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Massage for low-back pain (Review)

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Furlan AD, Giraldo M, Baskwill A, Irvin E, Imamura M.
Massage for low-back pain.
Cochrane Database of Systematic Reviews 2015, Issue 9. Art. No.: CD001929.
DOI: 10.1002/14651858.CD001929.pub3.

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[Intervention Review]

Massage for low-back pain

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Editorial group: Cochrane Back and Neck Group.
Publication status and date: New search for studies and content updated (conclusions changed), published in Issue 9, 2015.

Citation: Furlan AD, Giraldo M, Baskwill A, Irvin E, Imamura M. Massage for low-back pain. *Cochrane Database of Systematic Reviews* 2015, Issue 9. Art. No.: CD001929. DOI: 10.1002/14651858.CD001929.pub3.

ABSTRACT

Background

Low-back pain (LBP) is one of the most common and costly musculoskeletal problems in modern society. It is experienced by 70% to 80% of adults at some time in their lives. Massage therapy has the potential to minimize pain and speed return to normal function.

Objectives

To assess the effects of massage therapy for people with non-specific LBP.

Search methods

We searched PubMed to August 2014, and the following databases to July 2014: MEDLINE, EMBASE, CENTRAL, CINAHL, LILACS, Index to Chiropractic Literature, and Proquest Dissertation Abstracts. We also checked reference lists. There were no language restrictions used.

Selection criteria

We included only randomized controlled trials of adults with non-specific LBP classified as acute, sub-acute or chronic. Massage was defined as soft-tissue manipulation using the hands or a mechanical device. We grouped the comparison groups into two types: inactive controls (sham therapy, waiting list, or no treatment), and active controls (manipulation, mobilization, TENS, acupuncture, traction, relaxation, physical therapy, exercises or self-care education).

Data collection and analysis

We used standard Cochrane methodological procedures and followed CBN guidelines. Two independent authors performed article selection, data extraction and critical appraisal.

Main results

In total we included 25 trials (3096 participants) in this review update. The majority was funded by not-for-profit organizations. One trial included participants with acute LBP, and the remaining trials included people with sub-acute or chronic LBP (CLBP). In three trials massage was done with a mechanical device, and the remaining trials used only the hands. The most common type of bias in these studies was performance and measurement bias because it is difficult to blind participants, massage therapists and the measuring outcomes. We judged the quality of the evidence to be “low” to “very low”, and the main reasons for downgrading the evidence were

risk of bias and imprecision. There was no suggestion of publication bias. For acute LBP, massage was found to be better than inactive controls for pain ((SMD -1.24, 95% CI -1.85 to -0.64; participants = 51; studies = 1)) in the short-term, but not for function ((SMD -0.50, 95% CI -1.06 to 0.06; participants = 51; studies = 1)). For sub-acute and chronic LBP, massage was better than inactive controls for pain ((SMD -0.75, 95% CI -0.90 to -0.60; participants = 761; studies = 7)) and function (SMD -0.72, 95% CI -1.05 to -0.39; 725 participants; 6 studies;) in the short-term, but not in the long-term; however, when compared to active controls, massage was better for pain, both in the short ((SMD -0.37, 95% CI -0.62 to -0.13; participants = 964; studies = 12)) and long-term follow-up ((SMD -0.40, 95% CI -0.80 to -0.01; participants = 757; studies = 5)), but no differences were found for function (both in the short and long-term). There were no reports of serious adverse events in any of these trials. Increased pain intensity was the most common adverse event reported in 1.5% to 25% of the participants.

Authors' conclusions

We have very little confidence that massage is an effective treatment for LBP. Acute, sub-acute and chronic LBP had improvements in pain outcomes with massage only in the short-term follow-up. Functional improvement was observed in participants with sub-acute and chronic LBP when compared with inactive controls, but only for the short-term follow-up. There were only minor adverse effects with massage.

PLAIN LANGUAGE SUMMARY

Massage for low-back pain

Review question

What are the effects of massage therapy for people with low-back pain (LBP)?

Background

LBP is very common. While most back pain gets better without medical treatment, about 10% of cases lasts for three months or more. There are many therapies that are used to treat the pain, and improve the lives of individuals with back pain. Massage is one of these treatments.

Search date

We updated the searches in 07 August 2014 and included 12 additional randomized controlled trials (RCTs) in this review update.

Study characteristics

In total we included 25 RCTs and 3096 participants in this review update. Only one trial included patients with acute LBP (pain duration less than four weeks), while all the others included patients with sub-acute (four to 12 weeks) or chronic LBP (12 weeks or longer). In three studies, massage was applied using a mechanical device (such as a metal bar to increase the compression to the skin or a vibrating instrument), and in the remaining trials it was done using the hands. Pain intensity and quality were the most common outcomes measured in these studies, followed by back-related function, such as walking, sleeping, bending and lifting weights.

Study funding sources

Seven studies did not report the sources of funding, Sixteen studies were funded by not-for-profit organizations. One study reported not receiving any funding, and one study was funded by a College of Massage Therapists.

Key results

There were eight studies comparing massage to interventions that are not expected to improve outcomes (inactive controls) and 13 studies comparing massage to other interventions expected to improve outcomes (active controls). Massage was better than inactive controls for pain and function in the short-term, but not in the long-term follow-up. Massage was better than active controls for pain both in the short and long-term follow-ups, but we found no differences for function, either in the short or long-term follow-ups. There were no reports of serious adverse events in any of these trials. The most common adverse events were increased pain intensity in 1.5% to 25% of the participants.

Quality of the evidence

The quality of the evidence for all comparisons was graded “low ” or “very low” which means that we have very little confidence in these results. This is because most of the included studies were small and had methodological flaws.

SUMMARY OF FINDINGS FOR THE MAIN COMPARISON [Explanation]

Massage versus inactive controls for sub-acute and chronic LBP

Patient or population: patients with LBP
Settings:
Intervention: Massage versus inactive controls for sub-acute and chronic LBP

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Control	Massage versus inactive controls for sub-acute and chronic LBP				
Pain intensity (higher scores mean more pain) - Short-term follow-up Numerical pain rating scales (higher scores mean more pain). Scale from: 0 to 100 points. Follow-up: 0 to 6 months	The mean pain intensity in the inactive control group is **40.6 points (SD 26.7) VAS**[1]	The mean pain intensity in the massage group is 20.6 points (95%CI 16.6 to 24.6 points)	Not applicable	761 (7 studies, 2 studies were duplicated)	⊕⊕◯◯ **low**[2]	Medium, statistically significant effect size (SMD -0.75, 95% CI -0.90 to -0.60)
Pain intensity (higher scores mean more pain) - Long-term follow-up VAS, Von Korff Pain Scale. Follow-up: mean 6 months	The mean pain intensity in the inactive control group is **40.6 points (SD 26.7) VAS**[1]	The mean pain intensity in the massage group is 41.1 points (95%CI 36.6 to 45.4 points)	Not applicable	615 (3 studies, 1 study is duplicated because it had two types of massage)	⊕◯◯◯ **very low**[3,4]	Small, non-significant effect size (SMD 0.02, 95% CI -0.15 to 0.18)

Function (higher scores mean more disability) - Short-term follow-up Interference with daily activities (higher scores mean more disability) Follow-up: 0 to 6 months	The mean function in the inactive control groups is **36.6 points (SD 17.7) Oswestry Disability Questionnaire**[1]	The mean function in the massage groups is 23.9 points (95% CI 18.0 to 29.7 points)	Not applicable	725 (6 studies, 2 studies were duplicated)	⊕⊕◯◯ **low**[2]	Medium, statistically significant effect size SMD -0.72 (-1.05 to -0.39)
Function (higher scores mean more disability) - Long-term follow-up RDQ and ODI Follow-up: 6 to 12 months	The mean function in the inactive control group is **36.6 points (SD 17.7) Oswestry Disability Questionnaire**[1]	The mean function in the massage group is 33.8 points (95%CI 30.9 to 36.8 points)	Not applicable	615 (3 studies, 1 study is duplicated)	⊕◯◯◯ **very low**[2,4]	Small, non-significant effect size SMD -0.16 (-0.32 to 0.01)
Adverse events Self-reported	**4 per 1000**	**60 per 1000** (4 to 114)	See comment	624 (4 studies, 1 study is duplicated)	⊕◯◯◯ **very low**[2,4]	Small, non statistically significant difference (RD 0.06, 95% CI 0.00 to 0.11)

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% CI) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: confidence interval; **RR:** risk ratio; **ODI:** Oswestry disability index; **RDQ:** Roland Disability Questionnaire; **VAS:** visual analog scale.

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

[1]Final scores. Poole 2007 is the most representative study of this meta-analysis.
[2]Downgraded two levels because of risk of bias. The studies included in this meta-analysis have high risks of selection, performance, attrition and measurement bias, and are unclear for reporting bias.

[3]Downgraded two levels because of risk of bias. The studies included in this meta-analysis have unclear risk of selection bias and high risk of detection, performance and selective reporting bias.
[4]Downgraded one level because of imprecision. The CI includes the null hypothesis.

BACKGROUND

Description of the condition

Low-back pain (LBP) is a major health problem in modern society. The global point prevalence of LBP is estimated to be 12% (Hoy 2012). According to the 2010 Global Burden of Disease Study, it is estimated that LBP is among the top 10 diseases and injuries that account for the highest number of disability-adjusted life years (DALYs) worldwide (Vos 2010). Although LBP is a benign and self-limiting condition, many patients look for some type of therapy to relieve their symptoms and improve their function. For this reason, it is possible to list more than 50 potential therapies promising to relieve the pain, lessen the suffering and eliminate this problem (Haldeman 2008). However, there is sound evidence for only a minority of these therapies (Chou 2009). Most of the economic burden of LBP arises from the small number of people who develop chronic LBP (CLBP) because of the excessive use of diagnostic tests and therapeutic interventions, and inability to function (Dagenais 2008). Data from seven countries in Latin America show that the prevalence of CLBP is estimated between 4.2 and 10.1% of the population (Garcia 2014).

Description of the intervention

Therapeutical massage is defined as the manipulation of the soft tissue of whole body areas to bring about generalised improvements in health, such as relaxation or improved sleep, or specific physical benefits, such as relief of muscular aches and pains.(Vickers 1999) The use of massage for LBP is very popular. In Eastern cultures, massage is believed to have powerful analgesic effects. A systematic review of twenty-two surveys across six countries (USA, UK, Canada, Australia, Singapore and South Korea) found that the 12-month prevalence of visits to massage therapists by adults ranged from 0.4% to 20% and the median was 5.5%, while estimates for older adults were 1.5%-16.2% (median 5.2%).(Harris 2014).

How the intervention might work

Soft-tissue massage is thought to improve physiological and clinical outcomes by offering symptomatic relief of pain through physical and mental relaxation, and increasing the pain threshold through the release of endorphins (Ernst 1999). The gate-control theory predicts that massaging a particular area stimulates large diameter nerve fibres. These fibres have an inhibitory input onto T-cells (which are the first cells that project into the central nervous system within the spinal cord). T-cell activity is depressed (whereas, conversely, small diameter nerve fibres (nociceptive fibres) have an excitatory input) and pain relief follows (Melzack 1996). Massage therapy may provide its benefits by shifting the autonomic nervous system from a state of sympathetic response to a state of parasympathetic response. However, support for this theory is not universal, and it has even been suggested that massage therapy may promote a sympathetic response of the autonomic nervous system (Moyer 2004). The mechanistic links between manipulation of body tissues and corresponding relief from a broad range of symptoms are not fully understood. Mechanistic studies are needed to delineate underlying biologic and psychological effects of massage and their relationship to outcomes.

