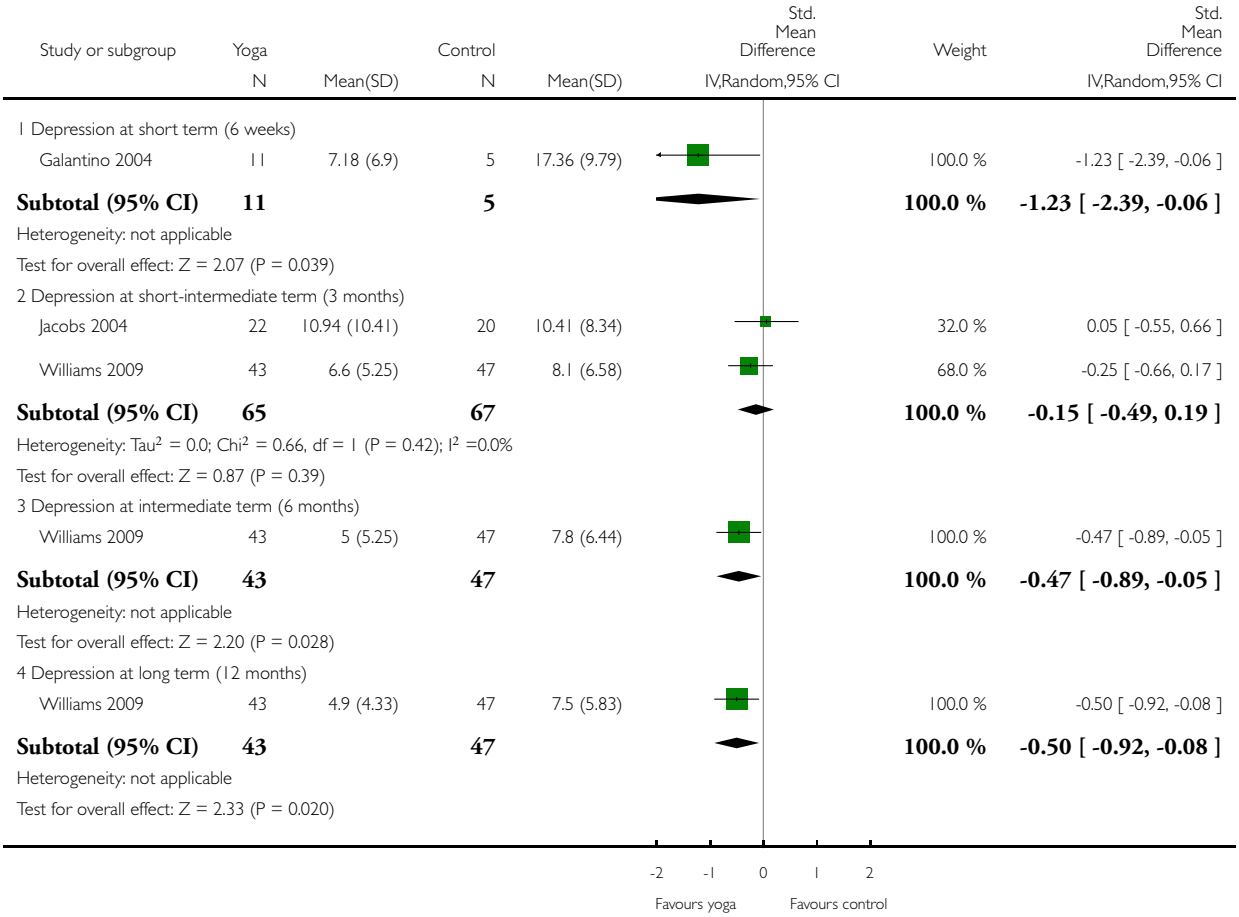


Analysis 1.6. Comparison 1 Yoga versus non-exercise control, Outcome 6 Depression.

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 1 Yoga versus non-exercise control

Outcome: 6 Depression



Analysis 1.7. Comparison 1 Yoga versus non-exercise control, Outcome 7 Adverse events.

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 1 Yoga versus non-exercise control

Outcome: 7 Adverse events

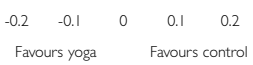
Study or subgroup	Yoga n/N	Control n/N	Risk Difference M-H,Random,95% CI	Weight	Risk Difference M-H,Random,95% CI
Saper 2009	1/15	0/15		3.3 %	0.07 [-0.10, 0.23]
Sherman 2005	1/36	0/30		14.2 %	0.03 [-0.05, 0.11]
Sherman 2011	14/92	1/45		11.9 %	0.13 [0.04, 0.22]
Tilbrook 2011	12/156	2/157		37.1 %	0.06 [0.02, 0.11]
Williams 2005	1/30	0/30		11.3 %	0.03 [-0.05, 0.12]
Williams 2009	1/43	0/47		22.2 %	0.02 [-0.04, 0.08]
Total (95% CI)	**372**	**324**		**100.0 %**	**0.05 [0.02, 0.08]**

Total events: 30 (Yoga), 3 (Control)

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 5.37$, df = 5 (P = 0.37); $I^2 = 7\%$

Test for overall effect: Z = 3.53 (P = 0.00042)

Test for subgroup differences: Not applicable

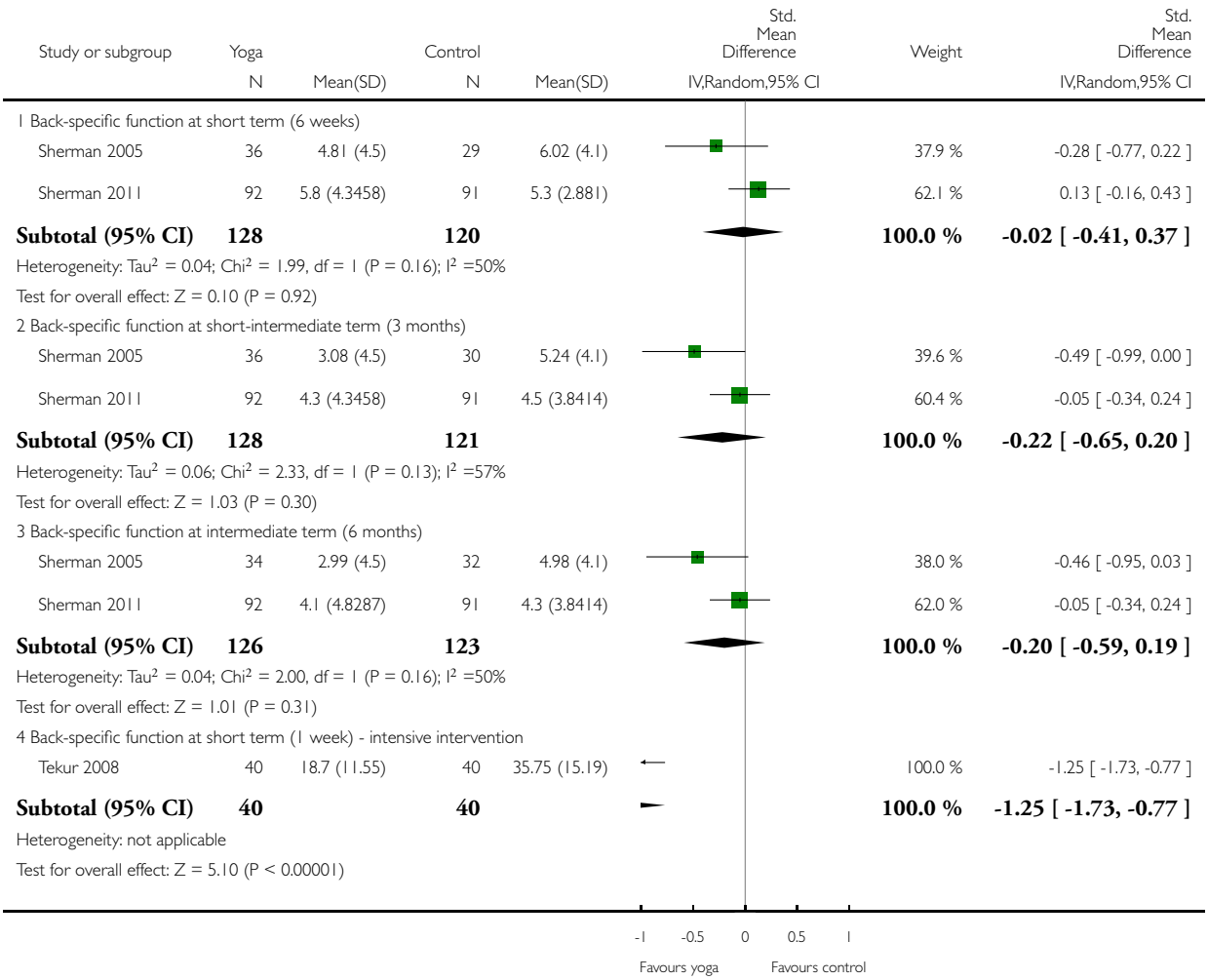


Analysis 2.1. Comparison 2 Yoga versus exercise, Outcome 1 Back-specific function.

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 2 Yoga versus exercise

Outcome: 1 Back-specific function

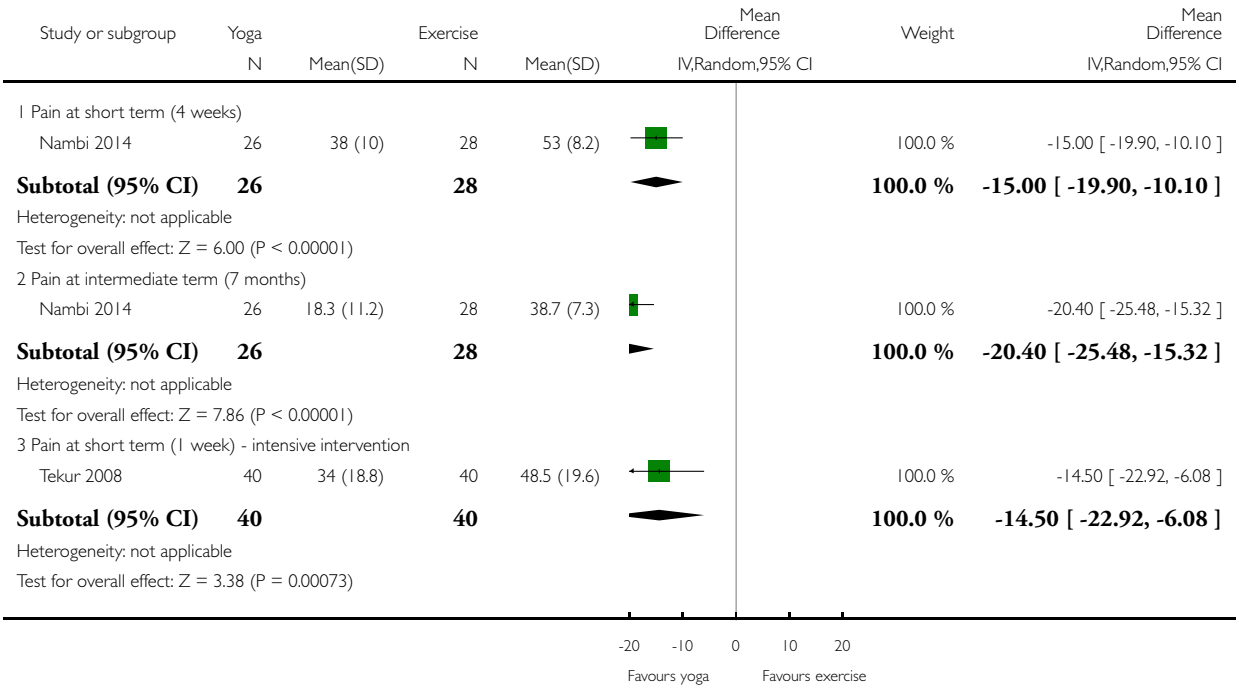


Analysis 2.2. Comparison 2 Yoga versus exercise, Outcome 2 Pain.

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 2 Yoga versus exercise

Outcome: 2 Pain

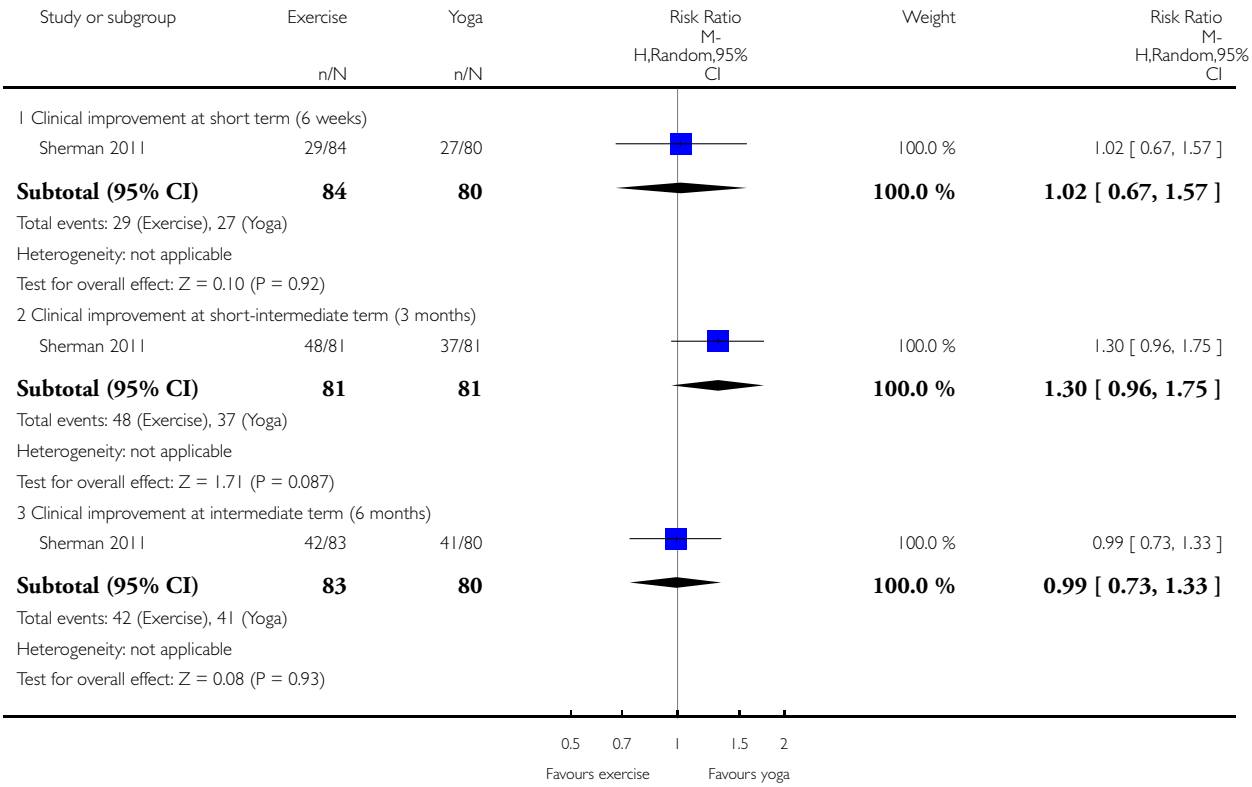


Analysis 2.3. Comparison 2 Yoga versus exercise, Outcome 3 Clinical improvement.

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 2 Yoga versus exercise

Outcome: 3 Clinical improvement

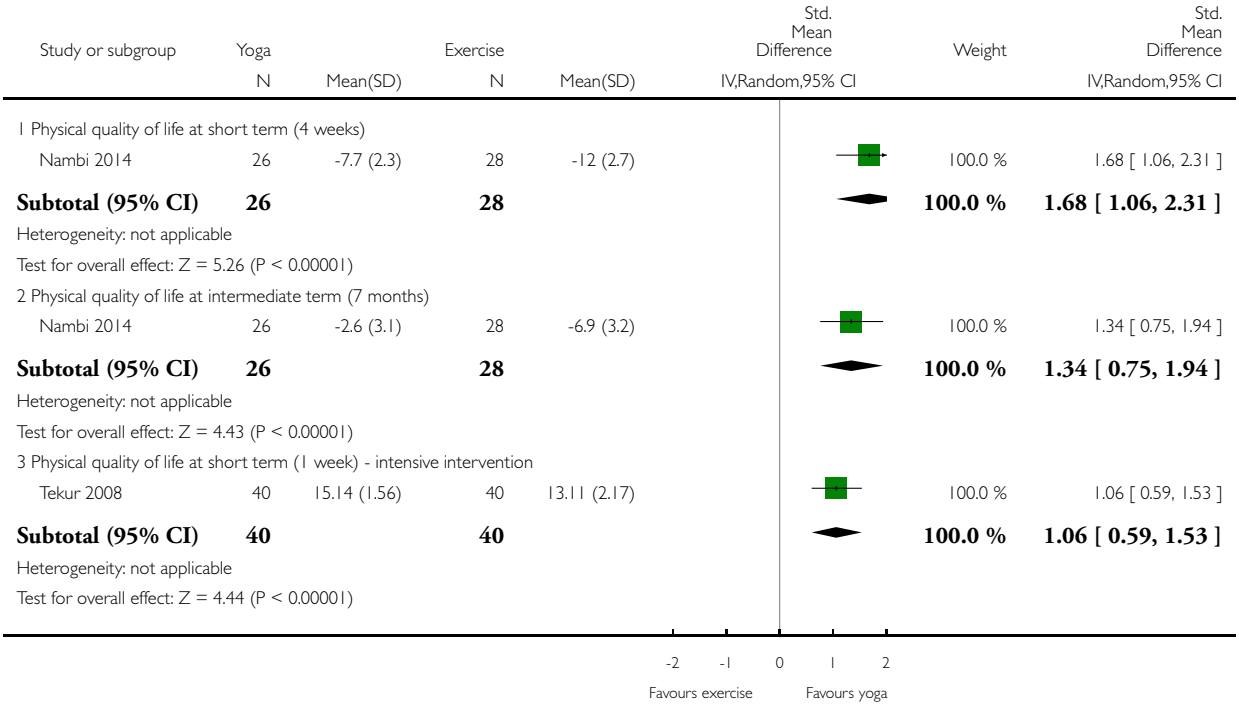


Analysis 2.4. Comparison 2 Yoga versus exercise, Outcome 4 Physical quality of life.