Massage is recognized as a safe therapeutic modality, with few risks or adverse effects. However, there are contraindications, such as applying massage over an area with acute inflammation, skin infection, non-consolidated fracture, burn area, deep vein thrombosis or over sites of active cancer tumour (Vickers 1999). Minor pain or discomfort was experienced by 13% of participants during or shortly after receiving massage (Cherkin 2001).

Massage has been investigated in the pain management area for its efficacy in relieving headaches (Jensen 1990), post-exercise muscle pain (Weber 1994), cancer pain (Weinrich 1990) and mechanical neck pain (Gross 1999). These studies show little or no effect of massage in relieving these pain conditions. Moyer 2004 reported on a meta-analysis of 37 randomized controlled trials (RCTs) (1802 participants) for many different health conditions. This meta-analysis supports the general conclusion that massage therapy is effective. Thirty-seven studies yielded a statistically significant overall effect as well as six specific effects out of nine that were examined. Significant results were found within the single-dose and multiple-dose categories, and for both physiological and psychological outcome variables.

Why it is important to do this review

In earlier versions of this Cochrane Review we concluded that massage was beneficial for CLBP (Furlan 2002; Furlan 2008). However, more recent trials have been published since Furlan 2008, Therefore it is important to update this Cochrane Review.

OBJECTIVES

To assess the effects of massage therapy for people with non-specific LBP.

METHODS

Criteria for considering studies for this review

Types of studies

We included RCTs as RCTs are the highest level of evidence to assess the effects of interventions. There were no language restrictions.

We excluded publications where we only had the abstract because there is evidence that most trials presented at conference never reach full publication, and those that are eventually published in full are systematically different from those never published in full (Scherer 2007). We listed these abstracts in the ongoing studies section.

Types of participants

We included adults (people older than 18 years) with non-specific LBP. Non-specific indicates that no specific cause is detectable, therefore we excluded studies when the population included LBP caused by infection, neoplasm, metastasis, osteoporosis, rheumatoid arthritis, fracture, inflammatory process or radicular syndrome.

LBP was classified as acute (< four weeks), sub-acute (four to 12 weeks) or chronic (> 12 weeks).

We defined LBP as pain localized from the costal margin or 12th rib to the inferior gluteal fold.

Types of interventions

In this Cochrane Review we defined massage as soft-tissue manipulation using hands or a mechanical device. Massage can be applied to any body part, to the lumbar region only or to the whole body. We used the taxonomy of massage treatments for musculoskeletal pain developed by Sherman 2006 to include studies in this review. The taxonomy was conceptualized as a three-level classification system: goals of treatment, styles and techniques. Four categories described the principal goal of treatment: relaxation massage, clinical massage, movement re-education and energy work. Each goal of treatment could be met using a number of different styles, with each style consisting of a number of specific techniques. A total of 36 distinct techniques were identified and described, many of which could be included in multiple styles (see Table 1). We excluded trials in which massage was not applied with any of the goals of treatment described above.

In physiotherapy, massage is considered an adjunct therapy or a complementary treatment to prepare the patient for exercise or other interventions; it is rarely the main treatment used. However, there are practitioners (e.g. massage therapists) that employ massage as the only intervention. In this Cochrane Review, we analyzed massage alone because it is difficult to reach definite conclusions when multiple treatments are involved.

Comparison groups

In this review update, we divided the comparison groups into two types: active controls and inactive controls. Other systematic reviews of massage have used this same approach and we used similar grouping for comparison groups. One review was massage for neck and shoulder pain (Kong 2013), and the other was massage for neck pain (Cheng 2014).

1. Inactive controls are interventions that are not expected to have an effect on the outcomes. They include sham therapy, no treatment, waiting list controls, or when all intervention arms received usual care including controls, and we can therefore say the control received no intervention beyond what the other arms received.

2. Active controls are interventions that are expected to have an effect on the outcomes: They include manipulation, mobilization, TENS, acupuncture, traction, relaxation, physical therapy, exercises or self-care education. These comparison groups were combined because the participants randomized to the control group were told that they would receive another "study intervention". The participants in this comparison group were more active, in which they were actively engaged in the intervention; even in the relaxation therapies, the participants had to be actively engaged in these modalities.

Types of outcome measures

Primary outcomes

Primary outcomes were pain and back-specific functional status. We divided the timing of the outcome measurements into two categories:

1. Short-term: when the outcome assessment was taken $\leq$ six months after randomization.

2. Long-term: when the outcome assessment was taken > six months after randomization. We also extracted data regarding adverse effects and complications related to massage.

Secondary outcomes

We only extracted secondary outcomes if there were no primary outcomes reported in the included studies, such as overall improvement, patient satisfaction, quality of life and work-related status.

Search methods for identification of studies

Electronic searches

We searched the following databases:

- Cochrane Central Register of Controlled Trials (CENTRAL; the Cochrane Library, Issue 6 of 12, June 2014) on 17 July 2014.
- MEDLINE (OvidSP, 1946 to July Week 2 2014) on 17 July 2014.
- MEDLINE In-Process and Other Non-Indexed Citations (OvidSP, 16 July 2014) on 17 July 2014.

- EMBASE (OvidSP, 1980 to 2014 Week 28) on 17 July 2014.
- Cumulative Index to Nursing and Allied Health Literature (CINAHL; EBSCO, 1981-) on 17 July 2014.
- Latin American and Caribbean Health Sciences Literature (LILACS, 1982-) on 17 July 2014.
- Index to Chiropractic Literature (ICL) on 21 July 2014.
- Proquest Dissertation Abstracts on 17 July 2014.
- PubMed (1946-) on 7 August 2014.

For this review update we added the following databases: MEDLINE In-Process and Other Non-Indexed Citations, Index to Chiropractic Literature, LILACS, Proquest Dissertation Abstracts, and PubMed. We searched PubMed in August 2014 to capture studies published within the last year that may not be in MEDLINE; and we searched the other databases up to July 2014. Two databases from the 2008 review were not searched: Dissertation Abstracts from SilverPlatter is no longer available and we found that HealthSTAR from OvidSP does not add uniquely relevant content.

We have presented the strategies for each database in Appendix 1. We used the search strategy recommended by the Cochrane Back and Neck (CBN) Review Group (Furlan 2009) to find RCTs for LBP. The CBN Trials Search Coordinator conducted and reviewed the literature searches. We merged the results using Reference Manager (RefMan 2010) and manually removed duplicates. We compared these results with the list of previously included and excluded studies from previous versions of this review (Furlan 2008), and removed duplicates.

We did not impose any language restrictions.

Searching other resources

We searched the reference lists of all included studies and other systematic reviews.

Data collection and analysis

Selection of studies

Two review authors (MG and AB) independently applied the inclusion criteria described above. When consensus was not reached we consulted a third review author (AF) to determine if the abstract or the full paper met the inclusion criteria.

Data extraction and management

Two review authors (AB and MG) independently extracted the data from each trial in Excel using a standardized form, and entered the data together in RevMan 2014. These review authors double-checked data entry. When consensus could not be reached, they consulted a third review author (AF). We extracted the following data from each included trial in addition to the data for the 'Risk of bias' assessment: methods of patient recruitment, age of patients, country, ethnicity, work status, number of patients included in each arm, length of LBP episode, causes of LBP, previous surgery, types of interventions, number of sessions, types of outcomes measures, timing of outcome assessment, funding for the study, statistical analyses and the authors' conclusions about the effectiveness of the interventions.

Assessment of risk of bias in included studies

Two review authors (MG and AB) independently assessed the risk of bias of each included trial. In the case of disagreement, MG and AB tried to reach consensus and, if necessary, a third review author (AF) helped to resolve disagreements.

We assessed the risk of bias of the included trials using the criteria recommended in the method guidelines for systematic reviews in the CBN group (Furlan 2009) and the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011), which are shown in Appendix 2. We scored each criterion as either "high", "low" or "unclear" risk. Five domains of bias were assessed in this Cochrane Review:

- Selection bias: method of randomization, allocation concealment and similarity at baseline.
- Performance bias: patient blinded, care provider blinded, co-interventions and compliance.
- Detection (or measurement) bias: outcome assessor blinded and timing of outcome assessment similar in all groups.
- Attrition bias: drop-out rate and intention-to-treat (ITT) analysis.
- Reporting bias: selective outcome reporting.

There was also opportunity to identify any additional bias (other bias). We used the 'Risk of bias' assessment of the included trials for grading the quality of the evidence (see GRADE approach described below and additional information in Appendix 3).

Measures of treatment effect

We reported the results for continuous variables as weighted mean difference (WMD) when the outcome measures were identical, and standardized mean difference (SMD) when the outcome measures were different. We analysed the incidence of adverse events as dichotomous variables and reported and analyzed these as risk difference (RD) values.

Unit of analysis issues

Repeated measurements: when a trial measured the same outcome multiple times, we extracted the data from the outcome closer to three months for short-term follow-up, and one year for long-term follow-up.

Dealing with missing data

When trial authors performed data imputation, we used the data imputation as reported in the trial. We contacted trial authors to obtain information when there was missing data.

Assessment of heterogeneity

We used the random-effects model for all meta-analyses. This is recommended by the CBN Group Editorial Board because the assumptions underlying the random-effects model are better suited to statistical combination of trials in this field.

Assessment of reporting biases

We analyzed the funnel plot to detect publication bias when there were at least 10 trials in a meta-analysis. We used the method of independent visual inspection by two review authors (AF and MG). When there was disagreement, we consulted a third review author.

Data synthesis

We entered all quantitative results into RevMan 2014. Statistical pooling (meta-analysis) was considered when there was homogeneity in terms of population (acute or subacute/chronic), comparison group (active or inactive), outcome (pain or function) and timing of follow-up (short or long-term). We rated the magnitude of the effect as small (effect sizes around 0.2), medium (effect sizes around 0.5) and large (effect sizes of 0.8 or higher).

The GRADE approach was used in order to provide the quality of the evidence. Justifications for downgrading the evidence can be referred to in Appendix 3. We only summarized the primary outcome measures in the 'Summary of findings' tables. As we included only RCTs in this Cochrane Review, the overall quality of the evidence for each outcome considered risk of bias, consistency of results, directness and precision (GRADE 2009; Higgins 2011),

Subgroup analysis and investigation of heterogeneity

We did not plan any subgroup or meta-regression analyses.

Sensitivity analysis

We did not plan any sensitivity analysis.