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 2 Yoga versus exercise

Outcome: 4 Physical quality of life

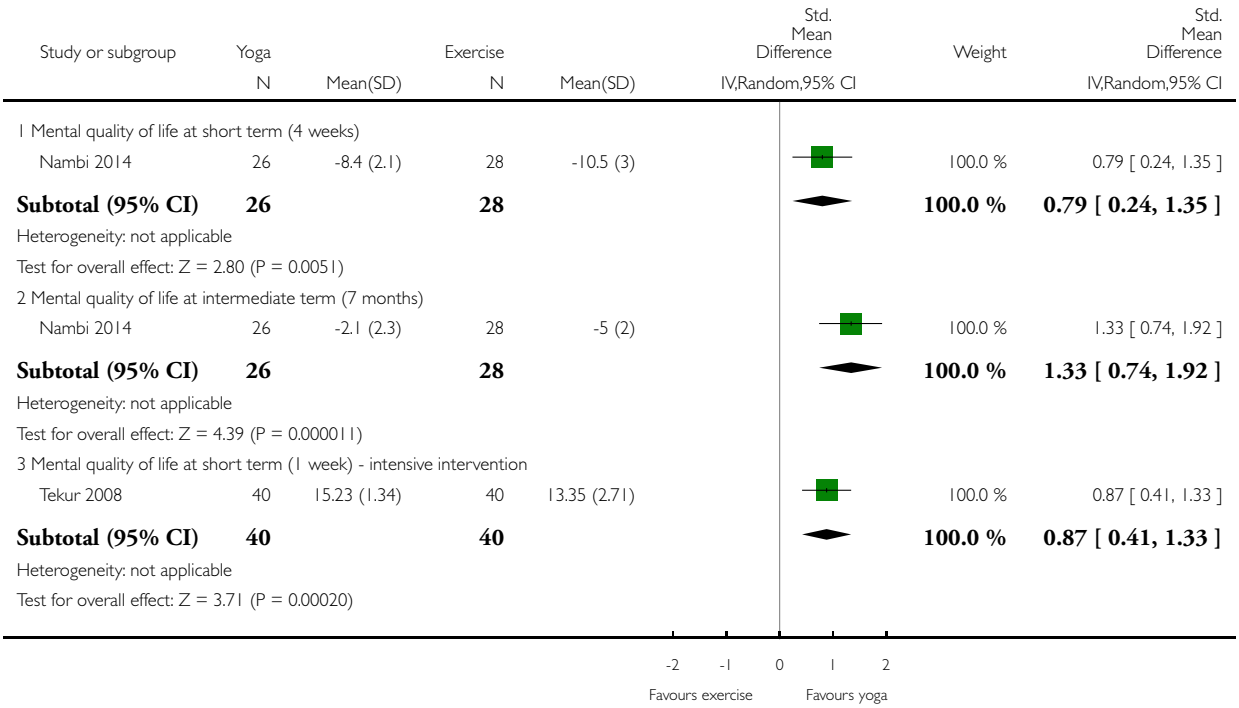


Analysis 2.5. Comparison 2 Yoga versus exercise, Outcome 5 Mental quality of life.

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 2 Yoga versus exercise

Outcome: 5 Mental quality of life

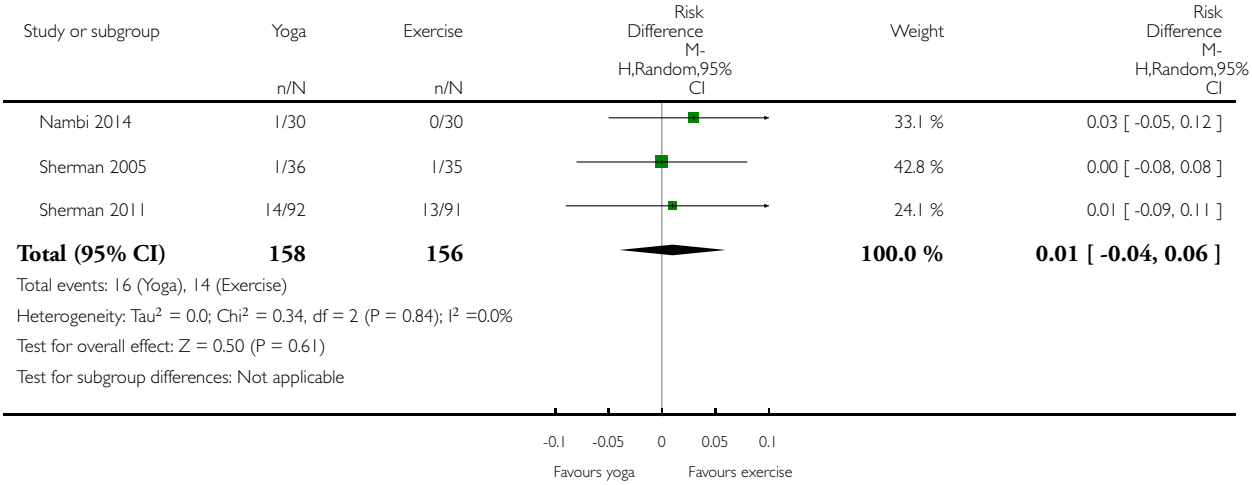


Analysis 2.6. Comparison 2 Yoga versus exercise, Outcome 6 Adverse events.

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 2 Yoga versus exercise

Outcome: 6 Adverse events

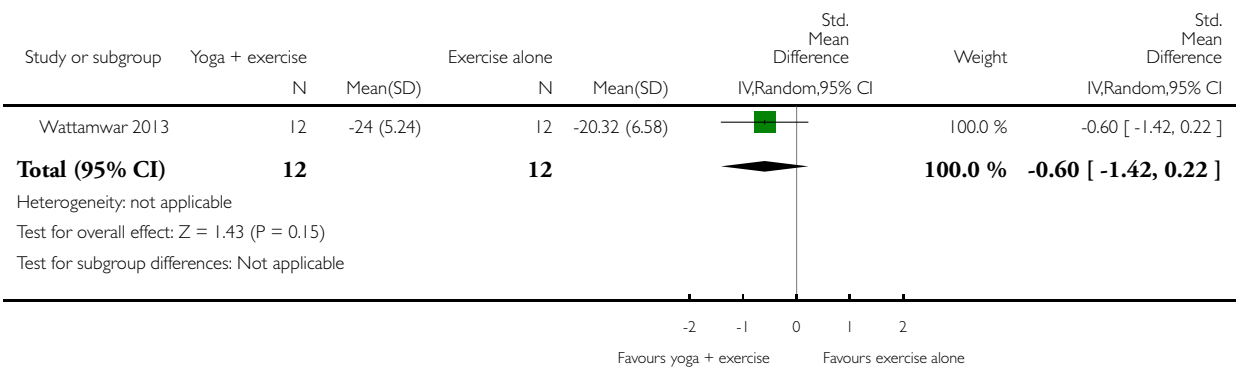


Analysis 3.1. Comparison 3 Yoga plus exercise versus exercise alone, Outcome 1 Back-specific function at short-intermediate term (10 weeks).

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 3 Yoga plus exercise versus exercise alone

Outcome: 1 Back-specific function at short-intermediate term (10 weeks)



Analysis 3.2. Comparison 3 Yoga plus exercise versus exercise alone, Outcome 2 Pain at short-intermediate term (10 weeks).

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 3 Yoga plus exercise versus exercise alone

Outcome: 2 Pain at short-intermediate term (10 weeks)

Study or subgroup	Yoga + exercise		Exercise alone		Mean Difference	Weight	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Random,95% CI		IV,Random,95% CI
Wattamwar 2013	12	-33.2 (13)	12	-30 (13.4)		100.0 %	-3.20 [-13.76, 7.36]
Total (95% CI)	**12**		**12**			**100.0 %**	**-3.20 [-13.76, 7.36]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.59 (P = 0.55)

Test for subgroup differences: Not applicable

Analysis 4.1. Comparison 4 Sensitivity and subgroup analyses for yoga versus non-exercise control, Outcome 1 Back-specific function sensitivity analyses (complete case).

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 4 Sensitivity and subgroup analyses for yoga versus non-exercise control

Outcome: 1 Back-specific function sensitivity analyses (complete case)

Study or subgroup	Yoga N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
1 Back-specific function at short term (4 to 6 weeks) using complete case data							
Cox 2010	5	6.2 (4.82)	8	7.25 (3.99)		5.5 %	-0.23 [-1.35, 0.90]
Galantino 2004	11	21.15 (10.18)	5	38.91 (17.56)		5.0 %	-1.32 [-2.50, -0.14]
Saper 2009	14	10.1 (5.7)	13	12.46 (5.8)		11.9 %	-0.40 [-1.16, 0.37]
Sherman 2005	36	4.81 (4.5)	27	7.63 (4)		26.3 %	-0.65 [-1.16, -0.14]
Sherman 2011	84	6.02 (4.0028)	44	7.26 (4.0028)		51.4 %	-0.31 [-0.67, 0.06]
Subtotal (95% CI)	**150**		**97**			**100.0 %**	**-0.45 [-0.72, -0.19]**
Heterogeneity: Tau² = 0.0; Chi² = 3.40, df = 4 (P = 0.49); I² =0.0%							
Test for overall effect: Z = 3.38 (P = 0.00071)							
2 Back-specific function at short-intermediate term (3 to 4 months) using complete case data							
Cox 2010	6	9 (8.49)	9	6.33 (4.33)		4.7 %	0.40 [-0.65, 1.45]
Jacobs 2004	18	4.67 (4.35)	20	4.85 (3.77)		10.4 %	-0.04 [-0.68, 0.59]
Sherman 2005	36	3.08 (4.5)	30	6.34 (4)		14.2 %	-0.75 [-1.25, -0.25]
Sherman 2011	81	4.31 (3.4371)	44	6.79 (3.1576)		19.1 %	-0.74 [-1.12, -0.36]
Tilbrook 2011	136	5.15 (4.88)	141	7.24 (5.45)		26.5 %	-0.40 [-0.64, -0.16]
Williams 2005	20	3.3 (5.1)	24	12.8 (11.9)		10.5 %	-0.99 [-1.62, -0.36]
Williams 2009	29	19.2 (8.7778)	36	22.6 (11.94)		14.5 %	-0.32 [-0.81, 0.18]
Subtotal (95% CI)	**326**		**304**			**100.0 %**	**-0.49 [-0.73, -0.25]**
Heterogeneity: Tau² = 0.04; Chi² = 10.75, df = 6 (P = 0.10); I² =44%							
Test for overall effect: Z = 3.93 (P = 0.000086)							
3 Back-specific function at intermediate term (6 months) using complete case data							
Saper 2009	8	6.6 (2.6)	15	8.3 (2.9)		6.7 %	-0.58 [-1.46, 0.29]
Sherman 2005	34	2.99 (4.5)	29	6.61 (4)		14.9 %	-0.84 [-1.35, -0.32]
Sherman 2011	83	4.12 (3.8469)	45	5.93 (3.3618)		21.8 %	-0.49 [-0.86, -0.12]
Tilbrook 2011	138	4.85 (4.75)	137	6.07 (4.89)		30.3 %	-0.25 [-0.49, -0.02]
Williams 2005	20	3.9 (5.3)	22	12.7 (11.4)		11.0 %	-0.96 [-1.60, -0.31]
Williams 2009	29	14.4 (6.0314)	36	21.5 (10.98)		15.2 %	-0.77 [-1.28, -0.26]

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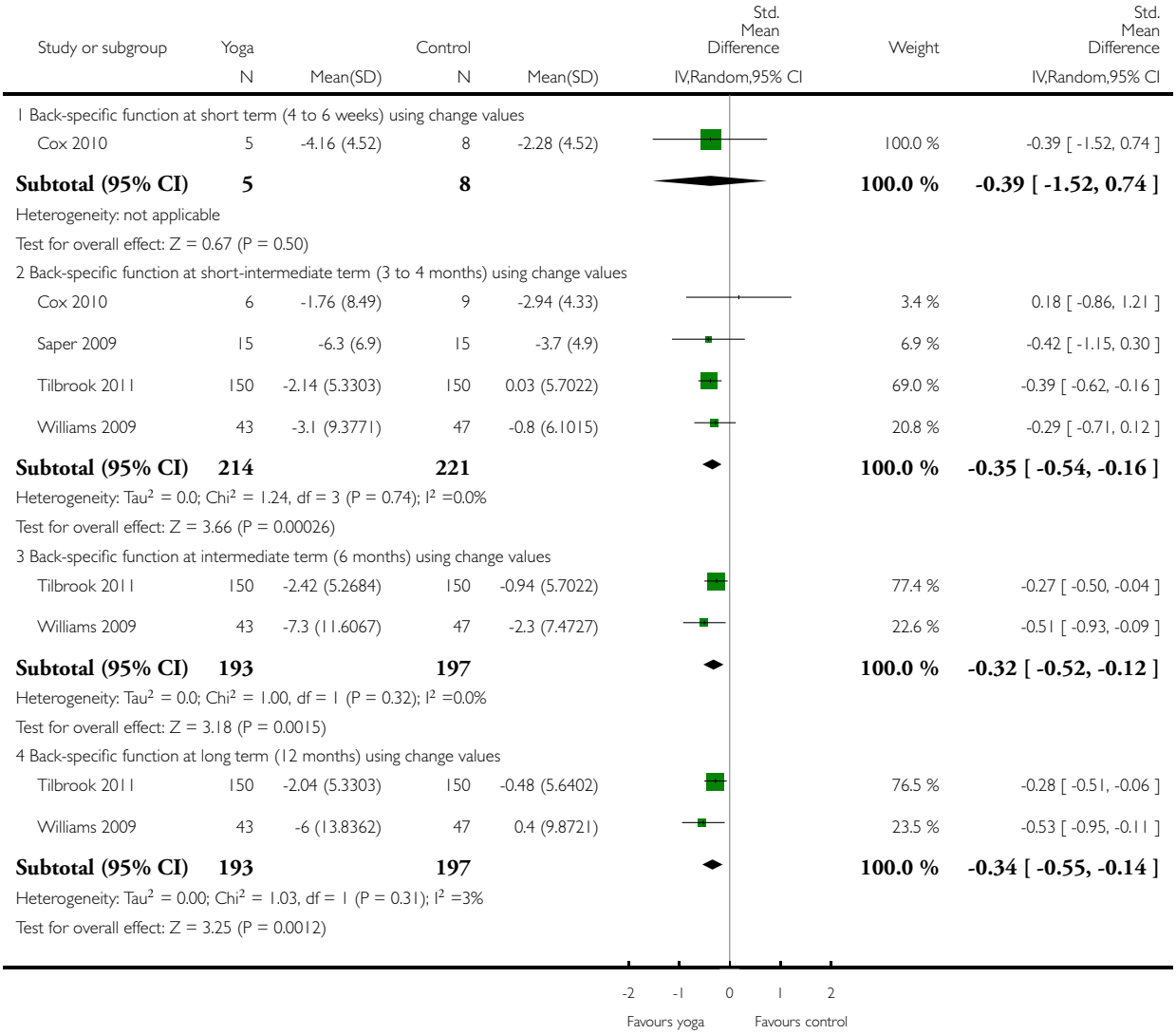
Study or subgroup	Yoga N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
Subtotal (95% CI)	**312**		**284**			**100.0 %**	**-0.57 [-0.82, -0.32]**
Heterogeneity: Tau^2 = 0.04; Chi^2 = 8.75, df = 5 (P = 0.12); I^2 =43%							
Test for overall effect: Z = 4.49 (P < 0.00001)							
4 Back-specific function at long term (12 months) using complete case data							
Tilbrook 2011	135	5.22 (5.27)	140	6.43 (5.23)		72.7 %	-0.23 [-0.47, 0.01]
Williams 2009	29	15.8 (10.7703)	36	22 (10.98)		27.3 %	-0.56 [-1.06, -0.06]
Subtotal (95% CI)	**164**		**176**			**100.0 %**	**-0.32 [-0.61, -0.03]**
Heterogeneity: Tau^2 = 0.02; Chi^2 = 1.39, df = 1 (P = 0.24); I^2 =28%							
Test for overall effect: Z = 2.16 (P = 0.031)							

Analysis 4.2. Comparison 4 Sensitivity and subgroup analyses for yoga versus non-exercise control, Outcome 2 Back-specific function sensitivity analyses (change values).