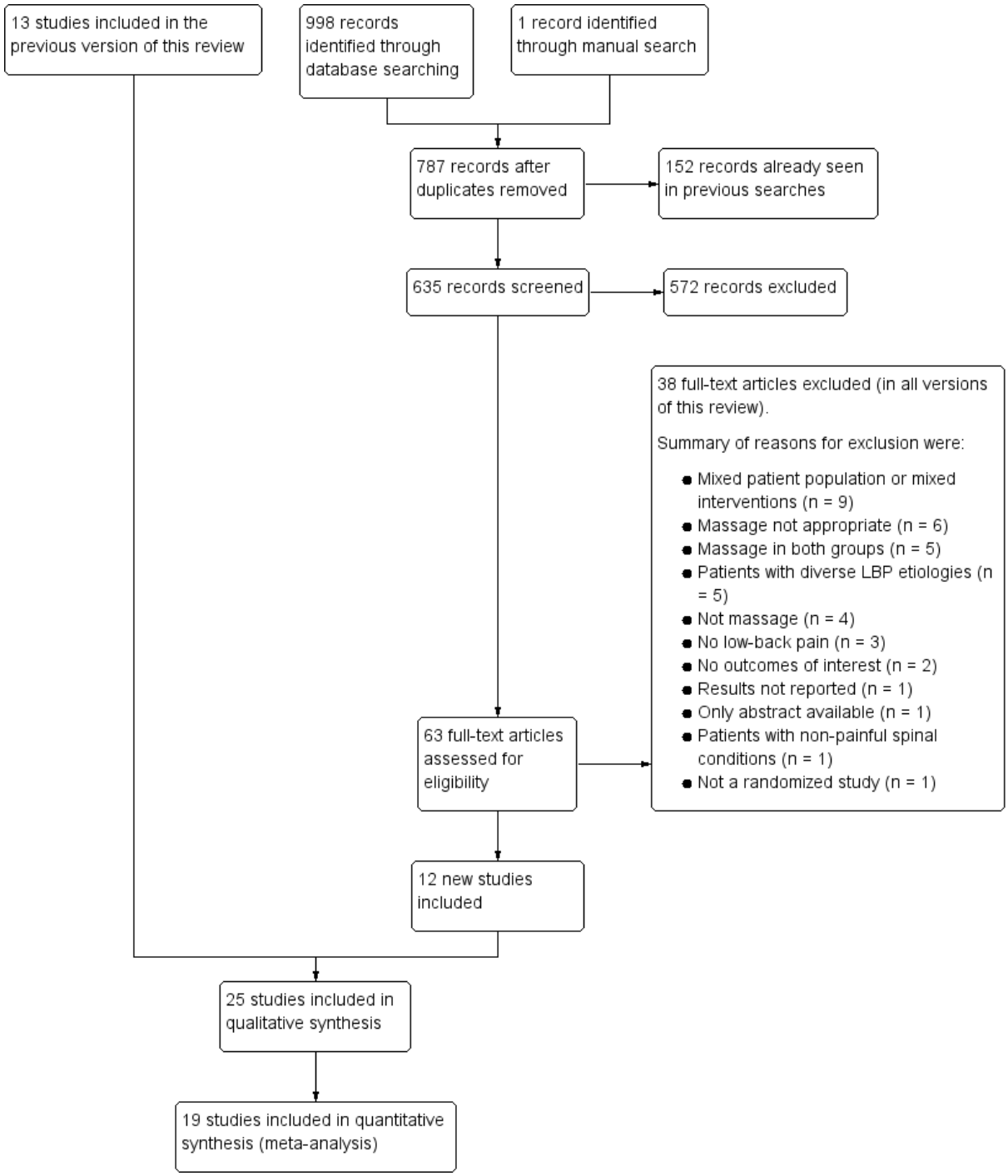
RESULTS

Description of studies

Results of the search

We have presented the flow of studies in the PRISMA chart in Figure 1.

Figure 1. Study flow diagram.



In our previous review, Furlan 2008, we included 13 RCTs. For this review update we identified 12 additional trials for inclusion (Ajimsha 2014; Buttagat 2011; Cherkin 2011; Eghbali 2012; Kamali 2014; Kumnerddee 2009; Lara-Palomo 2013; Little 2008; Quinn 2008; Sritoomma 2014; Yoon 2012; Zheng 2012).

Included studies

In total, we included 25 trials (3096 participants). Five studies were conducted in the USA (818 participants; Cherkin 2001; Cherkin 2011; Field 2007; Geisser 2005; Hernandez-Reif 2001), five in Thailand (441 participants; Buttagat 2011; Chatchawan 2005; Kumnerddee 2009; Mackawan 2007; Sritoomma 2014), three in the UK (837 participants; Little 2008; Poole 2007; Quinn 2008), two in Taiwan (275 participants; Hsieh 2004; Hsieh 2006), two in Iran (110 participants; Eghbali 2012; Kamali 2014), one in Germany (190 participants; Franke 2000), one in Canada (104 participants; Preyde 2000), one in India (80 participants; Ajimsha 2014), one in China (64 participants; Zheng 2012), one in Spain (62 participants; Lara-Palomo 2013), one in Hong Kong (61 participants; Yip 2004), one in Belgium (60 participants; Farasyn 2006) and one in Korea (24 participants; Yoon 2012). All trials were published in English except Franke 2000, which was published in German.

The population included in the trials was similar regarding the diagnosis, which was non-specific LBP, but differed with respect to the duration of pain, previous treatments and distributions of age. One trial included participants with acute LBP (Yip 2004), six trials included patients with sub-acute and chronic LBP (Farasyn 2006; Hsieh 2004; Hsieh 2006; Kumnerddee 2009; Preyde 2000; Yoon 2012) and the remaining trials were limited to patients with chronic pain (Ajimsha 2014; Buttagat 2011; Chatchawan 2005; Cherkin 2001; Cherkin 2011; Eghbali 2012, Field 2007; Franke 2000; Geisser 2005; Hernandez-Reif 2001; Kamali 2014; Lara-Palomo 2013; Little 2008; Mackawan 2007; Poole 2007; Quinn 2008; Sritoomma 2014; Zheng 2012).

The types of massage technique, duration and frequency of treatments varied among the included trials. In three studies the massage was applied with a mechanical device (Farasyn 2006; Franke 2000; Yoon 2012) while in the remaining studies it was done with hands. Three studies used a specific oil (Field 2007; Sritoomma 2014; Yip 2004). In four studies distinct techniques of massage were compared (Chatchawan 2005; Cherkin 2011; Franke 2000; Sritoomma 2014).

With respect to the outcome measures, pain intensity was used in most included studies, except Cherkin 2001 and Cherkin 2011 which assessed symptom bothersomeness. Seven studies (Buttagat 2011; Cherkin 2011; Hernandez-Reif 2001; Hsieh 2004; Kumnerddee 2009; Preyde 2000; Sritoomma 2014) also included other dimensions of pain, i.e. pain characteristics/quality/perception of pain symptoms. Sixteen studies assessed function/disability (Ajimsha 2014; Chatchawan 2005; Cherkin 2001; Cherkin 2011; Farasyn 2006; Franke 2000; Geisser 2005; Hsieh 2006; Kamali 2014; Lara-Palomo 2013; Little 2008; Preyde 2000; Poole 2007; Sritoomma 2014; Yip 2004; Yoon 2012).

We have provided details about each included trial in the Characteristics of included studies table.

Excluded studies

Many controlled studies studied massage in combination with other therapies (Ferrell 1997; Ginsberg 1987; Kankaanpää 1999; Koes 1992; Konrad 1992; Lindström 1970; Maniche 1991; Melzack 1980; Werners 1999). Although it is very common for massage to be used as an adjunct treatment for other physical treatments, we excluded these studies from this review because we could not extract the effect of massage separately. We have provided details about these studies and the reasons for exclusion in the Characteristics of excluded studies table.

Risk of bias in included studies

There was no suggestion of publication bias (Figure 2). A summary of the risk of bias for each article is shown in Figure 3.

Figure 2. Funnel plot of comparison: 3 Massage versus active therapies for sub-acute and chronic LBP, outcome: 3.1 Pain intensity (higher scores mean more pain).

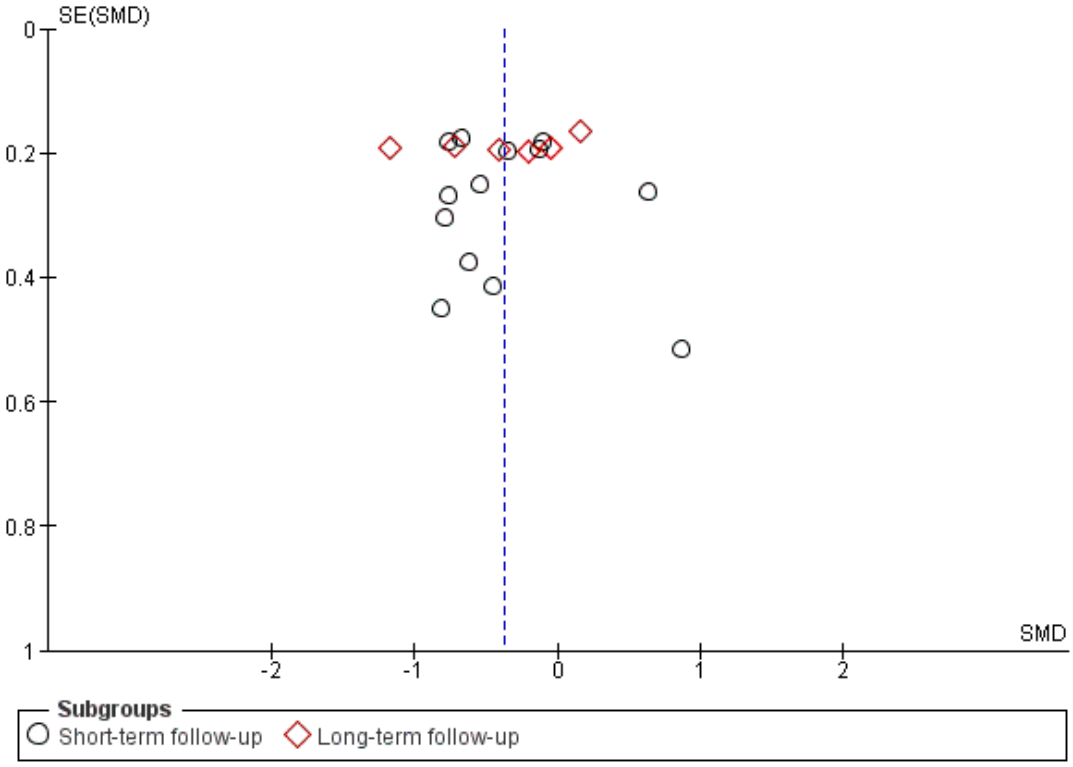
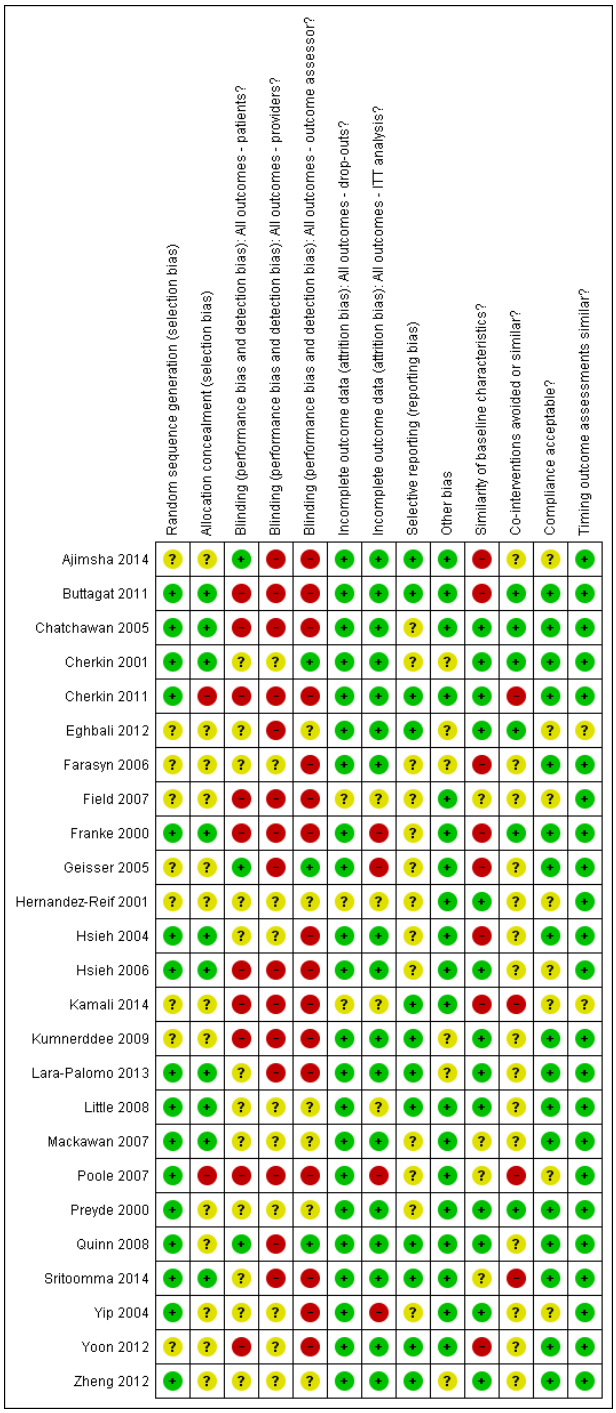


Figure 3. Summary of risks of bias



Allocation

Ten included trials were at low risk of bias (Buttagat 2011; Chatchawan 2005; Cherkin 2001; Franke 2000; Hsieh 2004; Hsieh 2006; Lara-Palomo 2013; Little 2008; Mackawan 2007; Sritoomma 2014). Strict strategies to reach proper allocation concealment included the support from a statistician to generate the random numbers followed by another person to placed the numbers in sealed opaque numbered envelopes; both of these participants were not involved in the trial (Sritoomma 2014).