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 4 Sensitivity and subgroup analyses for yoga versus non-exercise control

Outcome: 2 Back-specific function sensitivity analyses (change values)

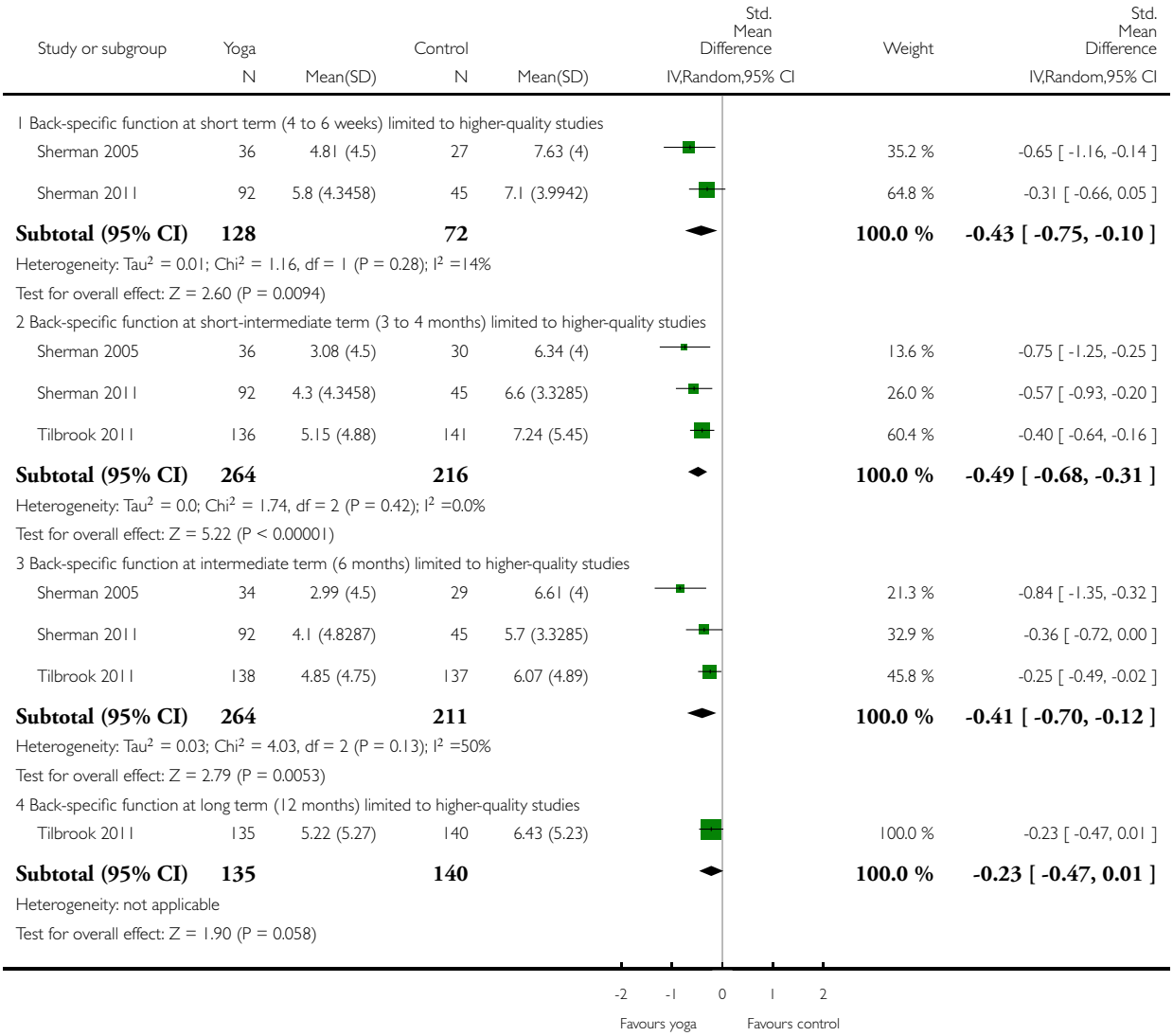


Analysis 4.3. Comparison 4 Sensitivity and subgroup analyses for yoga versus non-exercise control, Outcome 3 Back-specific function sensitivity analyses (higher-quality studies).

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 4 Sensitivity and subgroup analyses for yoga versus non-exercise control

Outcome: 3 Back-specific function sensitivity analyses (higher-quality studies)

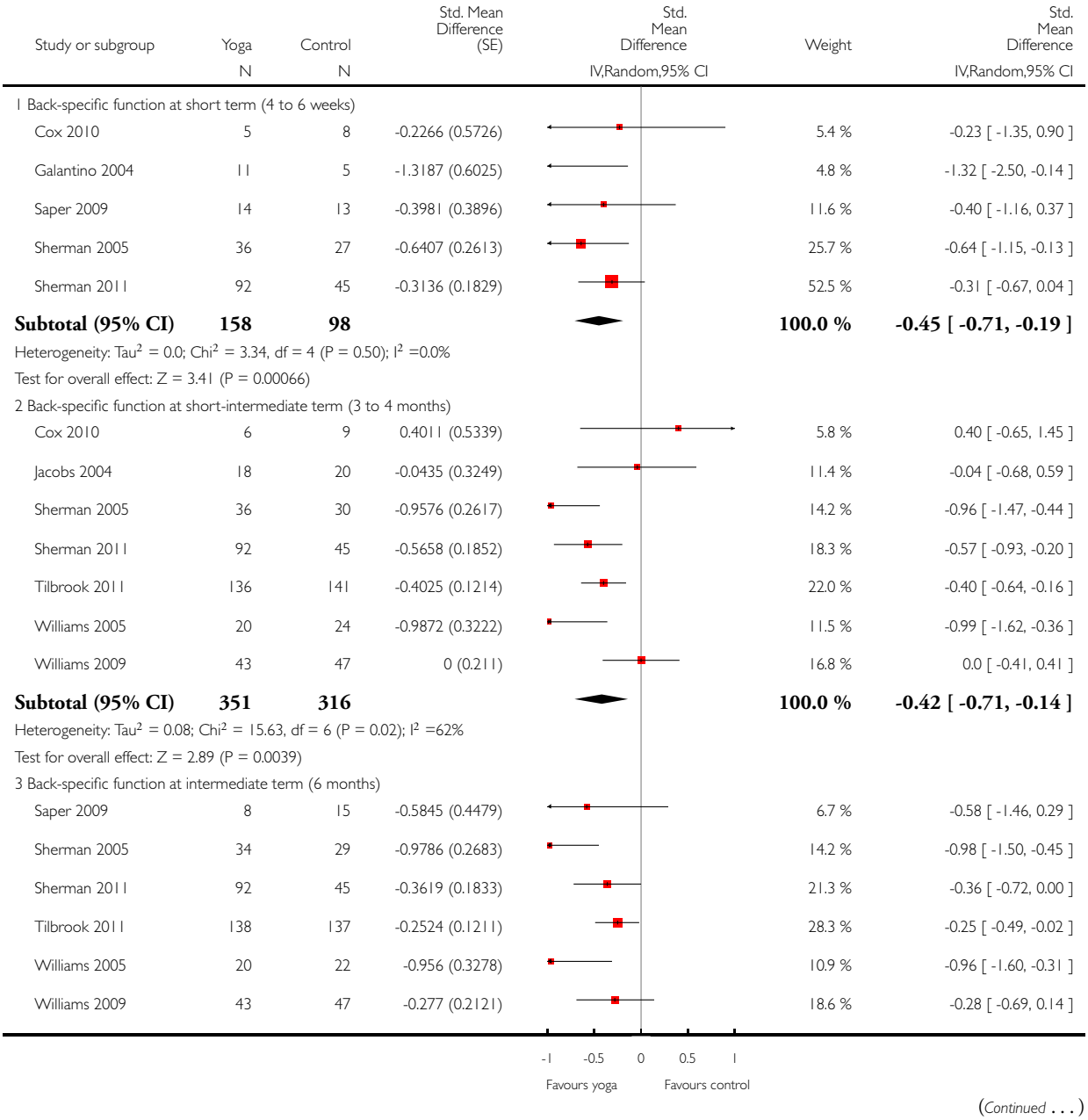


Analysis 4.4. Comparison 4 Sensitivity and subgroup analyses for yoga versus non-exercise control, Outcome 4 Back-specific function sensitivity analyses using generic inverse variance.

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 4 Sensitivity and subgroup analyses for yoga versus non-exercise control

Outcome: 4 Back-specific function sensitivity analyses using generic inverse variance



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Study or subgroup	Yoga N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
Subtotal (95% CI)	**335**	**295**			**100.0 %**	**-0.48 [-0.73, -0.23]**
Heterogeneity: Tau² = 0.04; Chi² = 9.56, df = 5 (P = 0.09); I² =48%						
Test for overall effect: Z = 3.77 (P = 0.00016)						

-1 -0.5 0 0.5 1

Favours yoga Favours control

Analysis 4.5. Comparison 4 Sensitivity and subgroup analyses for yoga versus non-exercise control, Outcome 5 Pain sensitivity analyses (complete case).

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 4 Sensitivity and subgroup analyses for yoga versus non-exercise control

Outcome: 5 Pain sensitivity analyses (complete case)

Study or subgroup	Yoga N	Yoga Mean(SD)	Control N	Control Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 Pain at short-intermediate term (3 to 4 months) using complete case data							
Cox 2010	5	28.53 (14.87)	9	24.74 (13.94)		2.5 %	3.79 [-12.11, 19.69]
Jacobs 2004	22	22.3 (24.3)	20	25.8 (23.5)		3.1 %	-3.50 [-17.96, 10.96]
Tilbrook 2011	130	20.83 (11.26)	138	25.24 (12.23)		80.8 %	-4.41 [-7.22, -1.60]
Williams 2005	20	10 (11)	24	21 (23)		5.9 %	-11.00 [-21.39, -0.61]
Williams 2009	29	29.9 (17.5018)	36	38.4 (19.86)		7.7 %	-8.50 [-17.59, 0.59]
Subtotal (95% CI)	**206**		**227**			**100.0 %**	**-4.88 [-7.41, -2.35]**
Heterogeneity: Tau² = 0.0; Chi² = 3.23, df = 4 (P = 0.52); I² =0.0%							
Test for overall effect: Z = 3.78 (P = 0.00015)							
2 Pain at intermediate term (6 months) using complete case data							
Saper 2009	8	39 (6)	15	45 (12)		24.8 %	-6.00 [-13.36, 1.36]
Tilbrook 2011	126	20.81 (13.64)	133	23.78 (12.51)		30.6 %	-2.97 [-6.16, 0.22]
Williams 2005	20	6 (11)	22	20 (21)		20.7 %	-14.00 [-24.01, -3.99]

-100 -50 0 50 100

Favours yoga Favours control

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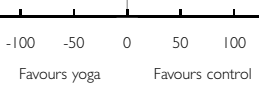
Study or subgroup	Yoga N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
Williams 2009	29	17.5 (12.1166)	36	36.1 (20.4)		23.8 %	-18.60 [-26.59, -10.61]
Subtotal (95% CI)	**183**		**206**			**100.0 %**	**-9.73 [-17.34, -2.13]**
Heterogeneity: Tau^2 = 46.51; Chi^2 = 15.45, df = 3 (P = 0.001); I^2 =81%							
Test for overall effect: Z = 2.51 (P = 0.012)							
3 Pain at long term (12 months) using complete case data							
Tilbrook 2011	127	21.75 (13.89)	138	23.16 (12.28)		55.2 %	-1.41 [-4.58, 1.76]
Williams 2009	29	22.2 (21.3253)	36	38.3 (18.54)		44.8 %	-16.10 [-25.94, -6.26]
Subtotal (95% CI)	**156**		**174**			**100.0 %**	**-7.99 [-22.30, 6.33]**
Heterogeneity: Tau^2 = 93.98; Chi^2 = 7.75, df = 1 (P = 0.01); I^2 =87%							
Test for overall effect: Z = 1.09 (P = 0.27)							

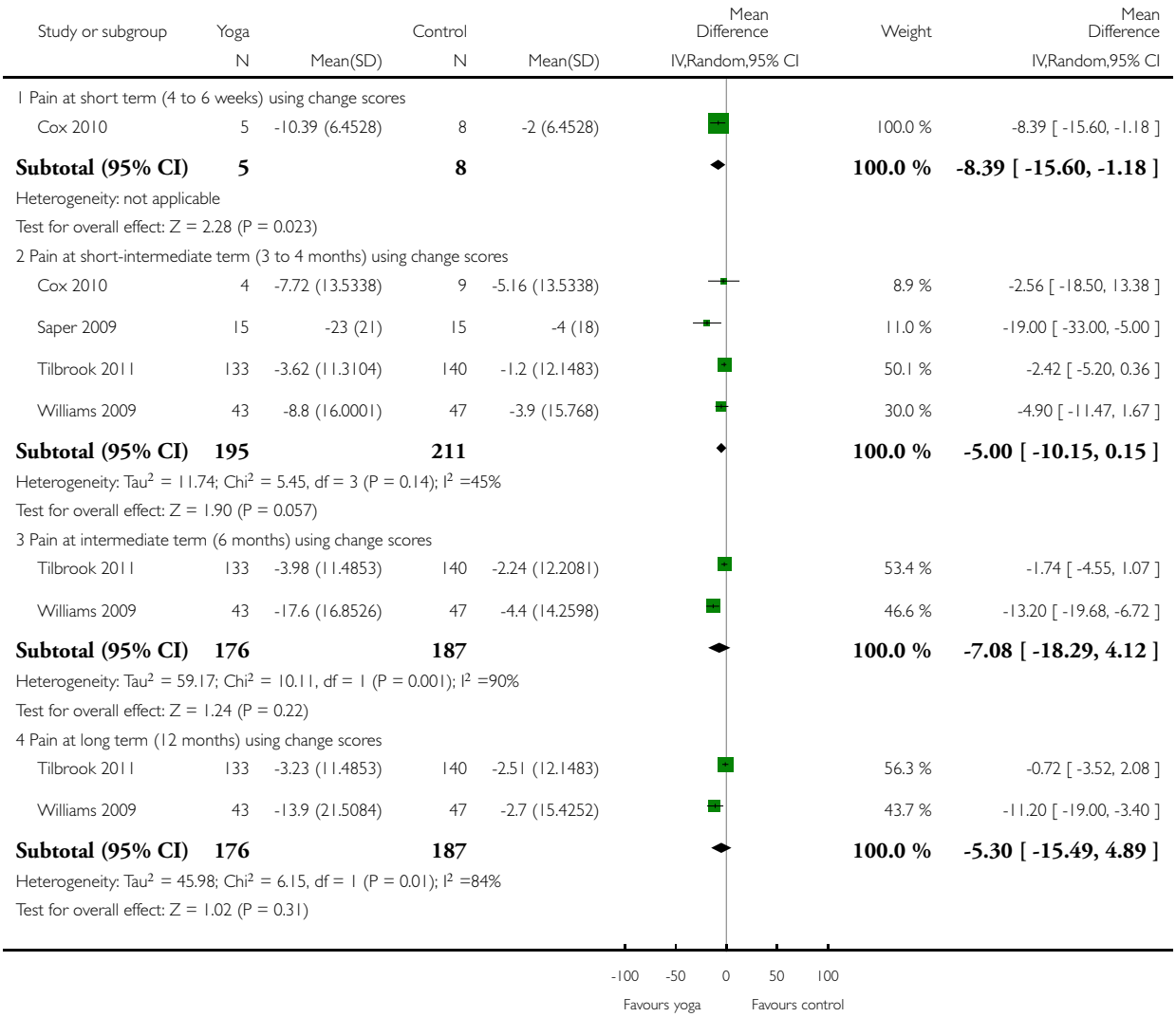


Analysis 4.6. Comparison 4 Sensitivity and subgroup analyses for yoga versus non-exercise control, Outcome 6 Pain sensitivity analyses (change values).

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 4 Sensitivity and subgroup analyses for yoga versus non-exercise control

Outcome: 6 Pain sensitivity analyses (change values)



Analysis 4.7. Comparison 4 Sensitivity and subgroup analyses for yoga versus non-exercise control, Outcome 7 Pain sensitivity analyses (higher-quality studies).

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 4 Sensitivity and subgroup analyses for yoga versus non-exercise control

Outcome: 7 Pain sensitivity analyses (higher-quality studies)

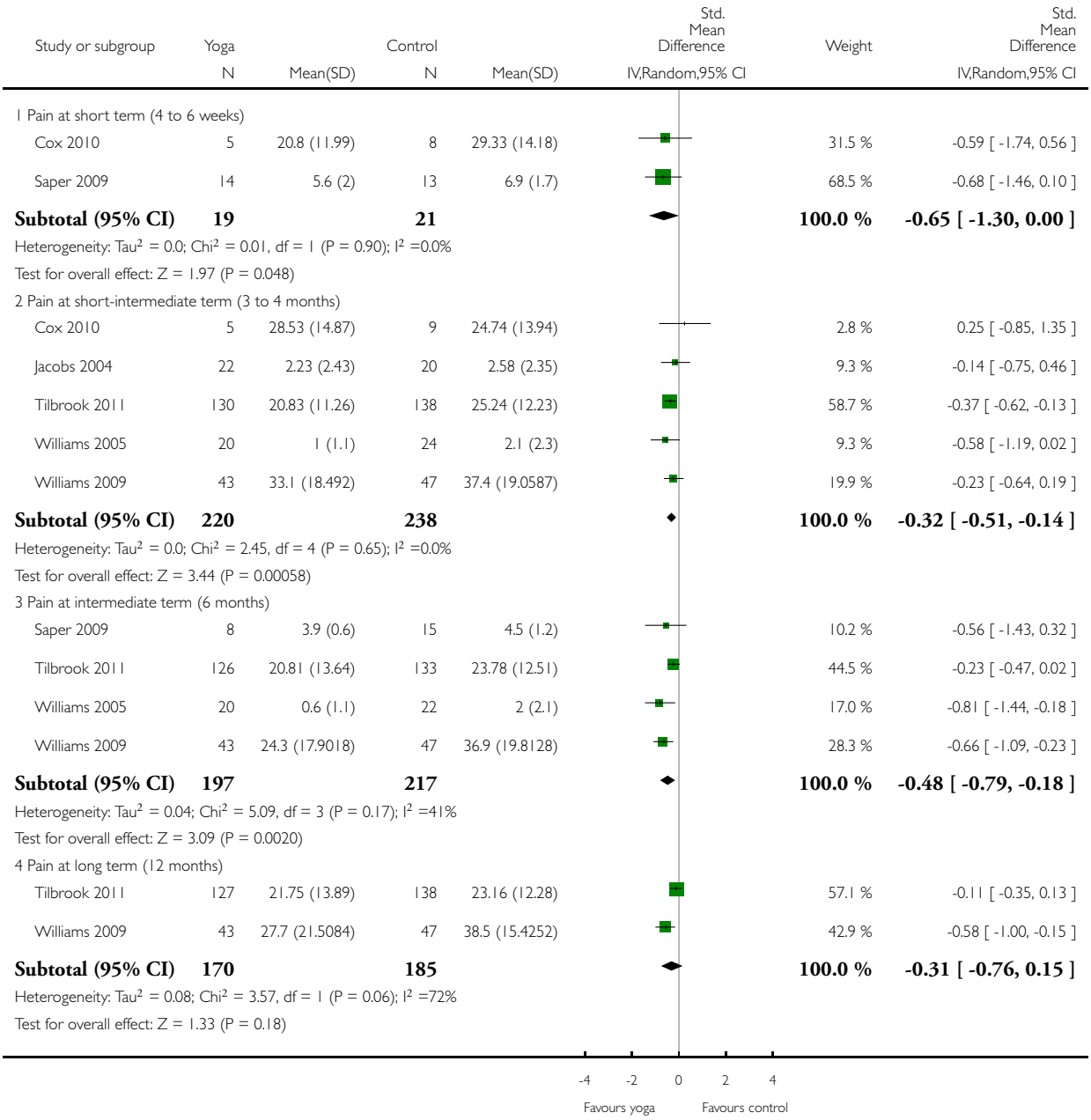
Study or subgroup	Yoga N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 Pain at short-intermediate term (3 to 4 months) limited to higher-quality studies							
Tilbrook 2011	130	20.83 (11.26)	138	25.24 (12.23)		100.0 %	-4.41 [-7.22, -1.60]
Subtotal (95% CI)	**130**		**138**			**100.0 %**	**-4.41 [-7.22, -1.60]**
Heterogeneity: not applicable							
Test for overall effect: Z = 3.07 (P = 0.0021)							
2 Pain at intermediate term (6 months) limited to higher-quality studies							
Tilbrook 2011	126	20.81 (13.64)	133	23.78 (12.51)		100.0 %	-2.97 [-6.16, 0.22]
Subtotal (95% CI)	**126**		**133**			**100.0 %**	**-2.97 [-6.16, 0.22]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.82 (P = 0.068)							
3 Pain at long term (12 months) limited to higher-quality studies							
Tilbrook 2011	127	21.75 (13.89)	138	23.16 (12.28)		100.0 %	-1.41 [-4.58, 1.76]
Subtotal (95% CI)	**127**		**138**			**100.0 %**	**-1.41 [-4.58, 1.76]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.87 (P = 0.38)							

Analysis 4.8. Comparison 4 Sensitivity and subgroup analyses for yoga versus non-exercise control, Outcome 8 Pain sensitivity analyses (standardized mean difference).

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 4 Sensitivity and subgroup analyses for yoga versus non-exercise control

Outcome: 8 Pain sensitivity analyses (standardized mean difference)

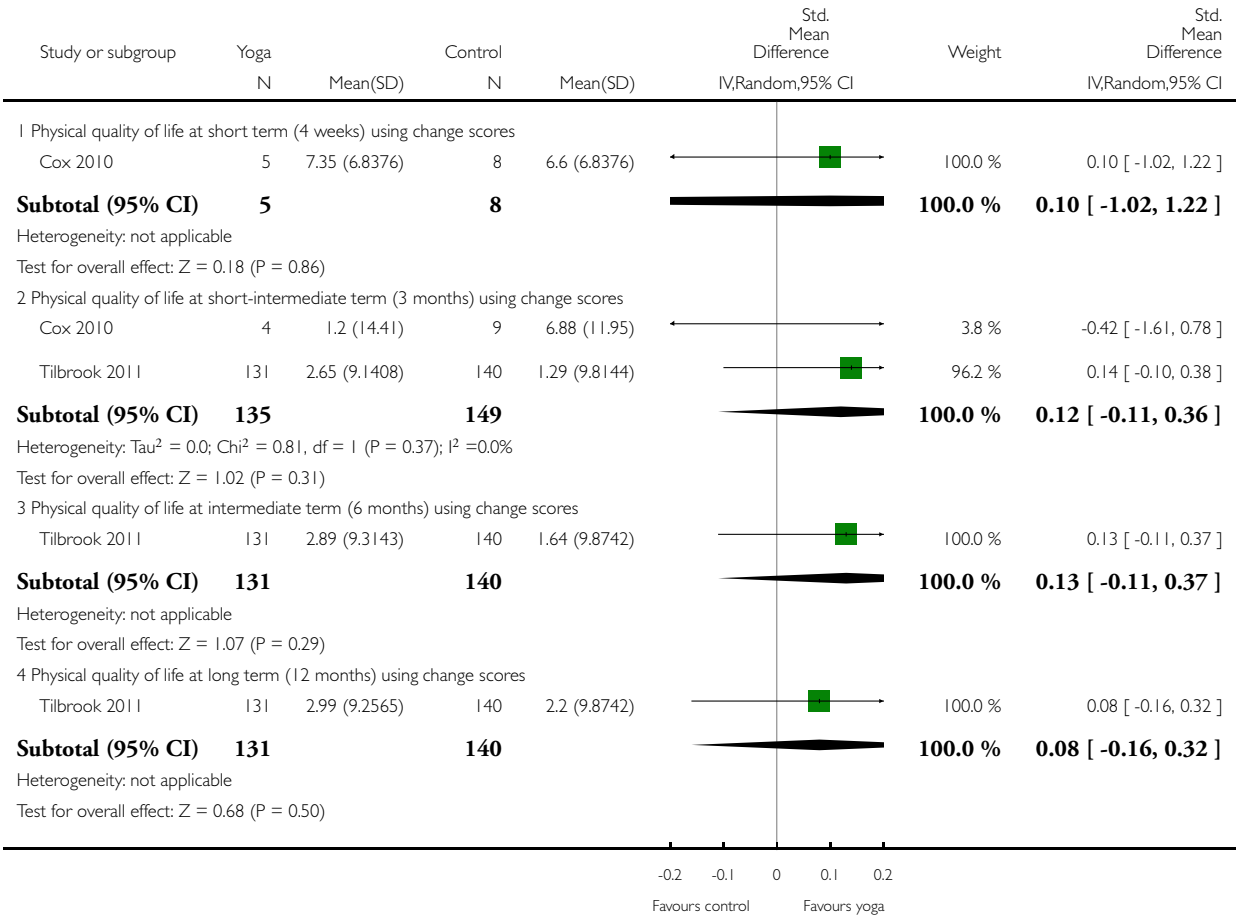


Analysis 4.9. Comparison 4 Sensitivity and subgroup analyses for yoga versus non-exercise control, Outcome 9 Physical quality of life sensitivity analyses (change values).

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 4 Sensitivity and subgroup analyses for yoga versus non-exercise control

Outcome: 9 Physical quality of life sensitivity analyses (change values)



Analysis 4.10. Comparison 4 Sensitivity and subgroup analyses for yoga versus non-exercise control, Outcome 10 Physical quality of life sensitivity analyses (higher-quality studies).

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 4 Sensitivity and subgroup analyses for yoga versus non-exercise control

Outcome: 10 Physical quality of life sensitivity analyses (higher-quality studies)

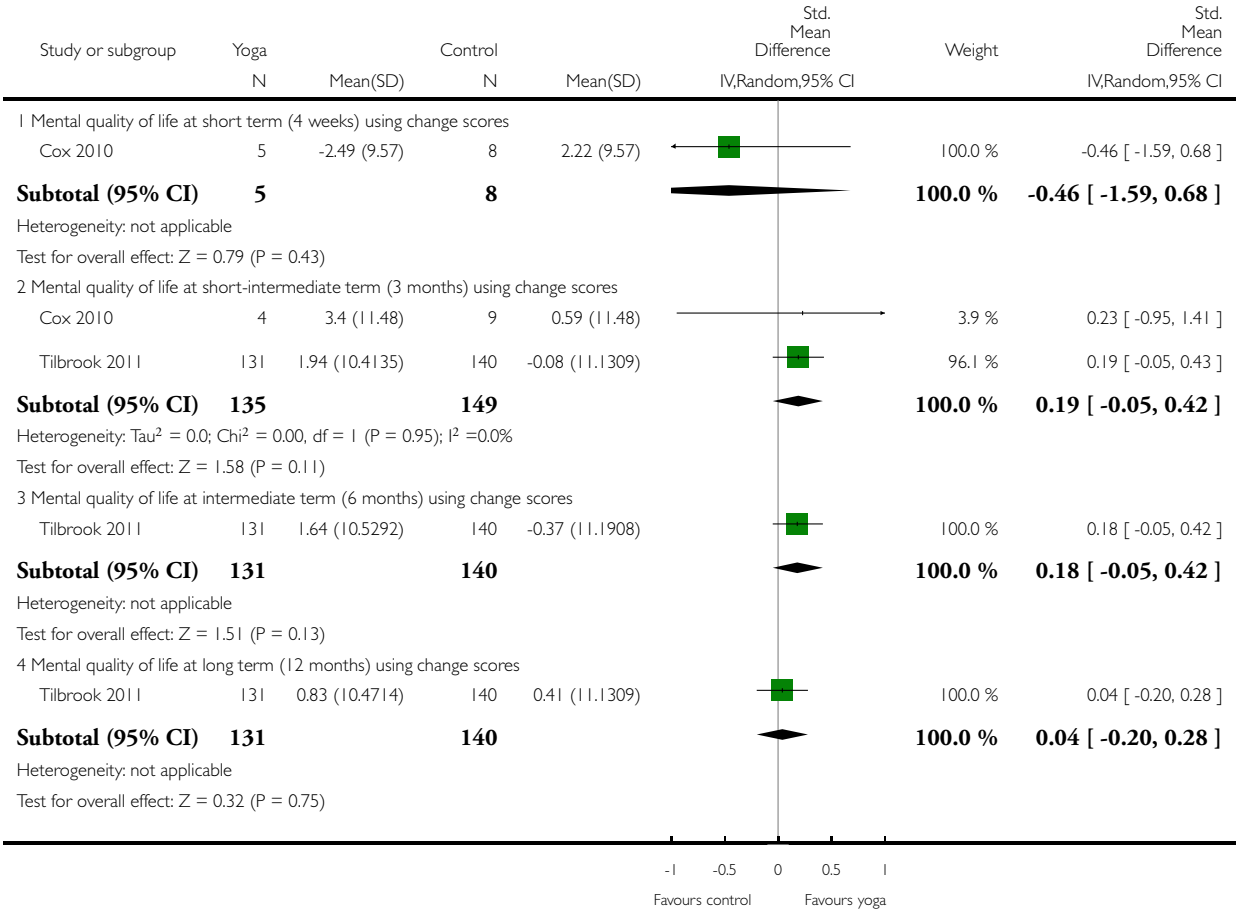
Study or subgroup	Yoga N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
1 Physical quality of life at short-intermediate term (3 months) limited to higher-quality studies							
Tilbrook 2011	129	47.66 (9.56)	138	45.05 (9.3)		100.0 %	0.28 [0.03, 0.52]
Subtotal (95% CI)	**129**		**138**			**100.0 %**	**0.28 [0.03, 0.52]**
Heterogeneity: not applicable							
Test for overall effect: Z = 2.24 (P = 0.025)							

Analysis 4.11. Comparison 4 Sensitivity and subgroup analyses for yoga versus non-exercise control, Outcome 11 Mental quality of life sensitivity analyses (change values).

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 4 Sensitivity and subgroup analyses for yoga versus non-exercise control

Outcome: 11 Mental quality of life sensitivity analyses (change values)



Analysis 4.12. Comparison 4 Sensitivity and subgroup analyses for yoga versus non-exercise control, Outcome 12 Depression sensitivity analyses (complete case).

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 4 Sensitivity and subgroup analyses for yoga versus non-exercise control

Outcome: 12 Depression sensitivity analyses (complete case)

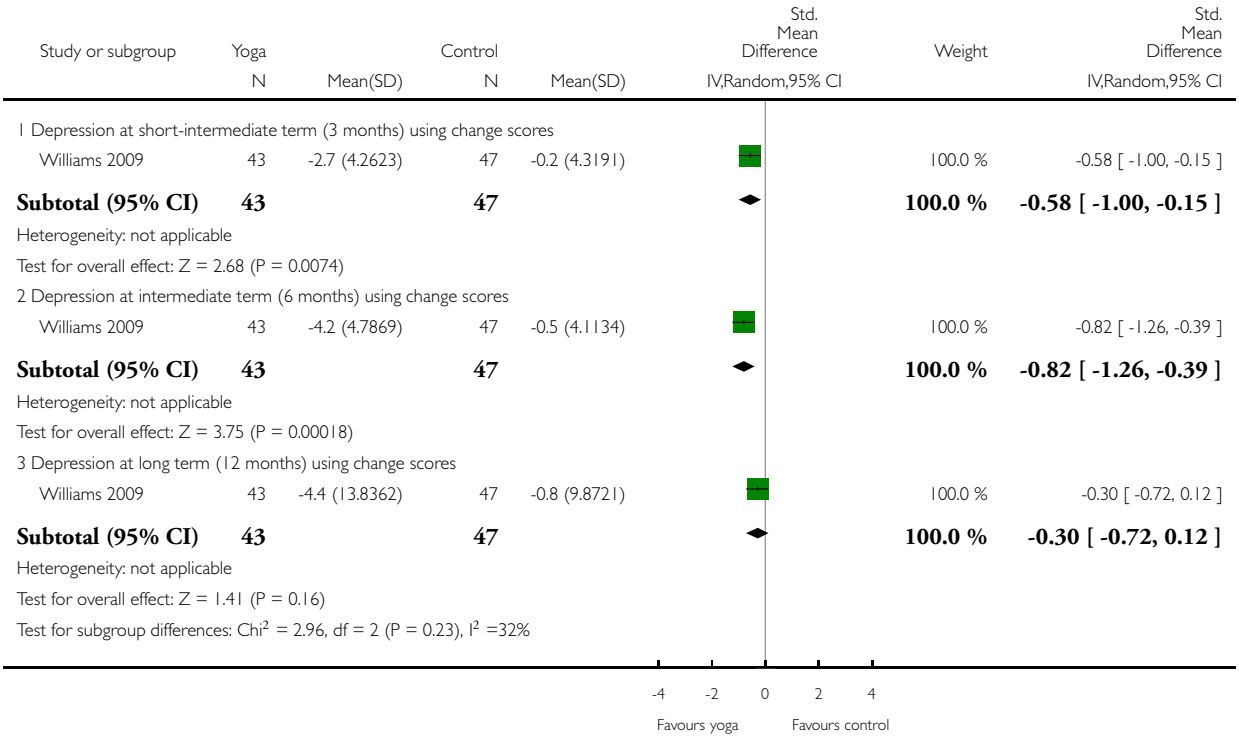
Study or subgroup	Yoga N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
1 Depression at short-intermediate term (3 months) using complete case data							
Jacobs 2004	22	10.94 (10.41)	20	10.41 (8.34)		43.1 %	0.05 [-0.55, 0.66]
Williams 2009	29	5.8 (4.7389)	36	8.4 (6.9)		56.9 %	-0.43 [-0.92, 0.07]
Subtotal (95% CI)	**51**		**56**			**100.0 %**	**-0.22 [-0.68, 0.25]**
Heterogeneity: Tau^2 = 0.04; Chi^2 = 1.45, df = 1 (P = 0.23); I^2 =31%							
Test for overall effect: Z = 0.92 (P = 0.36)							
2 Depression at intermediate term (6 months) using complete case data							
Williams 2009	29	4 (4.3081)	36	8.4 (6.72)		100.0 %	-0.75 [-1.26, -0.25]
Subtotal (95% CI)	**29**		**36**			**100.0 %**	**-0.75 [-1.26, -0.25]**
Heterogeneity: not applicable							
Test for overall effect: Z = 2.91 (P = 0.0036)							
3 Depression at long term (12 months) using complete case data							
Williams 2009	29	4.6 (4.5235)	36	7.8 (6)		100.0 %	-0.59 [-1.09, -0.09]
Subtotal (95% CI)	**29**		**36**			**100.0 %**	**-0.59 [-1.09, -0.09]**
Heterogeneity: not applicable							
Test for overall effect: Z = 2.30 (P = 0.022)							
Test for subgroup differences: Chi^2 = 2.47, df = 2 (P = 0.29), I^2 =19%							

Analysis 4.13. Comparison 4 Sensitivity and subgroup analyses for yoga versus non-exercise control, Outcome 13 Depression sensitivity analyses (change values).