Blinding

The main risk of bias factors in the included studies were performance (blinding of participants/health care providers and co-interventions avoided or similar) and detection bias (blinding of outcome assessors). Four studies attempted to blind the patients to the assigned intervention (Ajimsha 2014; Eghbali 2012; Geisser 2005; Quinn 2008). The risk of bias was considered low when the trial clearly described the strategy to blind them. In one of these studies, Geisser 2005, the patients were randomized to four groups and they assessed the success of patient's blinding by asking the question: "I believe I received an actual treatment from the therapist" (1 = completely disagree and 7 = completely agree). There was no significant difference between the groups. Ten studies attempted to blind the outcome assessors (Ajimsha 2014; Cherkin 2001; Cherkin 2011; Eghbali 2012, Geisser 2005; Kamali 2014; Kumnerddee 2009; Lara-Palomo 2013; Mackawan 2007; Preyde 2000). However, when the outcome is a subjective measure, such as pain, and the patient is not blinded to the intervention, the attempt of blinding of outcome assessor is irrelevant.

Incomplete outcome data

The risk of attrition bias was judged low in 22 trials and only three did not explicitly report how many patients finished the study, therefore it was judged unclear (Field 2007; Hernandez-Reif 2001; Kamali 2014).

Eleven of the 12 new trials included in this review update were at low risk of attrition bias (Ajimsha 2014; Buttagat 2011; Cherkin 2011; Eghbali 2012; Kumnerddee 2009; Lara-Palomo 2013; Little 2008; Quinn 2008; Sritoomma 2014; Yoon 2012; Zheng 2012).

Selective reporting

The risk of reporting bias was low in 12 studies (Ajimsha 2014; Buttagat 2011; Cherkin 2011; Eghbali 2012; Kamali 2014; Kumnerddee 2009; Lara-Palomo 2013; Little 2008; Quinn 2008; Sritoomma 2014; Yoon 2012; Zheng 2012). This item was the most difficult to judge as many included trials did not publish a protocol. We obtained most information from the methods section of the published studies.

Other potential sources of bias

Seven included trials did not provide funding details (Farasyn 2006; Franke 2000; Hsieh 2004; Hsieh 2006; Quinn 2008; Sritoomma 2014; Zheng 2012). Sixteen studies were funded by not-for-profit organizations such as a research grant from the University or government (Ajimsha 2014; Buttagat 2011; Chatchawan 2005; Cherkin 2001; Cherkin 2011; Eghbali 2012; Field 2007; Geisser 2005; Hernandez-Reif 2001; Kamali 2014; Kumnerddee 2009; Little 2008; Mackawan 2007; Poole 2007; Yip 2004; Yoon 2012). One trial mentioned that no funding was received from any source (Lara-Palomo 2013). One trial, Preyde 2000, was funded by an organization with potential conflict of interest: the College of Massage Therapists of Ontario.

Effects of interventions

See: **Summary of findings for the main comparison** Massage versus inactive controls for sub-acute and chronic LBP; **Summary of findings 2** Massage versus active controls for sub-acute and chronic LBP

The studies compared massage therapy to various control treatments: eight studies employed an inactive control group (Ajimsha 2014; Buttagat 2011; Cherkin 2011; Farasyn 2006; Geisser 2005; Little 2008;Poole 2007; Preyde 2000). Thirteen studies compared massage to various active controls (Cherkin 2001; Field 2007; Hernandez-Reif 2001; Hsieh 2004; Hsieh 2006; Kumnerddee 2009; Lara-Palomo 2013;Little 2008; Mackawan 2007; Poole 2007; Preyde 2000; Yoon 2012; Zheng 2012). We have summarized the comparisons in Table 2 and described them below:

1. Massage versus inactive controls for acute LBP

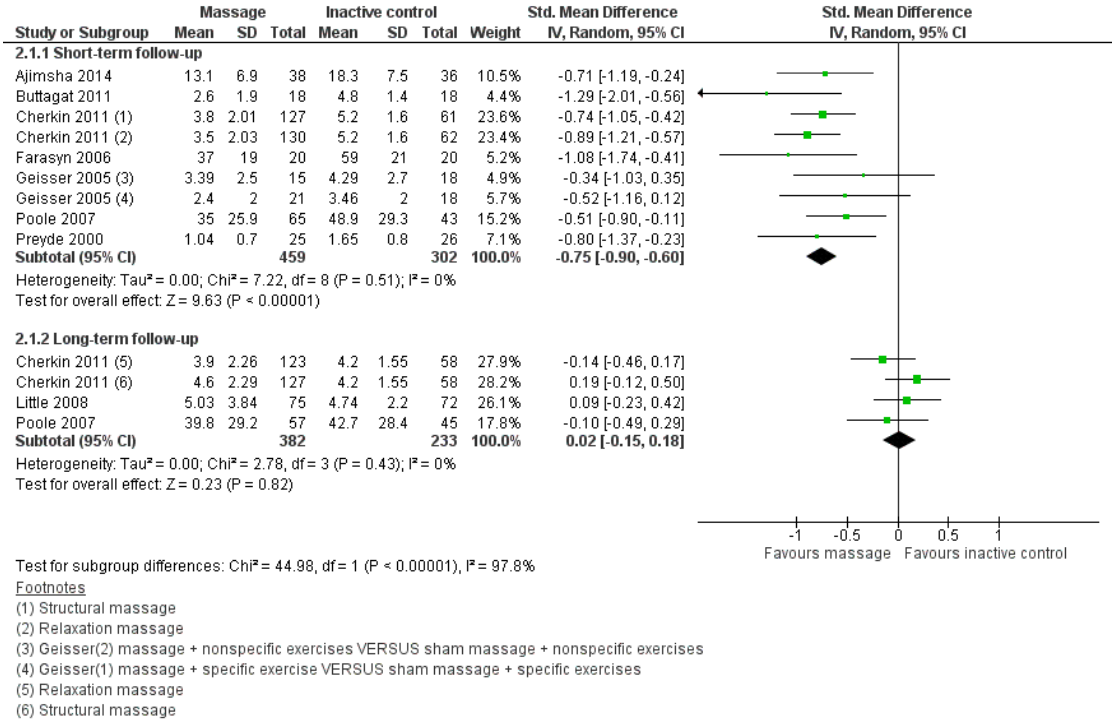
Based on the current evidence it is unclear whether or not massage is more effective than inactive controls for pain at short-term follow-up (SMD -1.24, 95% CI -1.85 to -0.64; 51 participants, one trial; *very low quality evidence,* Analysis 1.1), and that massage is not better than inactive controls for function on short-term follow-up (SMD -0.50, 95% CI -1.06 to 0.06; participants = 51; studies = 1; *very low quality evidence,* Analysis 1.2).

There is no evidence for outcomes in the long-term for this comparison.

2. Massage versus inactive controls for sub-acute and chronic LBP

We have presented the meta-analysis for pain in Figure 4. The summary of the results are shown in Summary of findings for the main comparison.

Figure 4. Forest plot of comparison: 2 Massage versus inactive controls for sub-acute and chronic LBP, outcome: 2.1 Pain intensity (higher scores mean more pain).



Massage may be more effective than inactive controls for pain (SMD -0.75, 95% CI -0.90 to -0.60; 761 participants, seven trials; I² statistic = 0%; low quality evidence, Analysis 2.1) and function (SMD -0.72, 95% CI -1.05 to -0.39; 725 participants, six trials; I² statistic = 74%; low quality evidence, Analysis 2.2) in the short-term follow-up.

Based on the current evidence it is unclear whether or not massage is better than inactive controls for pain (SMD 0.02, 95% CI -0.15 to 0.18; 615 participants, three trials; I² statistic = 0%; very low quality evidence, Analysis 2.1) and function (SMD -0.16, 95% CI -0.32 to 0.01; 615 participants, three trials; I² statistic = 0%; very low quality evidence, Analysis 2.2) in the long-term follow-up.

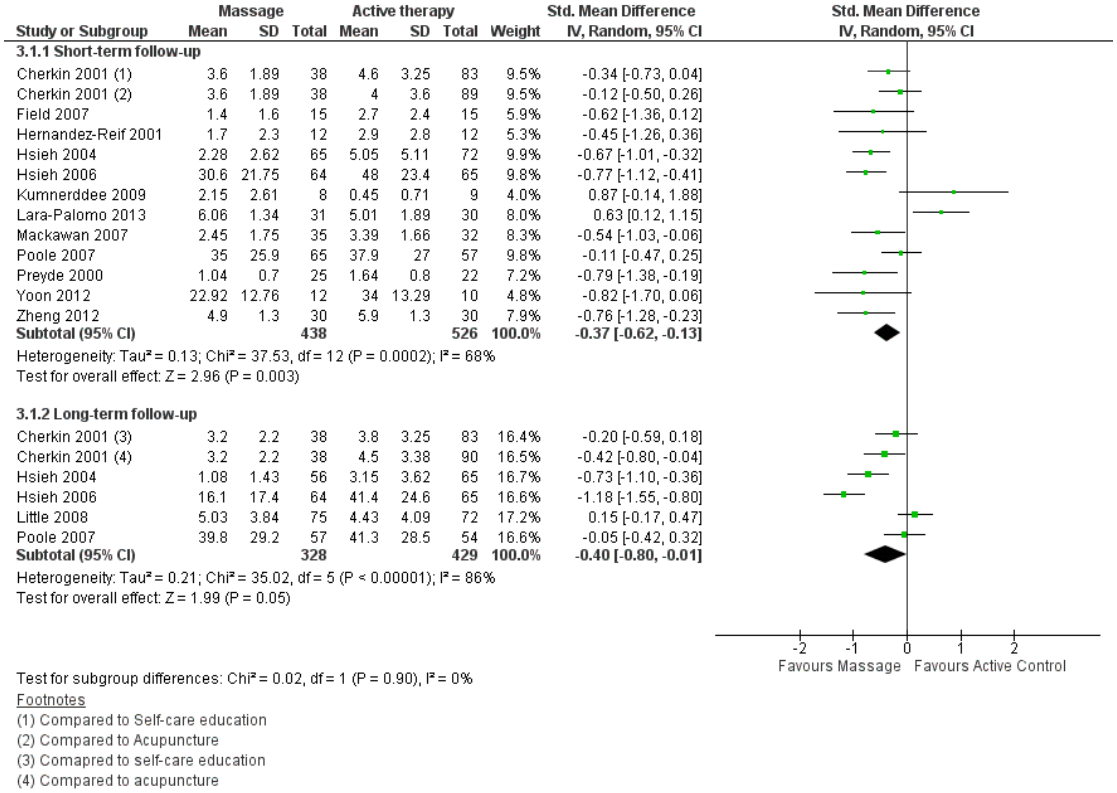
3. Massage versus active controls for acute LBP

There are no included trials for this comparison.