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 4 Sensitivity and subgroup analyses for yoga versus non-exercise control

Outcome: 13 Depression sensitivity analyses (change values)



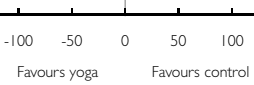
Analysis 4.14. Comparison 4 Sensitivity and subgroup analyses for yoga versus non-exercise control, Outcome 14 Subgroup analysis by socioeconomic status (SES) for back-specific function and pain.

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 4 Sensitivity and subgroup analyses for yoga versus non-exercise control

Outcome: 14 Subgroup analysis by socioeconomic status (SES) for back-specific function and pain

Study or subgroup	Yoga N	Mean(SD)	Non-exercise control N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
1 Back-specific function at 4 to 6 weeks: participants not low SES							
Galantino 2004	11	21.15 (10.18)	5	38.91 (17.56)		10.8 %	-1.32 [-2.50, -0.14]
Sherman 2005	36	4.81 (4.5)	27	7.63 (4)		37.1 %	-0.65 [-1.16, -0.14]
Sherman 2011	92	5.8 (4.3458)	45	7.1 (3.9942)		52.1 %	-0.31 [-0.66, 0.05]
Subtotal (95% CI)	**139**		**77**			**100.0 %**	**-0.54 [-0.96, -0.13]**
Heterogeneity: Tau^2 = 0.05; Chi^2 = 3.26, df = 2 (P = 0.20); I^2 =39%							
Test for overall effect: Z = 2.55 (P = 0.011)							
2 Back-specific function at 4 to 6 weeks: participants low SES							
Saper 2009	14	10.1 (5.7)	13	12.46 (5.8)		100.0 %	-0.40 [-1.16, 0.37]
Subtotal (95% CI)	**14**		**13**			**100.0 %**	**-0.40 [-1.16, 0.37]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.02 (P = 0.31)							
3 Back-specific function at 6 to 7 months: participants not low SES							
Sherman 2005	34	2.99 (4.5)	29	6.61 (4)		14.9 %	-0.84 [-1.35, -0.32]
Sherman 2011	92	4.1 (4.8287)	45	5.7 (3.3285)		22.9 %	-0.36 [-0.72, 0.00]
Tilbrook 2011	138	4.85 (4.75)	137	6.07 (4.89)		31.7 %	-0.25 [-0.49, -0.02]
Williams 2005	20	3.9 (5.3)	22	12.7 (11.4)		10.9 %	-0.96 [-1.60, -0.31]
Williams 2009	43	17.9 (10.49)	47	20.8 (10.28)		19.6 %	-0.28 [-0.69, 0.14]
Subtotal (95% CI)	**327**		**280**			**100.0 %**	**-0.45 [-0.69, -0.20]**
Heterogeneity: Tau^2 = 0.03; Chi^2 = 7.42, df = 4 (P = 0.12); I^2 =46%							
Test for overall effect: Z = 3.58 (P = 0.00034)							
4 Back-specific function at 6 to 7 months: participants low SES							
Saper 2009	8	6.6 (2.6)	15	8.3 (2.9)		100.0 %	-0.58 [-1.46, 0.29]
Subtotal (95% CI)	**8**		**15**			**100.0 %**	**-0.58 [-1.46, 0.29]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.30 (P = 0.19)							
5 Pain at 6 to 7 months: participants not low SES							
Tilbrook 2011	126	20.81 (13.64)	133	23.78 (12.51)		45.7 %	-0.23 [-0.47, 0.02]
Williams 2005	20	0.6 (1.1)	22	2 (2.1)		21.6 %	-0.81 [-1.44, -0.18]



(*Continued . . .*)

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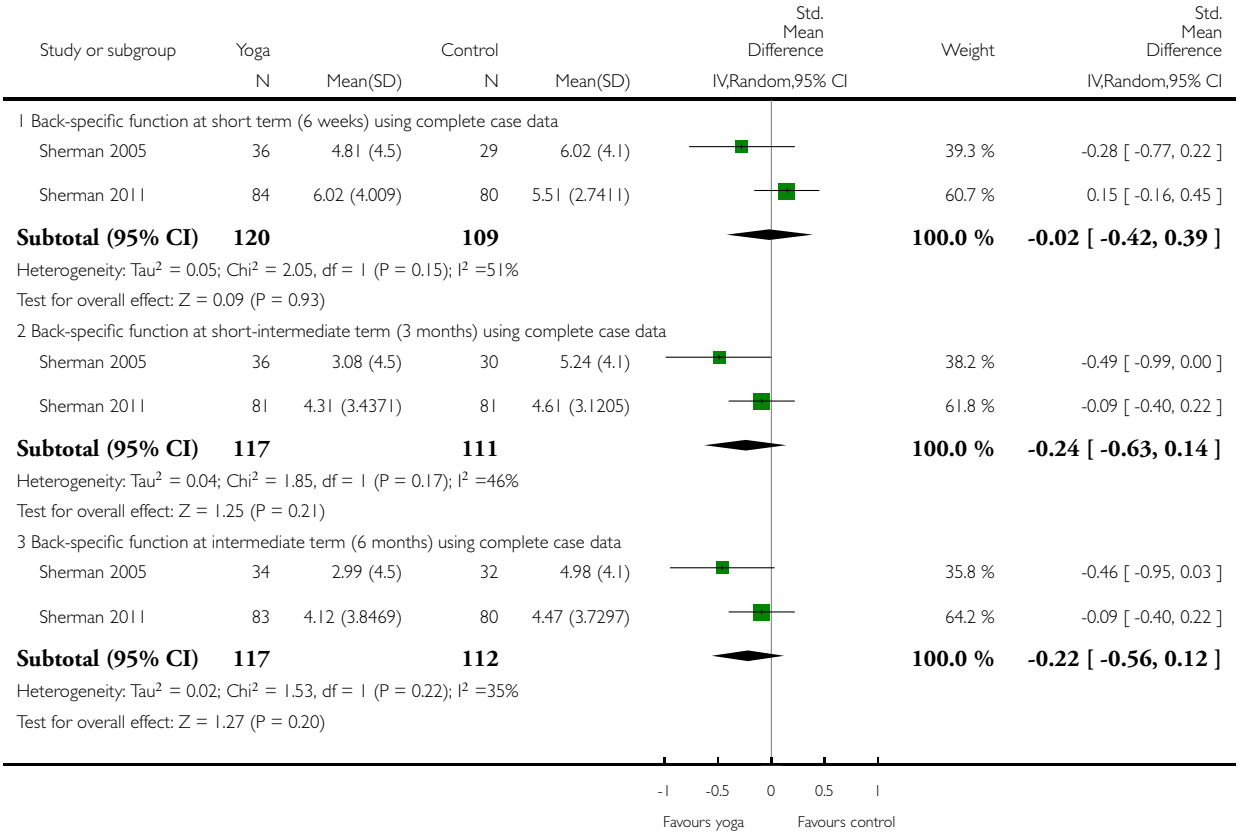
Study or subgroup	Yoga N	Mean(SD)	Non-exercise control N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
Williams 2009	43	24.3 (17.9018)	47	36.9 (19.8128)		32.7 %	-0.66 [-1.09, -0.23]
Subtotal (95% CI)	**189**		**202**			**100.0 %**	**-0.49 [-0.87, -0.12]**
Heterogeneity: Tau^2 = 0.06; Chi^2 = 4.94, df = 2 (P = 0.08); I^2 =60%							
Test for overall effect: Z = 2.59 (P = 0.0095)							
6 Pain at 6 to 7 months: participants low SES							
Saper 2009	8	3.9 (0.6)	15	4.5 (1.2)		100.0 %	-0.56 [-1.43, 0.32]
Subtotal (95% CI)	**8**		**15**			**100.0 %**	**-0.56 [-1.43, 0.32]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.24 (P = 0.21)							

Analysis 5.1. Comparison 5 Sensitivity analyses for yoga versus exercise, Outcome 1 Back-specific function sensitivity analyses (complete case).

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 5 Sensitivity analyses for yoga versus exercise

Outcome: 1 Back-specific function sensitivity analyses (complete case)

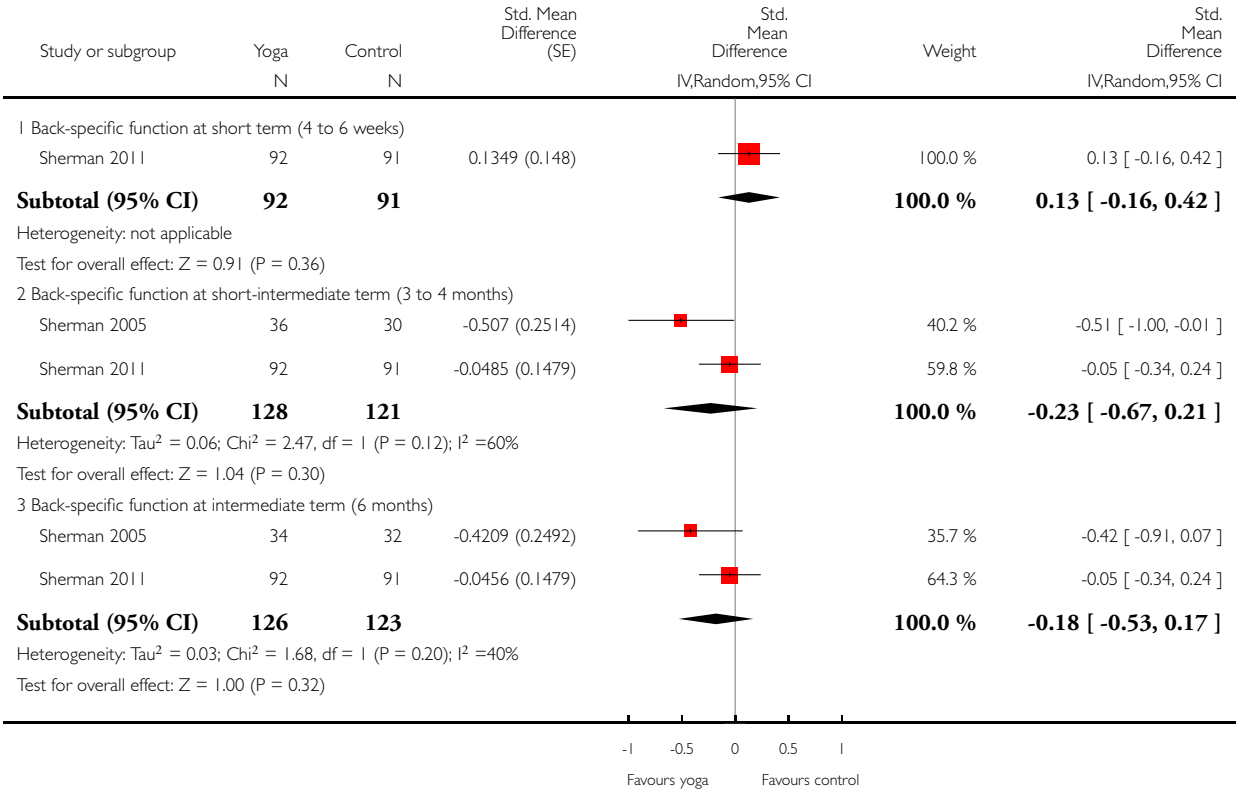


Analysis 5.2. Comparison 5 Sensitivity analyses for yoga versus exercise, Outcome 2 Back-specific function sensitivity analyses using generic inverse variance.

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 5 Sensitivity analyses for yoga versus exercise

Outcome: 2 Back-specific function sensitivity analyses using generic inverse variance

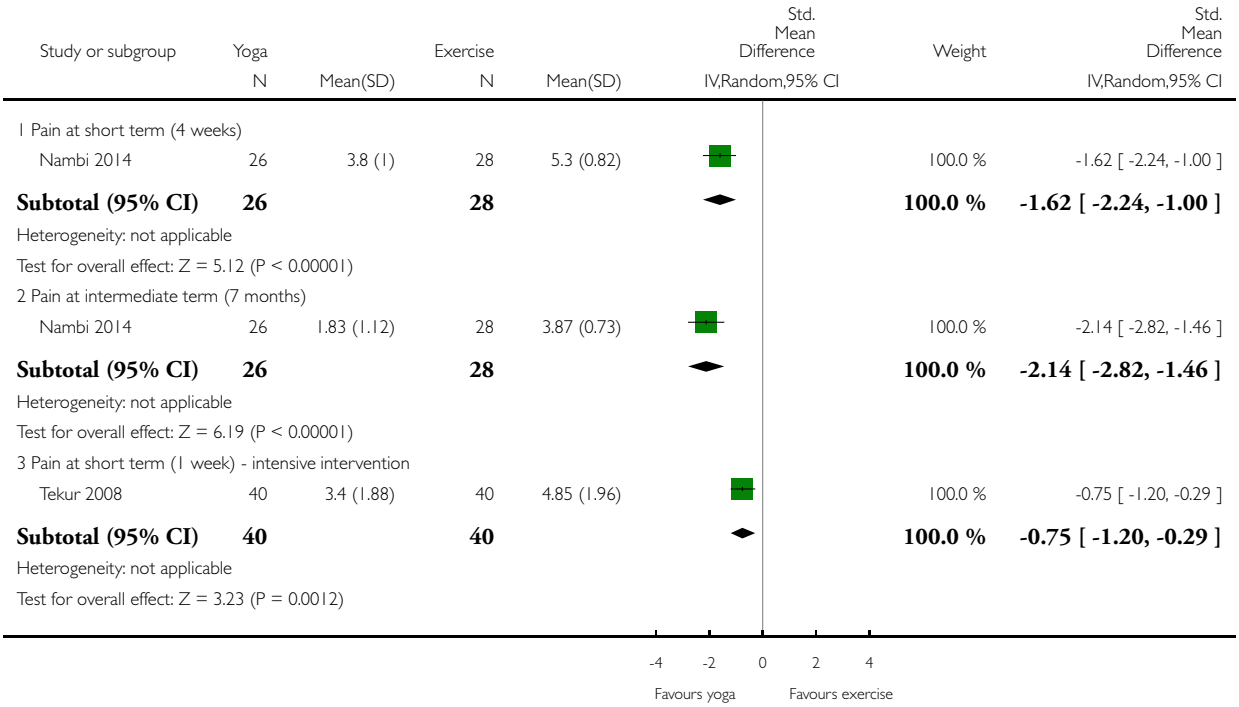


Analysis 5.3. Comparison 5 Sensitivity analyses for yoga versus exercise, Outcome 3 Pain sensitivity analyses (standardized mean difference).

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 5 Sensitivity analyses for yoga versus exercise

Outcome: 3 Pain sensitivity analyses (standardized mean difference)

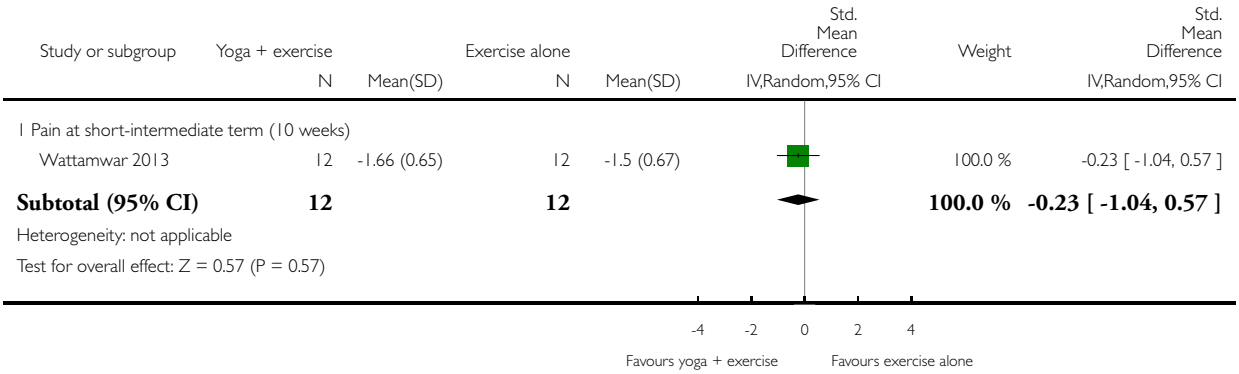


Analysis 6.1. Comparison 6 Sensitivity analyses for yoga plus exercise versus exercise alone, Outcome 1 Pain sensitivity analysis (standardized mean difference).

Review: Yoga treatment for chronic non-specific low back pain

Comparison: 6 Sensitivity analyses for yoga plus exercise versus exercise alone

Outcome: 1 Pain sensitivity analysis (standardized mean difference)



ADDITIONAL TABLES

Table 1. Sources of risk of bias

Bias domain	Source of bias	Possible answers
Selection	(1) Was the method of randomization adequate?	Yes/No/Unsure
Selection	(2) Was the treatment allocation concealed?	Yes/No/Unsure
Performance	(3) Was the patient blinded to the intervention?	Yes/No/Unsure
Performance	(4) Was the care provider blinded to the intervention?	Yes/No/Unsure
Detection	(5) Was the outcome assessor blinded to the intervention?	Yes/No/Unsure
Attrition	(6) Was the dropout rate described and acceptable?	Yes/No/Unsure
Attrition	(7) Were all randomized participants analyzed in the group to which they were allocated?	Yes/No/Unsure
Reporting	(8) Are reports of the study free of suggestion of selective outcome reporting?	Yes/No/Unsure

Table 1. Sources of risk of bias (*Continued*)

Selection	(9) Were the groups similar at baseline regarding the most important prognostic indicators?	Yes/No/Unsure
Performance	(10) Were cointerventions avoided or similar?	Yes/No/Unsure
Performance	(11) Was the compliance acceptable in all groups?	Yes/No/Unsure
Detection	(12) Was the timing of the outcome assessment similar in all groups?	Yes/No/Unsure
Other	(13) Are other sources of potential bias unlikely?	Yes/No/Unsure

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Table 2. Criteria for a judgement of 'Yes' for the sources of risk of bias

1	A random (unpredictable) assignment sequence. Examples of adequate methods are coin toss (for studies with 2 groups), rolling a dice (for studies with 2 or more groups), drawing of balls of different colours, drawing of ballots with the study group labels from a dark bag, computer-generated random sequence, preordered sealed envelopes, sequentially ordered vials, telephone call to a central office, and preordered list of treatment assignments. Examples of inadequate methods are: alternation, birth date, social insurance/security number, date in which they are invited to participate in the study, and hospital registration number
2	Assignment generated by an independent person not responsible for determining the eligibility of the patients. This person has no information about the persons included in the trial and has no influence on the assignment sequence or on the decision about eligibility of the patient
3	Index and control groups are indistinguishable for the patients or if the success of blinding was tested among the patients and it was successful
4	Index and control groups are indistinguishable for the care providers or if the success of blinding was tested among the care providers and it was successful
5	Adequacy of blinding should be assessed for each primary outcome separately. This item should be scored 'yes' if the success of blinding was tested among the outcome assessors and it was successful or: • for patient-reported outcomes in which the patient is the outcome assessor (e.g., pain, disability): the blinding procedure is adequate for outcome assessors if participant blinding is scored 'yes'; • for outcome criteria assessed during scheduled visit and that supposes a contact between participants and outcome assessors (e.g. clinical examination): the blinding procedure is adequate if patients are blinded, and the treatment or adverse effects of the treatment cannot be noticed during clinical examination; • for outcome criteria that do not suppose a contact with participants (e.g. radiography, magnetic resonance imaging): the blinding procedure is adequate if the treatment or adverse effects of the treatment cannot be noticed when assessing the main outcome; • for outcome criteria that are clinical or therapeutic events that will be determined by the interaction between patients and care providers (e.g. cointerventions, hospitalization length, treatment failure), in which the care provider is the outcome assessor: the blinding procedure is adequate for outcome assessors if item '4' (caregivers) is scored 'yes'; • for outcome criteria that are assessed from data of the medical forms: the blinding procedure is adequate if the treatment or adverse effects of the treatment cannot be noticed on the extracted data.

Table 2. Criteria for a judgement of 'Yes' for the sources of risk of bias (*Continued*)

6	The number of participants who were included in the study but did not complete the observation period or were not included in the analysis must be described and reasons given. If the percentage of withdrawals and drop-outs does not exceed 20% for short-term follow-up and 30% for long-term follow-up and does not lead to substantial bias a 'yes' is scored. (note: these percentages are arbitrary, not supported by literature.)
7	All randomized patients are reported/analyzed in the group they were allocated to by randomization for the most important moments of effect measurement (minus missing values) irrespective of non-compliance and cointerventions
8	All the results from all prespecified outcomes have been adequately reported in the published report of the trial. This information is either obtained by comparing the protocol and the report, or in the absence of the protocol, assessing that the published report includes enough information to make this judgement
9	Groups have to be similar at baseline regarding demographic factors, duration and severity of complaints, percentage of patients with neurological symptoms, and value of main outcome measure(s)
10	If there were no cointerventions or they were similar between the index and control groups
11	The reviewer determines if the compliance with the interventions is acceptable, based on the reported intensity, duration, number and frequency of sessions for both the index intervention and control intervention(s). For example, physiotherapy treatment is usually administered for several sessions; therefore it is necessary to assess how many sessions each patient attended. For single-session interventions (e.g. surgery), this item is irrelevant
12	Timing of outcome assessment should be identical for all intervention groups and for all primary outcome measures
13	Other types of biases. For example: • when the outcome measures were not valid. There should be evidence from a previous or present scientific study that the primary outcome can be considered valid in the context of the present; • industry-sponsored trials. The conflict of interest (COI) statement should explicitly state that the researchers have had full possession of the trial process from planning to reporting without funders with potential COI having any possibility to interfere in the process. If, for example, the statistical analyses have been done by a funder with a potential COI, usually 'unsure' is scored.

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Table 3. Baseline characteristics of study populations

Study	Total number randomized	Participant age (mean (SD) years or mean (range) years)	Sex (% women)	Race/ethnicity (% for categories in study)	Education (% for categories in study, or as reported)
Cox 2010	20	45 (-)	65%	-	-
Galantino 2004	22	-	80%*	-	-

Table 3. Baseline characteristics of study populations (*Continued*)

Jacobs 2004	52	43.4 (25-65)	-	White 63.5%; black 15.4%; Hispanic 3.8%; Asian 9.62%; other 1.9%	Median education = college graduate
Nambi 2014	60	43.9 (8.9)*	53%*	-	-
Saper 2009	30	44 (12)	83%	White 24%; black 70%; Asian 3%; native American 3%; Hispanic 13%	College graduate 24%; some college 43%; high school graduate or less 33%
Sherman 2005	101	44 (13)	66%	White 80%	Attended some college 97%
Sherman 2011	228	48.4 (9.8)	64%	White 87%	College graduate 62%
Tekur 2008	80	48.5 (3.8)*	45%*	-	Postgraduate 21%; college 51%; high school 28%
Tilbrook 2011	313	46.3 (11.4)*	70%*	-	Completed further education since leaving school, college, or university 58%
Wattamwar 2013	24	34 (-)*	-	-	-
Williams 2005	60	48.3 (7.1)*§	68%*§	Caucasian 91%; African-American 5%; Asian 2%; Native American 2%*§	College 75%; high school 25%*§
Williams 2009	90	48.0 (1.17)	76.7%	White 93.3%; African-American 2.2%; Asian-American 4.4%	College graduate 73%; some college or less 27%

* calculated from information in the publication.
§ data provided for completers only.
SD: standard deviation.

Table 4. Interventions and comparisons

Study	Yoga intervention (s)	Comparison intervention(s)	Restricted cointerventions	Duration of treatment	Duration of follow-up
Cox 2010	Yoga classes of 75 minutes held once per week for 12 weeks + suggested home practice. Booklet on how to manage back pain. Usual care	Booklet on how to manage back pain. Usual care.	-	12 weeks	12 weeks
Galantino 2004	Yoga classes of 60 minutes held twice per week for 6 weeks + home practice of 1 hour per day. Usual care	Usual care.	Changes in pain medication not allowed during study.	6 weeks	3 months (yoga participants only)
Jacobs 2004	Yoga classes of 90 minutes held twice per week for 12 weeks, + home practice of 30 minutes for 5 days/week. Usual care	Waiting list for yoga. Usual care + a 'back pain educational booklet'	-	12 weeks	6 months
Nambi 2014	Yoga classes of 60 minutes held once per week for 4 weeks, + home practice of 30 minutes for 5 days/week. 1-hour lecture and handouts on physiotherapy for chronic low-back pain, 2 weeks before beginning of intervention period	Individually prescribed exercises for 4 weeks, beginning with 3 days/week and increasing to 5 days/week. 1-hour lecture and handouts on physiotherapy for chronic low-back pain, 2 weeks before beginning of intervention period	Exercise group participants asked not to participate in any other exercises for low-back pain	4 weeks	7 months
Saper 2009	Yoga classes of 75 minutes held once per week for 12 weeks + 30 minutes/day home practice. A copy of *The Back Pain Helpbook* and usual care.	Waiting list for yoga. A copy of *The Back Pain Helpbook* and usual care.	Participants were discouraged from beginning any new back pain treatments during the study	12 weeks	26 weeks

Table 4. Interventions and comparisons (*Continued*)

Sherman 2005	Yoga classes of 75 minutes held once per week for 12 weeks + daily home practice. Usual care	2 groups: • Exercise classes of 75 minutes held once per week for 12 weeks + daily home practice. Usual care. • *The Back Pain Helpbook* was mailed to participants. Usual care.	-	12 weeks	26 weeks
Sherman 2011	Yoga classes of 75 minutes held once per week for 12 weeks + 20 minutes of home practice on non-class days. Usual care	2 groups: • Exercise classes of 75 minutes held once per week for 12 weeks + 20 minutes of home practice on non-class days. Usual care. • *The Back Pain Helpbook* was mailed to participants. Usual care.	-	12 weeks	26 weeks
Tekur 2008	Intensive 1-week residential yoga programme, including approximately 2 hours of yoga-based special techniques (e.g. postures) per day as well as yogic meditation, breathing, chanting, and lectures	Intensive 1-week residential programme of non-yogic physical exercises and education	-	7 days	7 days
Tilbrook 2011	1 × 75-minute yoga class once per week for 12 weeks + 30 minutes/day practice or practice at least 2 times/week. Booklet on managing back pain. Usual care	Book or booklet (*The Back Book*) on managing back pain. Usual care.	-	12 weeks	12 months

Table 4. Interventions and comparisons (*Continued*)

Wattamwar 2013	1 × 45- to 60-minute yoga session per week for 10 weeks. 2 × 45- to 60-minute occupational therapy sessions per week for 10 weeks, with some simple asanas and pranayama added. Home practice of back exercises with additional simple asanas and pranayama was suggested	3 × 45- to 60-minute occupational therapy sessions per week for 10 weeks, + a home programme of back exercises	-	10 weeks	10 weeks
Williams 2005	1 × 90-minute yoga class per week for 16 weeks, + home practice 30 minutes/day for 5 days/week. 16 weekly newsletters on back care. Usual care. Prior to study start, 2 × 1-hour lectures on low-back pain and some instructional handouts	16 weekly newsletters on back care. Prior to study start, 2 × 1-hour lectures on low-back pain and some instructional handouts. Usual care	Participants were only eligible for the study if they agreed to forgo other forms of complementary and alternative medicines treatment during the study	16 weeks	7 months
Williams 2009	2 × 90-minute yoga classes per week for 24 weeks, + home practice 30 minutes/day on non-class days	Waiting list for yoga. Usual care.	Participants were only eligible for the study if they agreed to forgo chiropractic, massage, Pilates, acupuncture, or any other yoga treatment during the study	24 weeks	48 weeks

Table 5. Yoga intervention - type, components and design

Study	Type of yoga	Components of yoga intervention	How yoga intervention was designed
Cox 2010	Iyengar yoga	Postures (Asanas) Breathing (Pranayama) Relaxation	"[D]evised by an Iyengar Yoga teacher (IYAUK) and LBP [low

Table 5. Yoga intervention - type, components and design (*Continued*)

		Mental focus	back pain] yoga specialist, in collaboration with a British Wheel of Yoga teacher (BWY), who delivered the intervention. The structure was based on that previously used in the US Karen Sherman yoga trial, ... whilst ensuring that a common ground was found between the two associations of IYAUK and BWY. Other influences included Geeta and B.K.S. Iyengar, who has taught yoga for over 70 years and has applied therapeutic variations of classical poses to many health problems including LBP."
Galantino 2004	Hatha yoga	Postures (Asanas) Breathing (Pranayama) Relaxation Ethics (Yamas and Niyamas)	"An expert panel of two Hatha yoga instructors with greater than 10 years of experience and a physical therapist specializing in spine treatment established an initial yoga protocol for this study. Postures were selected based on orthopedic biomechanics."
Jacobs 2004	Iyengar style of Hatha yoga	Postures (Asanas) Breathing (Pranayama) Relaxation Mental focus	A panel of experts developed the yoga intervention. "The panel included 8 senior Iyengar yoga instructors of national and international recognition with greater than 10 years experience teaching yoga. The protocol was constructed by consensus after 2 meetings and several months of discussion."
Nambi 2014	Iyengar yoga	Postures (Asanas) Relaxation	-
Saper 2009	Hatha yoga	Postures (Asanas) Breathing (Pranayama) Relaxation	"To design the protocol, we performed a systematic search of the peer-reviewed and lay literature on yoga for low back pain. We collected and distributed this literature to an expert panel with a broad range of experience in different yoga styles. After reviewing the literature, the panel met and synthesized information from the literature with their professional experience to draft a

Table 5. Yoga intervention - type, components and design (*Continued*)

			protocol that was subsequently refined iteratively through discussion, consensus, and use in nonstudy yoga classes."
Sherman 2005	Viniyoga	Postures (Asanas) Breathing (Pranayama) Relaxation Mental focus	"Our class instructor and a senior teacher of viniyoga, who has written a book about its therapeutic uses ... , designed the yoga intervention for patients with back pain who did not have previous yoga experience."
Sherman 2011	Viniyoga	Postures (Asanas) Breathing (Pranayama) Relaxation	Used intervention developed by the class instructor and senior Viniyoga teacher for previous trial. The developers are named and acknowledged in the protocol publication for this trial
Tekur 2008	'Integrated Approach of Yoga Therapy (IAYT)'	Postures (Asanas) Breathing (Pranayama) Relaxation Meditation Mental focus Chanting Yoga philosophy/lifestyle	"The specific 'integrated yoga therapy module for low back pain' was developed by a team of two yoga experts and a physiatrist. The concepts of the modules were taken from traditional yoga scriptures (patanjali yoga sutra, and yoga vasishtha) that highlight a holistic approach to health management at physical, mental, emotional and intellectual levels."
Tilbrook 2011	Iyengar and British Wheel of Yoga (described as Hatha yoga on the website)	Postures (Asanas) Breathing (Pranayama) Relaxation Mental focus Yoga philosophy/lifestyle	From the protocol publication: "Within the first three months of the study, whilst we gain ethics permission and NHS Research and Development approval, we will conduct a series of meetings between experienced yoga practitioners in order to agree on a basic package of yoga that can be delivered by yoga teachers of these two national organisations [British Wheel of Yoga and Iyengar Yoga Association (UK)]."
Wattamwar 2013	Combination of Iyengar and traditional yoga	Postures (Asanas) Breathing (Pranayama) Prayer	-

Table 5. Yoga intervention - type, components and design (*Continued*)

Williams 2005	Iyengar yoga	Postures (Asanas)	"The yoga intervention was developed with the consultation of senior Iyengar yoga instructors who had experience with Iyengar's protocol for treating CLBP [chronic low back pain]. The principal investigator, an Iyengar student for 14 years and teacher in training for 9 years, was introduced to the protocol for CLBP by Geeta Iyengar at Ramamani Memorial Institute in Pune, India in 1998. Since then she has utilized this therapeutic protocol and studied under senior Iyengar teachers with a minimum of 25 years of experience."
Williams 2009	Iyengar yoga	Postures (Asanas)	"The yoga therapy was developed in collaboration with 2 senior Iyengar teachers and approved by B. K. S. Iyengar."