4. Massage versus active controls for sub-acute and chronic LBP

We have presented the meta-analysis for pain in Figure 5 and the summary of the results in Summary of findings 2.

Figure 5. Forest plot of comparison: 3 Massage versus active controls for sub-acute and chronic LBP, outcome: 3.1 Pain intensity (higher scores mean more pain).



Based on the current evidence, it is unclear whether or not massage is more effective than active controls for pain (SMD -0.37, 95% CI -0.62 to -0.13; 964 participants, twelve trials; I^2 statistic = 68%; very low quality evidence, Analysis 3.1) in the short-term follow-up and for pain (SMD -0.40, 95% CI -0.80 to -0.01; 757 participants, five trials; I^2 statistic = 86%; very low quality evidence, Analysis 3.1) in the long-term.

Based on the current evidence, it is unclear whether or not massage is better than active controls for function (SMD -0.24, 95% CI -0.62 to 0.13; 618 participants, six trials; I^2 statistic = 79%; very low quality evidence, Analysis 3.2) in the short-term follow-up and for function (SMD -0.21, 95% CI -0.60 to 0.17; 616 participants, four trials; I^2 statistic = 82%; very low quality evidence, Analysis 3.2) in the long-term follow-up.

5. Studies excluded from meta-analyses

We excluded six trials in the meta-analyses: four compared two massage techniques (Chatchawan 2005; Eghbali 2012; Franke 2000; Sritoomma 2014), one did not report precisely the amount of patients in each group (Kamali 2014) and one reported the median and interquartile values but not mean and standard deviation (SD) values (Quinn 2008). Two studies at low risk of bias compared Thai massage versus classic (Swedish) massage to measure their effects on pain and function in the short term, yielding different results: one trial, Chatchawan 2005, showed that both techniques had similar effects, but the other, Sritoomma 2014, reported better results with the Swedish massage (SM). One trial, Eghbali 2012, reported a higher reduction in pain after six weeks of reflexology than massage applied to the feet and lower back. Franke 2000 reported that acupuncture massage is better than SM for pain and function immediately after the treatment.

Adverse events

Fourteen studies did not report whether or not adverse events were measured (Buttagat 2011; Eghbali 2012; Farasyn 2006; Field 2007; Franke 2000; Geisser 2005; Hernandez-Reif 2001; Hsieh 2006; Kamali 2014; Lara-Palomo 2013; Mackawan 2007; Poole 2007; Preyde 2000; Zheng 2012).

There is no report of adverse events in the trial of massage for acute low-back pain (Analysis 1.3), Based on the current evidence, it is unclear whether or not there is any difference in the incidence of adverse events between massage and inactive controls (RD 0.06, 95% CI 0.00 to 0.11; 624 participants, four trials; I^2 statistic = 73%; Analysis 2.3), or between massage and active controls (RD 0.01, 95% CI -0.01 to 0.03; 585 participants, five trials; I^2 statistic = 0%; Analysis 3.3).

Increased pain was the most common adverse event in the patients randomized to the massage group and it was reported in 25% of patients in Ajimsha 2014, 13% in Cherkin 2001, 7% in Cherkin 2011, and in one patient in Little 2008. Allergic reaction to the massage oil (rash and pimples) occurred in 5.5% of the patients randomized to the SM in Chatchawan 2005. In Kumnerddee 2009 one patient reported intense post treatment soreness, and in Yoon 2012 there was one patient who reported skin discomfort. One patient reported nausea, shortness of breath and chest pain but this was not considered as a side effect of structural massage by the authors of the trial (Cherkin 2011). Four studies found that no adverse events occurred in the study population, either in the massage or control groups (Hsieh 2004; Quinn 2008; Sritoomma 2014; Yip 2004).

ADDITIONAL SUMMARY OF FINDINGS *[Explanation]*

Massage versus active controls for sub-acute and chronic LBP for LBP

Patient or population: patients with LBP
Settings:
Intervention: Massage versus active controls for sub-acute and chronic LBP

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Control	Massage versus active controls for sub-acute and chronic LBP				
Pain intensity (higher scores mean more pain) - Short-term follow-up Numerical pain rating scales (higher scores man more pain) Follow-up: 0 to 6 months	The mean pain intensity in the active control group is **40.6 points (SD 26.7) VAS**[1]	The mean pain intensity in the massage group is 30.7 points (95%CI 24.0 to 37.1 points)	Not applicable	964 (12 studies, 1 study is duplicated because it had two types of massage)	⊕◯◯◯ **very low**[2,3]	Medium, statistically significant effect size (SMD -0.37, 95% CI -0.62 to -0.13)
Pain intensity (higher scores mean more pain) - Long-term follow-up Back and Leg pain; VAS and Von Korff Pain Scale. Follow-up: 6 to 12 months	The mean pain intensity in the active control group is **40.6 points (SD 26.7) VAS**[1]	The mean pain intensity in the massage group is 29.9 points (95%CI 19.2 to 40.3 points)	Not applicable	757 (5 studies)	⊕◯◯◯ **very low**[2,4,5]	Medium, statistically significant effect size SMD -0.4 (-0.8 to -0.01)

Function (higher scores mean more disability) - Short-term follow-up Interference with daily activities (higher scores mean more disability). Follow-up: 0 to 6 months	The mean function in the active control group is **36.6 points (SD 17.7) Oswestery Disability Questionnaire**[1]	The mean function in the massage group is 32.4 points (95%CI 25.6 to 38.9 points)	Not applicable	618 (6 studies)	⊕○○○ **very low**[2,6]	Small, non-significant effect size SMD -0.24 (-0.62 to 0.13)
Function (higher scores mean more disability) - Long-term follow-up RMDQ and ODI. Follow-up: 6 to 12 months	The mean function in the active control group is **36.6 points (SD 17.7) Oswestry Disability Questionnaire**	The mean function in the massage group is 32.9 points (95%CI 26.0 to 39.6 points)	Not applicable	616 (4 studies)	⊕○○○ **very low**[2,6,7]	Small, non-significant effect size SMD -0.21 (-0.6 to 0.17)
Adverse events Self-reported	**29 per 1000**	**37 per 1000** (19 to 59)	See comment	585 (5 studies)	⊕○○○ **very low**[2,6]	Small, non statistically significant difference (RD 0.01, 95% CI -0.01 to 0.03)

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% CI) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: confidence interval; **RR:** risk ratio; **ODI:** Oswestry disability index; **RMDQ:** Roland Morris Disability Questionnaire; **VAS:** visual analog scale.

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

[1]Final scores. Poole 2007 was the most representative trial included in this meta-analysis.
[2]Downgraded two levels because of risk of bias: The studies included in this meta-analysis had high risk of selection, performance, detection and attrition bias. Unclear risk of reporting bias.

[3]Downgraded one level because of inconsistency. Although the I² statistic value was < 80%, we found that there was some underlying heterogeneity because 2 studies found the opposite results from this meta-analysis (Lara-Palomo 2013; Kumnerddee 2009).
[4]Downgraded one level because of inconsistency. The I² statistic value is 86%.
[5]Downgraded one level because of imprecision. The 95% CI includes a small effect.
[6]Downgraded one level becasue of imprecsision. The 95% CI includes "no effect".
[7]Downgraded one level because of inconsistency. The I² statistic value is 82%.

DISCUSSION

Summary of main results

We included 12 new RCTs of massage for LBP in this Cochrane Review update. In contrast to our previous review (which was more postive), the current review shows that we have very little confidence that massage is an effective treatment for LBP. The results are conflicting for the long-term follow-up (massage versus inactive controls) and for the outcome of function (massage versus active controls), with some comparisons showing that massage is better than the control groups, and others showing no significant differences.

Not all the included trials showed that massage was better than the other treatment: one trial reported that acupuncture was better than Thai massage in military personnel (Kumnerddee 2009); another trial showed that acupuncture had similar effects for the relief of pain than SM in the short term (Cherkin 2001); and one trial, Lara-Palomo 2013, reported better results with interferential current electro-massage when compared with superficial massage for the relief of pain and function in the short term.

Even though reflexology is a massage technique that is not applied directly to the back, we included three studies in this Cochrane Review that studied reflexology. It is considered a manual manipulation of soft body tissues (Sherman 2006). One trial reported better results with reflexology than with sham therapy (Quinn 2008); one trial, Eghbali 2012, reported better results with reflexology than massage to the feet and lower back; and one trial reported better results with reflexology than usual care, but no differences when compared to relaxation (Poole 2007).

Overall completeness and applicability of evidence

We did not find any large effect size. The magnitude of the effect was small to medium in all meta-analyses of continuous outcomes. All of the meta-analyses of continuous outcomes had to be performed using SMD values because the included trials used different measurement instruments for the outcomes of interest (pain and function). The disadvantage of using SMD values is that clinicians and patients are unlikely to relate to this way of presenting results. (Guyatt 2013). Therefore, in the 'Summary of findings' tables we used a transformation to a common, well-known measurement to report the results in a meaningful way.

Only 11 trials measured adverse events. The remaining trials did not mention whether or not adverse events were measured. There were no serious adverse events in these trials, and the most common adverse event was increased pain after the massage sessions.

Fourteen trials employed statistical adjustments to control the type I error (Buttagat 2011; Chatchawan 2005; Cherkin 2001; Cherkin 2011; Franke 2000; Hernandez-Reif 2001; Hsieh 2004; Hsieh 2006; Lara-Palomo 2013; Little 2008; Poole 2007; Preyde 2000; Sritoomma 2014; Yip 2004). Not all studies considered sample size calculations based on the Minimal Clinically Important Difference (MCID) either for pain or function to yield more clinically meaningful results; three out of the 14 trials did not consider a MCID for the sample size (Buttagat 2011; Hernandez-Reif 2001; Sritoomma 2014). Moreover, the cut-off point is still debatable when considering the methods to operationalize or quantify the MCID (King 2011). A MCID of 19 out of 100 points in the VAS and 10 points in the Oswestry is proposed; this cut-off point was obtained by the standard error of measurement and by global transition questions to subtract the mean score of "unchanged" from "better" (Hägg 2003). A rationale to decide the MCID should be carried out a priori for more meaningful clinical estimates, otherwise, statistical differences could be obtained but not necessarily clinically important.

Quality of the evidence

This updated review is also different from previous versions in relation to the quality of the evidence. The current approach yielded "low" to "very low" quality evidence, which differs from the previous version of this review, (Furlan 2008), where the quality of the evidence was judged "moderate" for most comparisons. The explanation for these changes could be: first, we grouped more studies in the same comparisons, therefore increasing the types of biases that were introduced in each comparison; and second, the definitions of imprecision and inconsistency were stricter in the current than in the previous review.

In this review update we found high risk of selection, performance, attrition and measurement bias, suggesting that blinding patients, health care providers and outcomes were the most challenging methodological steps in clinical trials of massage. One trial, Geisser 2005, used a questionnaire to measure the success of patient blinding, so this strategy seemed to help in reducing the bias when patients themselves assess the outcomes of pain and function. On the other hand, the methods for allocation concealment were unclearly reported in half of the trials. It has been suggested that small trials with inadequate allocation concealment may exaggerate the effect of the interventions when they were compared to larger studies (Kjaergard 2001).

Potential biases in the review process

In this review update we grouped the comparison groups to yield more meaningful comparisons. Massage was compared to active and inactive controls. Massage is not a standardized treatment and many variables may affect its potential effect over painful conditions, such as the massage technique, the duration, frequency and number of treatment sessions, the intensity of pressure, the location over the body, the experience of the therapist, the level of stress, heterogeneity of participants and confounding variables,

such as co-interventions or emotional effect of counselling from the therapist. One limitation of this meta-analysis is the relative lack of studies for each technique of massage; amid a large number of variables involved in the massage techniques and small samples (Hernandez-Reif 2001; Kumnerddee 2009; Quinn 2008; Yoon 2012), some associations may be obtained merely by chance (type I error). As randomization might not be enough for balancing groups in their baseline conditions, risk stratification (Wagner 2009) or multivariable analysis (Wahlgren 2008) have been proposed to overcome this potential pitfall.

Agreements and disagreements with other studies or reviews

A recent non-Cochrane review reviewed the effects of massage for many pain conditions including shoulder pain, fibromyalgia and back pain (Bervoets 2015). This review included adults with common musculoskeletal disorders and compared massage versus no treatment (wait list control, sham, rest or usual care) and massage versus other active treatments (exercise therapy, joint manipulation, relaxation therapy). This review included eight RCTs of patients with LBP: six out of the 25 studies that were included in this Cochrane Review; the other two studies were excluded from this Cochrane Review because we considered that the massage technique was not properly delivered. This could also be explained by a different search strategy and differences in inclusion criteria. The eight studies comprised short and long term follow-up of either pain and function of massage compared to active or inactive therapies. Bervoets 2015 pooled two studies (one included and one excluded from our review), and found that massage was ineffective for LBP.

We published a systematic review of complementary and alternative medicine therapies for back and neck pain (Furlan 2012). This review included 10 trials of massage for LBP. In the comparisons of massage versus inactive treatments, massage had significantly better (effect in reducing) pain intensity and disability for acute/subacute non-specific LBP, but in subjects with non-specific CLBP there was no significant difference from no treatment or placebo in pain intensity or disability. When compared to active treatments, massage was significantly better in reducing pain compared to relaxation or physical therapy for subjects with non-specific CLBP, but there was no significant difference between massage and usual care -consisting of advice and exercise- for people with non-specific CLBP.

AUTHORS' CONCLUSIONS

Implications for practice

We have very little confidence that massage is an effective treatment for LBP. For acute LBP, massage improved pain but not function when compared to inactive controls in the short-term follow-up. For sub-acute and chronic LBP, massage improved pain and function outcomes in the short-term but not in the long-term follow-up when it was compared to inactive controls. Compared with active controls, massage improved pain in the short and long-term follow-ups, but it did not improve function at any follow-up. There were only minor adverse effects with massage.

The benefits of massage for patients with acute, sub-acute and chronic non-specific LBP were found mostly in the short-term follow-up period (up to six months after randomization) for pain outcomes. The inclusion of new studies in this Cochrane Review update allowed for a larger population and amount of studies. It objectively revealed heterogeneity and low quality of the evidence, suggesting the need for meta-analysis of larger and better studies with more specific populations, interventions, co-interventions and outcome measures.

Implications for research

As most outcomes in LBP are subjective measures, the ideal control group is one that ensures that treatments are equally credible and acceptable to patients to minimize placebo effects and high dropout rates (Haraldsson 2006). There are numerous techniques of massage therapy, and each one needs to be evaluated for effectiveness and cost-effectiveness. There are also different settings (private practice, hospital, primary care, pain clinics) and populations (acute or chronic pain, presence of other aggravating factors, different countries with different cultures) that need to be assessed separately. Future trials may also consider whether the benefits of massage can be increased if the therapist has many years of experience or is a licensed therapist.

Trials should examine the role of session length by including two (or more) levels of this variable, and the experience of the therapist by employing various people with different experience and training. Trial authors should discuss the clinical relevance of the results and include long-term follow-up. Trial authors are encouraged to follow the CONSORT statement for reporting their trials (Moher 2001) and use the standard outcomes for trials of LBP as described by Deyo 1998, in order to provide homogenous information for future systematic reviews and meta-analyses. When presenting the results, researchers are encouraged to show the baseline characteristics using point estimates (mean, median) with SDs (for continuous variables), and the number of patients in each category (for categorical variables) and for every follow-up measure.

Studies could consider treatment-based subgroups according to prognostic factors (risk stratification) in order to obtain more homogeneous categories of patients; subsequently, it might yield much larger treatment effects for selective groups of patients with LBP, instead of inconsistent estimates due to heterogeneous populations. Kamper 2010 outlined a wide spectrum of subgroup approaches, including pathoanatomy, psychosocial characteristics

and patterns of signs and symptoms and a rationale process to postulate the a priori candidate factors, a hypothesis verification and replication to confirm the estimates derived from subgroup-factors analysis.

ACKNOWLEDGEMENTS

We thank the CBN Editors for their excellent comments and suggestions, the CBN managing editor Claire Munhall for proofreading and making excellent suggestions to improve the manuscript, and the CBN Group Trials Search Coordinators Rachel Couban and Shireen Harbin.

Joanna Liu from the CBN gave her support with the search and translation of Chinese articles and help us to extract data to determine the inclusion criteria when necessary, for which we are grateful. We are grateful to Dr. Sergio Terreri for his help in translating and extracting data from the German paper (Franke 2000). Also we thank Dr. Annegret Franke (author of one included trial) for double checking the data extracted from her paper and for providing further information about the trial. We acknowledge Vivian Welch, Jean Wong, Lucie Brosseau and Trish Dryden, co-authors of previous versions of this Cochrane Review, for their participation.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

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

Ajimsha 2014

Methods	Country: India. Funding: this research was supported by a grant from the Mahatma Gandhi University, Kottayam, India Blinding: the outcome assessors were blinded. Recruited: between July 2010 and June 2012, 93 nursing professionals were referred to the Myofascial Therapy and Research Foundation with a diagnosis of CLBP. Those who met the inclusion criteria and provided written informed consent were randomized Randomized: 80 patients were randomized to treatment group (myofascial release) and control group (sham myofascial release) Followed: myofascial release group, n = 38; control group, n = 36 Analysis: statistical analysis of the data was performed using a 2 x 3 (group x time) analysis of variance (ANOVA) and 2 x 2 (group x time) and 2 x 3 (group x time) repeated-measures ANOVA. The between-groups (group), within-groups (time) and mixed-groups (group x time) interactions were examined
Participants	Population: nursing professionals aged 20 to 40 years old with a diagnosis of CLBP (defined as pain of ≥ 3 months duration) Settings: Myofascial Therapy and Research Foundation. Funding: economic incentives for patients were not reported. Mean age: myofascial release group 35.8 ± 8.4, sham myofascial release group 34.2 ± 9.3 % Female: myofascial release group 76%, sham myofascial release group 77.7% Ethnicity: not described. The study was performed in the city of Kerala, India Work status: all patients were nursing professionals. The time of job for myofascial release group was 9.8 ± 7.5 years and for sham myofascial release group was 8.1 ± 6.9 years Pain duration (mo): myofascial release group 28.3 ± 14.7, sham myofascial release group 26.8 ± 16.0 Previous surgery: not described. Diagnoses: CLBP (defined as pain of ≥ 3 months duration), with a primary complaint of CLBP, and who were judged to have musculoskeletal pain based on evaluation by the musculoskeletal physician and physical therapist. Patients were excluded if they displayed: 1) osteoporosis of the spine; 2) primary joint disease such as active rheumatoid arthritis; 3) metabolic bone disease; 4) malignant bone disease; 5) fracture; 6) hypermobility of the lumbar/sacral spine; 7) cardiovascular or other medical disorder preventing the person from engaging in strenuous exercise; 8) evidence of radiculopathy, or primary complaint of radiating pain; 9) pregnancy; or 10) severe psychiatric disturbance. Use of oral/systemic steroids, use of analgesics on > 10 days a month and any other treatment for CLBP during the previous 6 months were also excluded from the study
Interventions	Massage technique: myofascial release (MFR), or a sham myofascial release (SMFR). The 2 interventions were provided 3 times weekly for 8 weeks (weeks 1 to 8), with a minimum of a 1-day gap between the 2 sessions; the duration of each treatment session was 60 min (40 min for MFR or SMFR and 20 min for specific back exercises) • Group 1: MFR (n = 40). MFR of the lower thoracolumbar fasciae and gluteus

	maximus, myofascia of the posterior hip and piriformis, lower back, deeper lower back and the trunk. • Group 2: SMFR (n = 40). Gentle placement of the hand over the areas treated in the MFR group just enough to maintain contact for the desired time.
Outcomes	* used in the meta-analyses: Measured at baseline, immediately after (8th week) and short-term (12th week): a. Pain: McGill Pain Questionnaire (MPQ)*- Pain Rating Index (PRI) b. Function: Quebec Back Pain Disability Scale (QBPDS)*. c. Adverse events: no serious adverse events. Ten patients from the MFR group and 1 from control group reported an increase of pain in the first week after initiation of treatment, and this was reported to have subsided within a week without any medications Measured in the long-term: none.
Notes	a. Pain intensity (MPQ) (range, lower means "better", higher means "worse"): • Group 1: MFR: from [baseline] 23.2 ± 8.7to [immediately after] 10.8 ± 7.9 to [short term] 13.1 ± 6.9. • Group 2: SMFR: from [baseline] 23.0 ± 7.6 to [immediately after] 17.0 ± 9.3 to [short term] 18.3 ± 7.5. b. Function (QBPDS) (lower means "less disabled"): • Group 1: MFR: from [baseline] 37.1 ± 11.8 to [immediately after] 26.0 ± 11.1to [short term] 28.7 ± 9.1. • Group 2: SMFR: from [baseline] 35.3 ± 13.6 to [immediately after] 31.8 ± 12.4 to [short term] 32.5 ± 10.4.