* All information is as explicitly described in study publication(s) or report(s).

Table 6. Yoga intervention - reporting, flexibility, monitoring, and setting

Study (Country)	Specific yoga poses listed or pictured	Flexibility of intervention	Monitoring for treatment fidelity	Setting for intervention delivery	Training and experience of teachers
Cox 2010 (England)	-	"Modifications of poses were available for people who needed them."	-	-	2 experienced yoga teachers assisted in developing the intervention and were coauthors of the trial report. It appears that the yoga classes were taught by 1 of these teachers
Galantino 2004 (USA)	Listed	"Yoga postures were demonstrated and adapted to the capabilities of each individual to prevent injury."	-	-	"A single instructor, who was certified by the Yoga Alliance directed each one hour Hatha yoga session…"

Table 6. Yoga intervention - reporting, flexibility, monitoring, and setting (*Continued*)

Jacobs 2004 (USA)	Listed	The intervention was described as semi-structured so that individual poses could be selected for different classes depending on the needs of the class. No explicit mention of modifications for participants	-	-	"Four Iyengar yoga instructors were selected to teach the participants. Each instructor was required to meet University of California, San Francisco credentialing criteria, and, in addition, to have a minimum of 10 years experience teaching yoga, and experience working with patients with chronic back pain."
Nambi 2014 (India)	Listed and pictured	-	-	Outpatient department of a physiotherapy college.	-
Saper 2009 (USA)	Listed and pictured	"The protocol provided variations and used various aids (e.g., chair, strap, block) to accommodate different abilities."	"The 2 national yoga experts from the panel observed several classes in person to provide feedback to the instructors on accurate, effective, and safe protocol delivery."	A community health centre.	"[Classes] were taught by a team of 2 female yoga instructors, 1 white and 1 African American. Both were registered yoga teachers with Yoga Alliance, and each had approximately 4 years of teaching experience."
Sherman 2005 (USA)	Listed and pictured	Text states that some postures had available adaptations.	-	Integrated health system facilities (number not stated)	1 yoga teacher was mentioned in the text and acknowledgements as helping to develop the yoga intervention and teaching the yoga classes. No further details about teacher qualifications or experience

Table 6. Yoga intervention - reporting, flexibility, monitoring, and setting (*Continued*)

Sherman 2011 (USA)	Listed in protocol paper	Text stated there were variations and adaptations.	"One researcher (KJS) attended 1 class for each intervention for each cohort to evaluate adherence to the protocols."	Integrated health system facilities (number not stated)	Teachers: "Classes were taught by instructors with at least 500 hours of viniyoga training, 5 years of teaching experience, and familiarity with the selected postures and who were briefed by our yoga consultant."
Tekur 2008 (India)	Listed	-	-	Residential holistic health centre	-
Tilbrook 2011 (England)	The poses were not listed or pictured; however, an audio clip and comments on the journal website provided a link to a further website where the manual and accompanying CD may be purchased	-	"Treatment fidelity was assessed on 2 separate occasions by the back-up yoga teachers. At each assessment, a report was completed and sent to the trial coordinators for review. The fidelity of content was verified by this process, and no changes resulted from the monitoring sessions."	Non-medical centres at 5 sites	"Twenty experienced yoga teachers ... were recruited for the study. Teachers attended program training sessions over 2 weekends. All teachers taught the same form of yoga according to the teachers' manual class plans and the pose descriptions and sequences contained in the students' manual. For each course, 2 teachers were selected: 1 to teach and 1 to serve as back-up."
Wattamwar 2013 (India)	Listed and pictured	-	-	Iyenger Yoga centre	-
Williams 2005 (USA)	Listed	-	-	Community yoga studio	"The yoga instructors have trained in the Iyengar method for over 10 years, teaching yoga for 8 years and have experience teaching

Table 6. Yoga intervention - reporting, flexibility, monitoring, and setting (*Continued*)

					persons with CLBP [chronic low back pain]."
Williams 2009 (USA)	Listed and pictured	-	-	Yoga studio	"Certified Iyengar yoga instructor and 2 assistants with experience delivering yoga therapy to persons with CLBP [chronic low back pain]."

All information is as explicitly described in study publication(s) or report(s).

APPENDICES

Appendix 1. MEDLINE, Embase, CENTRAL, and CINAHL search strategies

CENTRAL

Last searched March 11, 2016. Lines 4, 5, 10, 16 and 20 were revised from 2014 search.
#1 MeSH descriptor: [Back Pain] explode all trees
#2 MeSH descriptor: [Low Back Pain] explode all trees
#3 dorsalgia
#4 backache or back-ache
#5 (lumb* near/3 pain) or coccyx or coccydynia or spondylosis or sciatica
#6 MeSH descriptor: [Spine] explode all trees
#7 MeSH descriptor: [Spinal Diseases] explode all trees
#8 lumbago or discitis
#9 spinal fusion
#10 facet near joint*
#11 MeSH descriptor: [Intervertebral Disc] explode all trees
#12 postlaminectomy
#13 arachnoiditis
#14 failed near back
#15 MeSH descriptor: [Cauda Equina] explode all trees
#16 lumb* near vertebra*
#17 stenosis near (spine or root or spinal)
#18 slipped near (disc* or disk*)
#19 degenerat* near (disc* or disk*)
#20 herniat* near (disc* or disk*)
#21 displace* near (disc* or disk*)
#22 prolap* near (disc* or disk*)

#23 MeSH descriptor: [Sciatic Neuropathy] explode all trees
#24 back near pain
#25 back disorder*
#26 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25
#27 MeSH descriptor: [Yoga] explode all trees
#28 yoga
#29 yogic
#30 yogi
#31 asana*
#32 pranayama
#33 dhyana
#34 #28 or #29 or #30 or #31 or #32 or #33
#35 #26 and #34 in Trials

2014 search. Lines 5 and 8 were revised.

#1 MeSH descriptor: [Back Pain] explode all trees
#2 MeSH descriptor: [Low Back Pain] explode all trees
#3 dorsalgia
#4 backache
#5 (lumbar near pain) or coccyx or coccydynia or spondylosis or sciatica
#6 MeSH descriptor: [Spine] explode all trees
#7 MeSH descriptor: [Spinal Diseases] explode all trees
#8 lumbago or discitis or (disc near herniation)
#9 spinal fusion
#10 facet near joints
#11 MeSH descriptor: [Intervertebral Disc] explode all trees
#12 postlaminectomy
#13 arachnoiditis
#14 failed near back
#15 MeSH descriptor: [Cauda Equina] explode all trees
#16 lumbar near vertebra*
#17 spinal near stenosis
#18 slipped near (disc* or disk*)
#19 degenerat* near (disc* or disk*)
#20 stenosis near (spine or root or spinal)
#21 displace* near (disc* or disk*)
#22 prolap* near (disc* or disk*)
#23 MeSH descriptor: [Sciatic Neuropathy] explode all trees
#24 back near pain
#25 back disorder*
#26 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25
#27 MeSH descriptor: [Yoga] explode all trees
#28 "yoga":ti,ab,kw
#29 yogic:ti,ab,kw
#30 yogi:ti,ab,kw
#31 asana*
#32 pranayama
#33 dhyana
#34 #28 or #29 or #30 or #31 or #32 or #33
#35 #26 and #34 in Trials
#36 #35 Publication Year from 2013 to 2014, in Trials

2013 search. Lines 10 and 25 were removed for 2014 search.

#1 MeSH descriptor: [Back Pain] explode all trees
#2 dorsalgia
#3 backache
#4 MeSH descriptor: [Low Back Pain] explode all trees
#5 lumbar next pain OR coccyx OR coccydynia OR sciatica OR spondylosis
#6 MeSH descriptor: [Spine] explode all trees
#7 MeSH descriptor: [Spinal Diseases] explode all trees
#8 lumbago OR discitis OR disc near degeneration OR disc near prolapse OR disc near herniation
#9 spinal fusion
#10 spinal neoplasms
#11 facet near joints
#12 MeSH descriptor: [Intervertebral Disk] explode all trees
#13 postlaminectomy
#14 arachnoiditis
#15 failed near back
#16 MeSH descriptor: [Cauda Equina] explode all trees
#17 lumbar near vertebra*
#18 spinal near stenosis
#19 slipped near (disc* or disk*)
#20 degenerat* near (disc* or disk*)
#21 stenosis near (spine or root or spinal)
#22 displace* near (disc* or disk*)
#23 prolap* near (disc* or disk*)
#24 MeSH descriptor: [Sciatic Neuropathy] explode all trees
#25 sciatic*
#26 back disorder*
#27 back near pain
#28 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27
#29 MeSH descriptor: [Yoga] explode all trees
#30 "yoga":ti,ab,kw (Word variations have been searched)
#31 yogic:ti,ab,kw (Word variations have been searched)
#32 yogi:ti,ab,kw (Word variations have been searched)
#33 asana*
#34 pranayama
#35 dhyana
#36 #29 or #30 or #31 or #32 or #33 or #34 or #35
#37 #28 and #36 in Trials

Medline and Medline In-Process & Other Nonindexed Citations

Last searched March 11, 2016. Line 3 was added; lines 16 and 18 were revised from 2014.

1. randomized controlled trial.pt.
2. controlled clinical trial.pt.
3. pragmatic clinical trial.pt.
4. randomi#ed.ab.
5. placebo.ab,ti.
6. controlled.ti,ab.
7. prospective.ti,ab.
8. randomly.ab,ti.
9. trial.ab,ti.
10. groups.ab,ti.
11. or/1-10

12. (animals not (humans and animals)).sh.
13. 11 not 12
14. dorsalgia.ti,ab.
15. exp Back Pain/
16. (backache or back-ache).ti,ab.
17. exp Low Back Pain/
18. ((back or lumb$) adj3 pain).ti,ab.
19. coccyx.ti,ab.
20. coccydynia.ti,ab.
21. sciatica.ti,ab.
22. exp sciatic neuropathy/
23. spondylosis.ti,ab.
24. lumbago.ti,ab.
25. back disorder$.ti,ab.
26. or/14-25
27. Yoga/
28. yoga.mp.
29. yogic.mp.
30. yogi.mp.
31. asana$.mp.
32. pranayama.mp.
33. dhyana.mp.
34. or/27-33
35. 13 and 26 and 34
36. limit 35 to yr=2014-2016
37. limit 35 to ed=20141124-20160310
38. 36 or 37

2014 search. Revised line 21 and removed line 30 from 2013 strategy.

1. randomized controlled trial.pt.
2. controlled clinical trial.pt.
3. randomi#ed.ab.
4. placebo.ab,ti.
5. controlled.ti,ab.
6. prospective.ti,ab.
7. randomly.ab,ti.
8. trial.ab,ti.
9. groups.ab,ti.
10. or/1-9
11. (animals not (humans and animals)).sh.
12. 10 not 11
13. dorsalgia.ti,ab.
14. exp Back Pain/
15. backache.ti,ab.
16. exp Low Back Pain/
17. (lumbar adj pain).ti,ab.
18. coccyx.ti,ab.
19. coccydynia.ti,ab.
20. sciatica.ti,ab.
21. exp sciatic neuropathy/
22. spondylosis.ti,ab.
23. lumbago.ti,ab.
24. back disorder$.ti,ab.
25. or/13-24

26. Yoga/
27. yoga.mp.
28. yogic.mp.
29. yogi.mp.
30. asana$.mp.
31. pranayama.mp.
32. dhyana.mp.
33. or/26-32
34. 12 and 25 and 33
35. limit 34 to yr=2013-2014
36. limit 34 to ed=20130801-20141124
37. 35 or 36

2013 search

1. randomized controlled trial.pt.
2. controlled clinical trial.pt.
3. randomi#ed.ti,ab.
4. placebo.ti,ab.
5. randomly.ti,ab.
6. controlled.ti,ab.
7. prospective.ti,ab.
8. trial.ti,ab.
9. groups.ti,ab.
10. or/1-9
11. (animals not (humans and animals)).sh.
12. 10 not 11
13. dorsalgia.ti,ab.
14. exp Back Pain/
15. backache.ti,ab.
16. exp Low Back Pain/
17. (lumbar adj pain).ti,ab.
18. coccyx.ti,ab.
19. coccydynia.ti,ab.
20. sciatica.ti,ab.
21. sciatic neuropathy/
22. spondylosis.ti,ab.
23. lumbago.ti,ab.
24. back disorder$.ti,ab.
25. or/13-24
26. Yoga/
27. yoga.mp.
28. yogic.mp.
29. yogi.mp.
30. 29 not 26
31. asana*.mp.
32. pranayama.mp.
33. dhyana.mp.
34. or/26-33
35. 12 and 25 and 34

Embase

Last searched March 11, 2016. The RCT filter and line 29 were revised; line 33 was added

1. Randomized Controlled Trial/

2. Controlled Study/
3. Controlled clinical trial/
4. Double Blind Procedure/
5. Single Blind Procedure/
6. crossover procedure/
7. placebo/
8. random$.ti,ab.
9. placebo$.ti,ab.
10. allocat$.ti,ab.
11. assign$.ti,ab.
12. blind$.ti,ab.
13. (clinic$ adj25 (study or trial)).ti,ab.
14. (compare or compared or comparing or comparison or comparative).ti,ab.
15. control$.ti,ab.
16. (crossover or cross-over).ti,ab.
17. prospectiv$.ti,ab.
18. ((singl$ or doubl$ or trebl$ or tripl$) adj7 (blind$ or mask$)).ti,ab.
19. or/1-18
20. exp animals/ or exp invertebrate/ or animal experiment/ or animal model/ or animal tissue/ or animal cell/ or nonhuman/
21. human/ or normal human/ or human cell/
22. 20 and 21
23. 20 not 22
24. 19 not 23
25. dorsalgia.mp.
26. back pain.mp.
27. exp LOW BACK PAIN/
28. exp BACKACHE/
29. (lumb$ adj3 pain).mp.
30. coccyx.mp.
31. coccydynia.mp.
32. sciatica.mp.
33. sciatica/
34. exp ISCHIALGIA/
35. spondylosis.mp.
36. lumbago.mp.
37. back disorder$.mp.
38. or/25-37
39. yoga/
40. yoga.mp.
41. yogic.mp.
42. yogi.mp.
43. asana$.mp.
44. pranayama.mp.
45. dhyana.mp.
46. or/39-45
47. 24 and 38 and 46

2013 search. For the 2014 search, line 31 was changed to 14 or 30

1. Clinical Article/
2. exp Clinical Study/
3. Clinical Trial/
4. Controlled Study/
5. Randomized Controlled Trial/
6. Major Clinical Study/

7. Double Blind Procedure/
8. Multicenter Study/
9. Single Blind Procedure/
10. Phase 3 Clinical Trial/
11. Phase 4 Clinical Trial/
12. crossover procedure/
13. placebo/
14. or/1-13
15. allocat$.mp.
16. assign$.mp.
17. blind$.mp.
18. (clinic$ adj25 (study or trial)).mp.
19. compar$.mp.
20. control$.mp.
21. cross?over.mp.
22. factorial$.mp.
23. follow?up.mp.
24. placebo$.mp.
25. prospectiv$.mp.
26. random$.mp.
27. ((singl$ or doubl$ or trebl$ or tripl$) adj25 (blind$ or mask$)).mp.
28. trial.mp.
29. (versus or vs).mp.
30. or/15-29
31. 14 and 30
32. exp animals/ or exp invertebrate/ or animal experiment/ or animal model/ or animal tissue/ or animal cell/ or nonhuman/
33. human/ or normal human/ or human cell/
34. 32 and 33
35. 32 not 34
36. 31 not 35
37. dorsalgia.mp.
38. back pain.mp.
39. exp LOW BACK PAIN/
40. exp BACKACHE/
41. (lumbar adj pain).mp.
42. coccyx.mp.
43. coccydynia.mp.
44. sciatica.mp.
45. exp ISCHIALGIA/
46. spondylosis.mp.
47. lumbago.mp.
48. back disorder$.mp.
49. or/37-48
50. yoga/
51. yoga.mp.
52. yogic.mp.
53. yogi.mp.
54. asana$.mp.
55. pranayama.mp.
56. dhyana.mp.
57. or/50-56
58. 36 and 49 and 57