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	The method of randomization is not described.
Allocation concealment (selection bias)	Unclear risk	The method of allocation is not described.
Blinding (performance bias and detection bias) All outcomes - patients?	Low risk	Patients were blinded to the type of therapy.
Blinding (performance bias and detection bias) All outcomes - providers?	High risk	Providers were not blinded..
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	High risk	Assessors were blinded to group but patients are the source of information for the outcome questionnaires and they were not blinded
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	Drop outs were 2 (5%) and 4 (10%) for MFR group and control group, respectively

Ajimsha 2014 (*Continued*)

Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Low risk	All patients were analyzed in the group to which they were allocated by randomization
Selective reporting (reporting bias)	Low risk	Pain and function were measured as defined in the methodology
Other bias	Low risk	No other bias was detected.
Similarity of baseline characteristics?	High risk	Other potential conditions that could affect the report of outcomes were not reported, such as physical demands at job or body mass index
Co-interventions avoided or similar?	Unclear risk	Specific exercises were taken from Sahrman (2002) and Bookhout (1997) and combined with self-corrections, stretches, and strengthening exercises for 20 min per session both for MFR and control groups Medications at baseline or follow-up are not described, although patients were asked to complete a dairy
Compliance acceptable?	Unclear risk	Not completely well described.
Timing outcome assessments similar?	Low risk	All patients were evaluated at baseline, immediately after and at 2 weeks

Buttagat 2011

Methods	Country: Thailand. Funding: Khon Kaen University's Graduate Research Fund Academic Year 2007 Blinding: there is no description about blinding ofo participants, care providers or outcome assessors Recruited: 36, from Khon Kaen province using bulletin boards and oral requests for participants during a 7-month period between September 2007 and March 2008 Randomized: 36. Followed: 36. Analysis: Mean and SDs for descriptive statistics. Paired t-tests were used to compare outcome variables at baseline with outcome measures immediately after the treatment or control period within each respective group. Covariance (ANCOVA) was used to compare the difference in post-test values between the control and treatment groups after adjusting for differences in baseline values, for each outcome measure
Participants	Population: patients with back pain associated with myofascial trigger points (MTrPs), according to criteria specified by Travell and Simons (1983). In > 88% of all cases, the most painful trigger point of each patient was found in the lower part of the back. Upper back pain was not excluded

	Settings: the study was conducted in the Division of Physical Therapy, Faculty of Associated Medical Sciences, Khon Kaen University, Thailand Funding: no monetary incentives for patients. Mean age: 22.6 ± 2.9 years % Female: 55.6%. Ethnicity: All recruited from Khon Kaen province without more descriptions about ethnicity Work status: student 30 (83.3%), physical Therapist 4 (11.1%), teacher 1 (2.8%), policeman 1 (2.8%) Pain duration: > 12 weeks. Previous surgery: none of the patients. Diagnoses: apparently healthy participants. Disorders affecting the heart rate variability were excluded, such as myocardial infarction, hypertension, neuropathy diabetes mellitus, fever, a history of acute trauma, spinal fracture, inflammatory arthritis (rheumatoid arthritis or gout), muscle diseases, evidence of neurological deficits, or skin diseases
Interventions	Massage technique: traditional Thai massage (TTM), 30-min session, confined to the back area only on TTM-patients lying in the prone position, during the period between 10.00 and 13.00 h on the day of the study. The technique was in accordance to the system of royal Thai massage, which applies the theory of "Sen Sib" or the 10 meridian lines. Massage points were located along two lines and at an additional, single, point along the paravertebral muscles on each side of the spine. Gentle, gradually increasing, pressure through the therapist's thumb, fingers or palm. Pressure is applied until the patient starts to feel slight discomfort after which this pressure is maintained for 5 to 10 seconds at a time. This sequence can be repeated several times for each massage point Experience of therapist: "well-trained massage therapist". No more details were described Group 1: TTM (n = 18 randomized to this group) Group 2: relaxation (n = 18 randomized to this group). Patients in this group relaxed by lying prone quietly in the same environment and for the same period of time as the treatment group
Outcomes	* used in the meta-analyses: Measured at baseline and immediately after: a. Pain: VAS for pain*, b. Function: none c. Adverse events: not reported d. Other measures: • VAS for muscle tension, • Heart Rate Variability (HRV), • Pressure pain threshold (PPT) that was measured using the pressure algometry technique • State Anxiety inventory (STAI) (Thai version) . • Sit-and-reach box to measure body flexibility. Measured in the short-term: none. Measured in the long-term: none.
Notes	Results: Pain intensity (VAS) (0 to 10, lower means "better"). • Group 1: from [baseline] 4.7 to [immediately after] 2.3.

	• Group 2: from [baseline] 4.1 to [immediately after] 4.5. Authors' conclusions: TTM can increase HRV and improve stress-related parameters in this patient population. The results of this study suggest that TTM onto the back muscle for 30 min in the prone position is effective in increasing cardiac parasympathetic activity, reducing sympathetic activity and reducing pain and stress in patients with back pain associated with MTrP. This treatment technique is a non-pharmacologic intervention with no side effects. Since, this massage technique can be easily taught to partners or family members of patients, we suggest that TTM should be considered as one of the alternative treatments for MTrP

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Block randomized allocation (computer generated) with block sizes of 2, 4 and 6
Allocation concealment (selection bias)	Low risk	Pre-generated random assignment scheme enclosed in envelopes
Blinding (performance bias and detection bias) All outcomes - patients?	High risk	Participants either received massage or had to lie down and relax. The patients would know if he/she received massage or just lied down
Blinding (performance bias and detection bias) All outcomes - providers?	High risk	There is no description of blinding the providers to the type of therapy
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	High risk	Patients self-reported pain (VAS). There is no description of blinding the patients to the therapy. Since patients were not blinded to the intervention, they were not blinded for outcome assessment
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	All randomized patients were analysed
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Low risk	All patients were analyzed in the group to which they were allocated by randomization
Selective reporting (reporting bias)	Low risk	The pain intensity-VAS was measured before and after the 30 min session of Massage as specified in the methods section of the manuscript
Other bias	Low risk	No other bias was identified.

Buttagat 2011 (*Continued*)

Similarity of baseline characteristics?	High risk	Missing information about scoliosis, practice of sports, history of longstanding trauma or spinal injuries Exclusion criteria addressed factors affecting heart rate. Duration of back pain was 5 months more in the massage group. Pain intensity slightly more in the massage group
Co-interventions avoided or similar?	Low risk	At the end of the study, all participants in both groups were given the opportunity for instruction in a series of back exercises to conduct at home
Compliance acceptable?	Low risk	All patients complied with the interventions.
Timing outcome assessments similar?	Low risk	It was done at the end of intervention in both groups.

Chatchawan 2005

Methods	Country: Thailand. Funding: study grant from the Office of the Higher Education Commission, Ministry of Education, Thailand. Blinding: outcome assessor. Recruited: 214. Randomized: 180. Followed: 177 at post treatment; 172 at one month. Analyses: paired t-tests for comparisons immediately before and after treatment and follow-ups. ANCOVA for comparisons between groups
Participants	Population: back pain associated with myofascial trigger points Settings: Department of Physical Therapy, Faculty of Associated Medical Sciences, Khon Kaen University, Thailand Mean age: 36.4 years. % female: 114 (63%). % White: not reported. Work status: heavy work: N = 9 (5%); lighter work: N = 171 (95%) Pain duration: 35.7 months. Previous surgery: not included in the study if back surgery. Diagnoses: presence of at least one trigger point diagnosed as the presence of local tenderness at a palpable nodule in a taut band and with pain recognition
Interventions	All eligible patients received one of two treatments, either traditional Thai massage (TTM) or Swedish massage (SM), during six sessions over a period of 3 to 4 weeks. Treatment was given for 30 mins and followed by 10 mins of passive stretching, which was similar in both groups

	Massage technique: TTM was performed according to the system of royal Thai massage. Massage points included in this method are located along two lines and at an additional, single, point on each side of the back. The first line of massage starts from a point 2 cm above the posterior superior iliac spine (PSIS) and ends at the thoraco-cervical junction or C7. Each point on this line is approximately one finger breadth away from the spinous process. The second line follows the same course but is about two finger breadths away from the spinous process. The single massage points on each side of the back are located three finger breadths away from the spinous process of the L2 vertebra. The pressing technique employed in TTM uses the body weight of the massage therapist to apply gentle, gradually increasing, pressure through the therapist's thumb finger, palm and elbow. Pressure is applied until the patient starts to feel some pain (pain threshold) after which the pressure is maintained for 5 to 10 seconds at a time. This sequence can be repeated several times for each massage point. SM: this treatment was performed using body oil (jojoba oil) for lubrication of the skin. Pressure was applied on the area of the back between PSIS and C7. This pressure was enough to reach deep into the skin and subcutaneous tissue, but insufficient to reach the pain threshold of each patient. SM techniques used in this study included light stroking or effleurage, and petrissage (which consist of kneading with the thumb, digit and palm; wringing and skin rolling) Massage technique: along two lines on each side of the back: approximately one finger breadth away from the spinous process from 2 cm above the posterior superior iliac spine to C7; about two finger breadths away from the spinous process at the same course. One single massage point on each side of the back three finger breadths away from the spinous process of L2; employed the body weight of the massage therapist to apply gentle, gradually increasing, pressure through the therapist's thumb finger, palm and elbow, until the patient starts to feel some pain after which the pressure is maintained for 5 to 10 seconds at a time, for 30 minutes, 10 minutes passive stretching during for six sessions over a period of three to four weeks. Experience of therapist: four, eight and 20 years of experience Group 1: TTM (90 randomized to this group). Group 2: SM (90 randomized to this group).
Outcomes	Measured at baseline, immediately after first treatment; during intervention period (three weeks) and one month after last treatment a. Pain: VAS. b. Overall improvement: not measured. c. Function: Thai version of the Oswestry disability questionnaire (ODQ) d. Patient satisfaction: 4-point scale (1 = completely dissatisfied to 4 = very satisfied); % of very satisfied e. PPT algometry; Thoracolumbar ROM, body flexibility (sit-and-reach box) f. Adverse events: soreness, allergic reaction (rashes and pimples) to the massage oil
Notes	a. VAS: • Group 1: from 5.5 to 4.1 to 2.2 to 2.4. • Group 2: from 5.2 to 3.4 to 2.0 to 2.5. b. Function: ODQ (baseline, 3 weeks and 1 month FU): • Group 1: from 20.7 to 13.8 to 13.4. • Group 2: from 20.7 to 15.4 to 13.9.

	c. PPT: • Group 1: from 2.7 to 3.0 to 3.5 to 4.2. • Group 2: from 2.6 to 2.8 to 3.4 to 3.6. d. Patient satisfaction: • Group 1: 83% day 1; 88% week 3. • Group 2: 86% day 1; 82% week 3. Authors' conclusions: "TTM or SM treatment can be used, with equal expected effectiveness, in the treatment of back pain associated with myofascial trigger points. We therefore recommend that TTM and SM be more widely promoted as alternative primary health care treatments for this disorder."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Randomization was performed using block randomized allocation with block sizes of 2, 4 and 6. Groups were assigned using a pre-generated random assignment scheme
Allocation concealment (selection bias)	Low risk	Random assignment scheme enclosed in envelopes.
Blinding (performance bias and detection bias) All outcomes - patients?	High risk	Authors reported "it was not feasible for the patients to be blinded"
Blinding (performance bias and detection bias) All outcomes - providers?	High risk	Not blinded.
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	High risk	"All outcome measures were assessed by one physical therapist with 15 years of experience, for whom the treatment groups were blinded." However, the outcomes are self-reported by patients and patients were not blinded
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	At the end of the study 85/90 patients of TTM and 87/90 of SM completed the treatment and follow-up
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Low risk	The trial authors state that all analysis were performed on an ITT basis
Selective reporting (reporting bias)	Unclear risk	Trial authors reported all primary outcomes: pain and back-specific functional status. However, the satisfaction with the treatment at 1 month, the adverse effects,

Chatchawan 2005 (*Continued*)

		the medication used and the range of motion were not reported for the last evaluation at 1 month
Other bias	Low risk	No other bias was identified.
Similarity of baseline characteristics?	Low risk	No major differences between groups on demographics, physical work load of occupation, causes of back pain, height, weight, duration of back pain, time since last episode of back pain, stress level and main outcomes (pain, disability and patient's satisfaction)
Co-interventions avoided or similar?	Low risk	Both groups received 10 minutes of stretching after the treatment. A home care program was recommended including back stretching exercises and health care education (correct posture and lifting techniques). The adherence to the home care program was not measured. It could be different between groups
Compliance acceptable?	Low risk	"in the majority of patients, treatment occurred according to the planned schedule of two sessions a week for 3 weeks"
Timing outcome assessments similar?	Low risk	Yes.