CINAHL

Last searched March 11, 2016. Lines 32 and 34 were revised; line 33 was added
S58 S49 AND S57
S57 S50 OR S51 OR S52 OR S53 OR S54 OR S55 OR S56
S56 “dhyana”
S55 “pranayama”
S54 “asana*”
S53 “yogi”
S52 “yogic”
S51 “yoga”
S50 (MH “Yoga+”)
S49 S28 and S48
S48 S35 or S43 or S47
S47 S44 or S45 or S46
S46 “lumbago”
S45 (MH “Spondylolisthesis”) OR (MH “Spondylolysis”)
S44 (MH “Thoracic Vertebrae”)
S43 S36 or S37 or S38 or S39 or S40 or S41 or S42
S42 lumbar N2 vertebra
S41 (MH “Lumbar Vertebrae”)
S40 “coccydynia”
S39 “coccyx”
S38 “sciatica”
S37 (MH “Sciatica”)
S36 (MH “Coccyx”)
S35 S29 or S30 or S31 or S32 or S33 or S34
S34 lumb* N5 pain
S33 back pain
S32 backache or back-ache
S31 (MH “Low Back Pain”)
S30 (MH “Back Pain+”)
S29 “dorsalgia”
S28 S26 NOT S27
S27 (MH “Animals”)
S26 S7 or S12 or S19 or S25
S25 S20 or S21 or S22 or S23 or S24
S24 volunteer*
S23 prospectiv*
S22 control*
S21 followup stud*
S20 follow-up stud*
S19 S13 or S14 or S15 or S16 or S17 or S18
S18 (MH “Prospective Studies+”)
S17 (MH “Evaluation Research+”)
S16 (MH “Comparative Studies”)
S15 latin square
S14 (MH “Study Design+”)
S13 (MH “Random Sample”)
S12 S8 or S9 or S10 or S11
S11 random*
S10 placebo*
S9 (MH “Placebos”)

S8 (MH "Placebo Effect")
S7 S1 or S2 or S3 or S4 or S5 or S6
S6 triple-blind
S5 single-blind
S4 double-blind
S3 clinical W3 trial
S2 "randomi?ed controlled trial*"
S1 (MH "Clinical Trials+")
2013 and 2014 search (2013 search used no date limits)
S61 S59 OR S60
S60 S58 AND EM 20130801-20141124
S59 S58 Limiters - Published Date: 20130801-20141131
S58 S49 AND S57
S57 S50 OR S51 OR S52 OR S53 OR S54 OR S55 OR S56
S56 "dhyana"
S55 "pranayama"
S54 "asana*"
S53 "yogi"
S52 "yogic"
S51 "yoga"
S50 (MH "Yoga+")
S49 S28 and S48
S48 S35 or S43 or S47
S47 S44 or S45 or S46
S46 "lumbago"
S45 (MH "Spondylolisthesis") OR (MH "Spondylolysis")
S44 (MH "Thoracic Vertebrae")
S43 S36 or S37 or S38 or S39 or S40 or S41 or S42
S42 lumbar N2 vertebra
S41 (MH "Lumbar Vertebrae")
S40 "coccydynia" 19
S39 "coccyx" 123
S38 "sciatica" 865
S37 (MH "Sciatica") 653
S36 (MH "Coccyx") 90
S35 S29 or S30 or S31 or S32 or S33 or S34
S34 lumbar N5 pain
S33 lumbar W1 pain
S32 "backache"
S31 (MH "Low Back Pain")
S30 (MH "Back Pain+")
S29 "dorsalgia"
S28 S26 NOT S27
S27 (MH "Animals")
S26 S7 or S12 or S19 or S25
S25 S20 or S21 or S22 or S23 or S24
S24 volunteer* 23,020
S23 prospectiv*
S22 control*
S21 follow-up stud*
S20 follow-up stud*
S19 S13 or S14 or S15 or S16 or S17 or S18
S18 (MH "Prospective Studies+")

S17 (MH “Evaluation Research+”)
S16 (MH “Comparative Studies”)
S15 latin square
S14 (MH “Study Design+”)
S13 (MH “Random Sample”)
S12 S8 or S9 or S10 or S11
S11 random*
S10 placebo*
S9 (MH “Placebos”)
S8 (MH “Placebo Effect”)
S7 S1 or S2 or S3 or S4 or S5 or S6
S6 triple-blind
S5 single-blind
S4 double-blind
S3 clinical W3 trial
S2 “randomi?ed controlled trial*”
S1 (MH “Clinical Trials+”)

Appendix 2. PsycINFO, AMED, IndMED, PubMed, and Trials registry search strategies

PsycINFO

Last searched March 11, 2016. The RCT filter was revised; lines 11, 12 and 13 were edited; lines 16, 17, and 23 were added.

1. clinical trials/
2. control$.mp.
3. random$.mp.
4. placebo.mp.
5. trial.mp.
6. (compare or compared or comparing or comparison or comparative).mp.
7. exp Treatment/
8. or/1-7
9. back pain/
10. dorsalgia.mp.
11. (backache or back-ache).mp.
12. (lumb$ adj3 pain).mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures]
13. back pain.mp.
14. sciatica.mp.
15. lumbago.mp.
16. coccydynia.mp.
17. coccyx.mp.
18. spinal nerves/
19. lumbar spinal cord/
20. ((disc? or disk?) adj degenerat$).mp.
21. ((disc? or disk?) adj prolapse$).mp.
22. ((disc? or disk?) adj herniat$).mp.
23. back disorder$.mp.
24. or/9-23
25. yoga/
26. yoga.mp.
27. yogic.mp.
28. yogi.mp.

29. asana$.mp.
30. pranayama.mp.
31. dhyana.mp.
32. or/25-31
33. 8 and 24 and 32

2013 and 2014 search (2013 search used no date limits)

1. clinical trials/
2. Randomi?ed controlled trial$.mp.
3. control$.mp.
4. random$.mp.
5. exp Treatment/
6. or/1-5
7. back pain/
8. dorsalgia.mp.
9. backache.mp.
10. (lumbar adj pain).mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures]
11. (low adj back adj pain).mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures]
12. sciatica.mp.
13. lumbago.mp.
14. spinal nerves/
15. lumbar spinal cord/
16. ((disc or disk) adj degenerat*).mp.
17. ((disc or disk) adj prolapse*).mp.
18. ((disc or disk) adj herniat*).mp.
19. or/7-18
20. 6 and 19
21. yoga/
22. yoga.mp.
23. yogic.mp.
24. yogi.mp.
25. asana$.mp.
26. pranayama.mp.
27. dhyana.mp.
28. or/21-27
29. 20 and 28
30. limit 29 to yr=2013-2014

AMED

Last searched March 11, 2016. Added lines 13, 19 and 22; edited line 14

1. yoga/
2. yoga.mp.
3. yogic.mp.
4. yogi.mp.
5. asana$.mp.
6. pranayama.mp.
7. dhyana.mp.
8. or/1-7
9. low back pain/
10. Backache/
11. Back injuries/
12. back pain.mp.
13. (backache or back-ache).mp.

14. (lumb$ adj3 pain).mp.
15. Lumbar vertebrae/
16. coccyx.mp.
17. coccydynia.mp.
18. Sciatica/
19. sciatica.mp.
20. spondylosis.mp.
21. lumbago.mp.
22. dorsalgia.mp.
23. back disorder$.mp.
24. or/9-23
25. 8 and 24

2013 and 2014 search (2013 search used no date limit)

1. yoga/
2. yoga.mp.
3. yogic.mp.
4. yogi.mp.
5. asana$.mp.
6. pranayama.mp.
7. dhyana.mp.
8. or/1-7
9. low back pain/
10. Backache/
11. Back injuries/
12. back pain.mp.
13. lumbar pain.mp.
14. Lumbar vertebrae/
15. coccyx.mp.
16. coccydynia.mp.
17. Sciatica/
18. spondylosis.mp.
19. lumbago.mp.
20. back disorder$.mp.
21. or/9-20
22. 8 and 21
23. limit 22 to yr=2013-2014

IndMED

Advanced search, in "Anywhere" field:
yoga or asana or pranayama or dhyana or yogi or yogic
AND back

PubMed

Last searched March 11, 2016

((yoga OR asana OR pranayama OR dhyana OR yogi OR yogic) AND (back pain OR (lumb* AND pain) OR sciatica OR backache OR back-ache OR dorsalgia OR coccydynia OR lumbago OR coccyx OR back disorders) AND (pubstatusaheadofprint OR publisher[sb] or pubmednotmedline[sb]))

2013 and 2014 search (2013 search used no date limits)

Search (((yoga[MeSH Terms]) OR (((((((yoga) OR yogic) OR yogi) OR asana) OR asanas) OR pranayama) OR dhyani))) AND ((((((((((((randomized controlled trial[pt]) OR controlled clinical trial[pt]) OR randomized[tiab]) OR placebo[tiab]) OR drug therapy[sh]) OR randomly[tiab]) OR trial[tiab]) OR groups[tiab])) NOT ((animals[mh] NOT humans[mh]))))) AND ((((((((((((((back

pain[MeSH Terms]) OR dorsalgia) OR backache) OR low back pain[MeSH Terms]) OR lumbar pain) OR coccyx) OR coccydynia) OR sciatica) OR sciatic neuropathy[MeSH Terms]) OR spondylosis) OR lumbago) OR back disorder) OR back disorders)) publication date from 2013/08/01 to 2014/11/24

Complementary Medicine Field Trials Register (CRSO)

#1 (back OR backache OR pain) AND (yoga OR asana OR pranayama OR dhyani) AND SRCOMPMED:CC

Back and Neck Review Group Trials Register (CRS)

Last searched March 11, 2016. In 2014, this search was intended to capture studies not in CENTRAL. Therefore, only studies not in CENTRAL were selected.
In My Register:
#1 yoga

ClinicalTrials.gov

Last searched March 11, 2016
((yoga OR asana OR pranayama OR dhyana OR yogi OR yogic) AND (back pain OR lumbago OR dorsalgia OR lumbar pain OR sciatica OR coccydynia OR coccyx OR backache)), received from 11/01/2014 to 03/11/2016
2014 search
Advanced search, search terms field: ((yoga OR asana OR pranayama OR dhyana OR yogi OR yogic) AND back pain)

WHO ICTRP

Basic search: Yoga and back pain

Appendix 3. The GRADE approach to evidence synthesis

We categorized the certainty of evidence as follows.

- High (⊕⊕⊕⊕): further research is very unlikely to change the confidence in the estimate of effect.
- Moderate (⊕⊕⊕◯): further research is likely to have an important impact in the confidence in the estimate of effect.
- Low (⊕⊕◯◯): further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
- Very low (⊕◯◯◯): any estimate of effect is very uncertain.

We graded the evidence available to answer each subquestion on the domains following criteria based on Ryan 2016.

1. Risk of bias

Confidence in the estimate of the effect decreases if studies have major limitations in design and conduct. We assessed five types of bias, described in detail in Table 1 and Table 2:

- selection bias (random sequence generation, allocation concealment, group similarities at baseline);
- performance bias (blinding of participants, blinding of personnel or care providers, cointerventions, compliance);
- attrition bias (incomplete outcome data, intention-to-treat analysis);
- detection bias (blinding of outcome assessors, timing of outcome assessments);
- reporting bias (selective reporting).

The certainty of evidence was downgraded one level for an estimate of effect that relied on studies with a high risk of bias in one of these domains. The certainty of evidence was downgraded by two levels for an estimate of effect that relied heavily (i.e. approximately 50% or greater weight in the meta-analysis) on studies with a high risk of bias in two or more of these domains.

2. Inconsistency

Inconsistency refers to heterogeneity between studies that does not have a plausible explanation. The I^2 statistic is an estimate of the percentage of the variability in effect estimates that is due to clinical or methodological heterogeneity rather than chance. An I^2 statistic of 30% to 60% may represent moderate heterogeneity, 50% to 90% may represent substantial heterogeneity, and 75% to 100% may

represent considerable heterogeneity (Deeks 2011). The design and conduct of yoga interventions for low-back pain are highly variable and, therefore, heterogeneity is expected.
The certainty of evidence was downgraded by one level when heterogeneity was substantial (i.e. when $I^2 \geq 50\%$), and by two levels when heterogeneity was considerable (i.e. when $I^2 \geq 75\%$), unless there was a plausible explanation for the heterogeneity.

3. Indirectness

Indirectness refers to a mismatch between the population, intervention, comparator, or outcomes for the studies included in the review and the population, intervention, comparator, or outcomes for the research question being posed by the systematic review. The certainty of evidence was downgraded by one level when there was indirectness for one element of the research question (e.g. population) and by two levels when there was indirectness for two or more elements of the research question.

4. Imprecision

Imprecision refers to uncertainty in the results due to few participants or to wide confidence intervals.
We used the following guidance in judging imprecision.

For continuous outcomes

An outcome was downgraded one level for imprecision if:

- the total number of participants was fewer than 400; or
- the 95% confidence interval around the estimate of effect covered both no effect and a minimally important difference for that outcome, or if a minimally important difference was not prespecified, no effect and a standardized mean difference (SMD) of ± 0.5.

An outcome was downgraded two levels for imprecision if both points above were true.

For dichotomous outcomes

An outcome was downgraded one level for imprecision if:

- the total number of events was less than 300; or
- the 95% confidence interval around the estimate of effect included both no effect and either appreciable benefit or appreciable harm. The threshold for 'appreciable benefit' or 'appreciable harm' was a relative risk reduction (RRR) or relative risk increase (RRI) greater than 25%.

An outcome was downgraded two levels for imprecision if both points above were true.

5. Publication bias

Publication bias refers to the selective publication of studies, which may bias the estimate of effect that is based on available studies. The certainty of evidence was downgraded by one level if a funnel plot to assess the potential for small-study bias suggests that publication bias was present, or there was any other reason to strongly suspect that publication bias was present.

CONTRIBUTIONS OF AUTHORS

Study concept and design: LSW, NS, KP, RV.

Development of search strategy: KP, LSW, NS.

Searching for studies: KP, LSW.

Study selection: LSW, NS, KP, RV, CDA.

Data extraction: LSW, NS, KP, RV, CDA.

Data analysis: LSW.

Drafting the manuscript: LSW.

Critically revising manuscript for important intellectual content and providing final approval of the version to be published: all authors.

DECLARATIONS OF INTEREST

No known conflicts of interest.

RV is a volunteer researcher with Yoga Sangeeta, a non-profit organization which promotes music for meditation and healing.

SOURCES OF SUPPORT

Internal sources

- No sources of support supplied

External sources

- NIH National Center for Complementary and Integrative Medicine, R24 AT001293, USA.

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

We planned to examine outcomes at short-term (closest to four weeks), intermediate-term (closest to six months), and long-term (closest to one year) time points. Several studies measured outcomes at six weeks and six months but also at three months. Therefore, we added a short-to-intermediate term (closest to three months) time point to capture the changes over time in the effects of the intervention.

We listed yoga versus no treatment or waiting list, yoga versus minimal intervention (e.g. booklets), and yoga versus usual care as separate comparisons in the protocol. We also listed yoga plus an intervention versus the intervention alone as a comparison for which we would consider control conditions separately. However, in our analyses, we grouped together the studies in which yoga was compared to no treatment or a waiting list, a minimal intervention, or usual care, because we believe that the control conditions were clinically comparable. We also included in this grouping studies in which yoga plus education (such as a book or lectures) was compared to education alone.

We clarified the definition of chronic low back pain under the 'Types of participants' section.

We planned to have two authors use a standardized and pilot-tested form to independently extract data on study design, setting and sponsorship, study participants, components of yoga and comparison interventions, and outcomes. We only had one author available to extract data on study design, setting, study participants, components of yoga and comparison interventions, but a second author checked all extracted data. We had two authors extract data on outcomes (as planned) and sponsorship (as planned, as part of the risk of bias assessment).

We did not assess the inter-rater reliability of the 'Risk of bias' assessment.

We initially planned to summarize outcome data using the mean difference (MD) when the studies used the same scale, and the standardized mean difference (SMD) when studies used different scales for the same underlying concept. Most comparisons used different scales and we used the SMD for those comparisons, then for consistency across time points and comparability with other meta-analyses of yoga for low back pain we chose to use the SMD for all meta-analyses.

Instead of using the MD (when the same scale was used in individual studies) or the SMD (when different scales were used across studies) for pain outcomes, we followed the suggestion of a peer reviewer to transform all pain outcomes to a 0 to 100 scale and use the MD. The peer reviewer also suggested that we use a measure of clinically significant difference in pain that is measured on a 0- to 100-point scale, and we identified and used such a measure to report whether changes were clinically significant. Due to this change from the protocol, we also added sensitivity analyses comparing the MD and SMD results for pain outcomes, and observed that they were broadly consistent.

We did not specify in the protocol that we would use absolute risk difference (RD) to report adverse events.

We did not prespecify whether we preferred to use endpoint or change data in our data extraction and analyses. Most studies presented only endpoint data, one presented only change data, and three contained both endpoint and change data (or both types of data were

made available by the study authors). For our main analyses, we used endpoint data for the SMD, and we carried out separate sensitivity analyses with change data when change data were available.

We did not prespecify whether we preferred to use adjusted or unadjusted outcome data in our data extraction and analyses. When both adjusted and unadjusted outcome data were available, we used adjusted data.

We did not report an assessment of clinical relevance of individual studies, neither did we incorporate this assessment in the clinical implications of the review, as the Cochrane Back and Neck group no longer recommends this assessment (Furlan 2015a).