Cherkin 2001

Methods	Country: USA. Funding: grants from Group Health Cooperative, The Group Health Foundation, Seattle, Wash, and the John E. Fetzer Institute, Kalamazoo, Mich; and by grant HS09351 from the Agency for Healthcare Research and Quality. Method of randomization: computer-generated random sequence. 3996 letters were mailed. 693 consent forms returned. The first 262 enrollees confirmed eligible were randomized Patients were HMO enrollees, six weeks after a primary care visit for back pain. Period of study: May to Oct 1997. Follow-up: 4, 10 and 52 weeks after randomization. 95% were followed up to 52 weeks
Participants	Settings: this study was conducted at Group Health Cooperative, a large staff-model health maintenance organization (HMO) in Washington State Average age: 44.9 years. 58% women. 84% white. 84% employed or self-employed. Previous treatments: 6% operation, 3% acupuncture, 16% massage Length of pain: at least 6 weeks, 61% lasted > 1 year.

Cherkin 2001 (*Continued*)

Interventions	1. Licensed therapist. At least three years of experience. Manipulation of soft tissue (i.e. muscle and fascia). Swedish (71%), movement reeducation (70%), deep-tissue (65%), neuromuscular (45%), and trigger and pressure point (48%), Moist heat or cold (51%). Prohibited: energy techniques (Reiki, therapeutic touch). Proscribed meridian therapies (acupressure and shiatsu) and approaches deemed too specialized (craniosacral and Rolfing). Massage therapists recommended exercise, typically stretching. 59% also used "body awareness" techniques to help clients become more aware of their physical and kinaesthetic sensations, including potential early warning signals of injury. Mean (SD) number of visits = 8.0 (2.4). 2. Traditional Chinese medical acupuncture. Mean (SD) number of visits = 8.3 (2.3). 3. Self-care education: high-quality and inexpensive educational material designed for persons with chronic back pain: a book and two professionally produced videotapes
Outcomes	* used in the meta-analyses: Measured before, after 4, 10* and 52* weeks of the randomization Primary outcome measures: a. Bothersomeness of back pain (0 to 10); bothersomeness of leg pain (0 to 10), or bothersomeness of numbness or tingling (0 to 10). The higher (of the 3) score was used (valid) b. Modified Roland Disability Scale (reliable, valid and sensitive)* Secondary outcome measures: c. Disability: National Health Interview Survey. d. Utilization: provider visits, RXs, operations, hospitalizations, medication use, visits to other massage or acupuncture practitioners e. Satisfaction. f. SF-12, Mental Health summary scales. h. Number of days of exercise. i. Adverse events: No serious adverse effects. Eleven percent of patients in the acupuncture group and 13% in the massage group reported "significant discomfort or pain" during or shortly after treatment
Notes	Authors' conclusions: therapeutic massage was effective for persistent LBP, apparently providing long-lasting benefits

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated random sequence.
Allocation concealment (selection bias)	Low risk	By using computer assisted telephone interviewing, patients were randomly allocated without stratification using a computer-generated random sequence

Cherkin 2001 (*Continued*)

Blinding (performance bias and detection bias) All outcomes - patients?	Unclear risk	It is not described whether or not patients were blinded to which group they belonged to
Blinding (performance bias and detection bias) All outcomes - providers?	Unclear risk	Not described in the text.
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	Low risk	Interviewers masked to treatment group used computer assisted telephone interviews to assess outcomes 4, 10, and 52 weeks after randomization
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	Follow-up in the three groups was between 92% and 97%.
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Low risk	Authors reported: "...within the context of an intent-to-treat analysis using analysis of covariance (ANCOVA) with adjustment for baseline values..."
Selective reporting (reporting bias)	Unclear risk	The outcomes described in the methodology were: symptoms (back pain, leg pain, numbness and tingling), back specific functional status (Modified Roland Morris Questionnaire), disability (number of days spent in bed, home from work or school, or with reduced activity according to data from National Health Interview survey), satisfaction with the overall treatment, well being (SF-12 Physical and Mental Health summary scales), utilization of health care services covered by HMO and cost (data from health maintenance organization -HMO-), utilization of services not covered by HMO, use of medications and practice of aerobic exercise in the last week. The study did not report or reported partial data in 3 of 10 outcomes. Wellbeing is not reported for the 1 year follow-up. The hospitalizations were not recorded for the 1 year follow-up period. The use of medication is reported only for the follow-up in the week 4
Other bias	Unclear risk	Differences in adherence to exercise is unclear among the three groups

Similarity of baseline characteristics?	Low risk	There were no significant differences among the 3 treatment groups for any of the baseline characteristics measured: age, gender, educational status, white ethnical group, family income, employment status, quality of life (SF 12), duration of pain, hospitalizations for back pain, back surgeries, previous massage or acupuncture, > 90 days in LBP in the last 6 months, radiation of the pain, Roland Disability scale score, > 1 day work-loss day due to LBP in the past month, > 7 days of restricted activity due to LBP in the last month, medication in the past week, taking narcotics of analgesics and satisfaction with overall care
Co-interventions avoided or similar?	Low risk	Exercise at home was recommended in all groups. "Medication use by the acupuncture and massage groups did not differ from each other but was significantly below that in the self-care group (P>0.05) ". "In patient who received acupuncture, other commonly used therapies were infrared or other lamp heat (82% of patients) , cupping (66%), and electrostimulation of the needles (51%)". "A mean of 12 needles (range, 5-16) were inserted at each visit, with significant differences among acupuncturists (P,.001)". "Acupuncturists recommended exercise for about half of their patients, usually stretching, walking, or swimming". "Massage therapists recommended exercise, typically stretching, at the conclusion of 64% of initial visits. Most massage therapists (59%) also used "body awareness" techniques to help clients become more aware of their physical and kinaesthetic sensations, including potential early warning signals of injury"
Compliance acceptable?	Low risk	Ninety-four percent of patients in the acupuncture group and 95% in the massage group visited their assigned provider and made a mean (SD) of 8.0 (2.4) and 8. 3 (2.3) visits, respectively. Visits to massage therapists and acupuncturists averaged approximately 1 hour

Cherkin 2001 (*Continued*)

Timing outcome assessments similar?	Low risk	Yes: baseline, 4 weeks, 10 weeks and 1 year.

Cherkin 2011

Methods	Country: USA. Funding: National Institute of Health's National Center for Complementary and Alternative Medicine (NCCAM) Blinding: care providers were not blinded to the intervention Study personnel assessing trial outcomes were blinded to study assignment Conflict between protocol and final published paper (Cherkin 2011) regarding the participants: Protocol: participants were called to be informed about the type of Massage they would receive Full published article: participants knew whether they received massage but were blinded to type Recruited: 9127 invitations and evaluated 1161 responses; 402 persons (35%) were eligible and were randomly allocated Randomized: 402 persons (35%) were eligible and were randomly allocated Pre-programmed computer-generated sequence of blocked random numbers for each therapist to assign the participant 401 participants assigned to relaxation massage (n = 136), structural massage (n = 132), or usual care (n = 133) Duration of pain: > 1 year in 77%, 72% and 78%. Followed: follow-up analysis, structural massage: • 10 wk: 127 (96%). • 26 wk: 126 (95%). • 52 wk: 127 (96%). Follow-up analysis, relaxation massage (RM): • 10 wk: 130 (96%). • 26 wk: 126 (93%). • 52 wk: 123 (90%). Usual care (n = 133). Follow-up analysis, control: • 10 wk: 123 (92%). • 26 wk: 120 (90%). • 52 wk: 116 (87%). Analysis: analyses were conducted by using regression through generalized estimating equations (12) with an independent working correlation structure and robust SE estimates taking into account multiple outcomes per participant. Follow-up times were treated as categorical variables using dummy variables for each treatment, each time point, and all 2-way interactions between follow-up time and treatment. Adjusted models included baseline covariates that were prespecified, were imbalanced at baseline (that is, potential confounders), or were associated with a primary outcome (that is, precision variables): age, group, sex, baseline Roland Morris Disability Questionnaire (RMDQ) and symptom bothersomeness scores, education level, body mass index, type of work, original cause of back pain, > 7 days of reduced activities because of back pain, and medication use in the previous week. The adjusted analysis as the primary analysis was prespecified. For continuous and binary outcome measures, the linear and modified Poisson regression were applied, respectively, with robust SEs. Modified Poisson regression allows estimation of relative risks for non-rare outcomes using Poisson regression and corrects the misidentification of the variance using robust SEs in a generalized estimating equation framework

	To control for multiple comparisons, the least-significant-difference approach was used, in which pairwise treatment comparisons were evaluated at a given time only if the overall omnibus P value was statistically significant at 0.05. Mean differences, 95% CIs and omnibus P values for treatment group effect and pairwise significance were presented To assess effects of individual providers on the RMDQ outcome, an adjusted mixed-effects model with a random intercept for each provider was fitted by using only data from the 2 massage groups. The intraclass correlation coefficient was calculated to quantify the degree of variability due to providers relative to the overall variability of the outcome
Participants	Population: group health members with in-plan visits of the Puget Sound region of western Washington, between 20 and 65 years of age with non-radicular CLBP of mechanical origin (as opposed to infectious, neoplastic, or inflammatory causes) Settings: 27 licensed therapists' offices. Funding: to minimize disappointment (and possibly losses to follow-up), participants assigned to UC (continued usual care) received USD 50 Mean age: age (SD). Structural massage 46 (12), relaxation massage 47 (11), controls 48 (11) % Female: structural massage 66%, relaxation massage 65%, controls 62% Ethnicity: white race 86% in structural massage, 87% in relaxation Massage, 86% in controls Work status: • Not employed SM 13%, RM 21%, controls 17%. • Work is mainly sedentary 37%, 36%, 42%. • Work requires lifting up to 20 lb 21%, 13%, 17%. • Work requires lifting 20 lb 29%, 29%, 23%. Pain duration: • LBP for at least 1 year, SM 77%, RM 72%, controls 78% • Mean days with LBP in past the 6 months (SD): 133 (51), 128 (50), 131 (55). Previous surgery: patients with surgery in the previous 3 years were excluded. No further details are given about the surgery in previous years for the included participants Diagnoses: back pain for > three months without 2 or more pain-free weeks. Original cause of LBP unknown: 23% in SM, 13% in RM and 14% in controls. Pain below knee 11%, 15% and 19% respectively. No further details about other causes or related conditions
Interventions	Massage technique: both techniques consisted of visits lasting 50 to 60 minutes Structural massage (it included Clinical Massage and Movement Re-education techniques) Relaxation massage: therapists were given time limits for each body region, including 7 to 20 minutes on the back and buttocks Control: usual care participants received no special care, but were paid USD 50 Experience of therapist: care providers were 27 licensed massage therapists with at least 5 years of experience • Group 1: structural massage (132 randomized to this group). • Group 2: relaxation massage (136 randomized to this group). • Group 3: control (133 randomized to this group).
Outcomes	* used in the meta-analyses: Measured at baseline, in the short-term (10 weeks)*, in the long term (26 and 52 weeks)

	: a. Pain: none. b. Function: Roland Morris Disability Questionnaire (RMDQ). c. Adverse effects: Five of 134 (4%) relaxation massage recipients and 9 of 131 (7%) structural massage recipients reported adverse events possibly related to massage, mostly increased pain One event in the structural massage group (nausea, shortness of breath, and chest pain) was classified as serious and considered unrelated to treatment d. Other measures: • physical and mental health Short Form-12 Health Survey. Measured immediately after: none.
Notes	Results: a. Pain: No scales were measured. b. Function: RMDQ, (range from 0 to 23 points, lower means "less limitations due to the back pain", "better") From baseline [Mean] (SD) to short term week 10 [Mean Value] (95% CI) to long term week 26 [Mean Value] (95% CI) to long term week 52 [Mean Value] (95% CI) • Group 1: structural massage: from baseline [10.1] (5.0) to week 10 [6.5] (5.8 to 7.2) to week 26 [6.7] (6.0 to 7.5) to week 52 [7.2] (6.4 to 7.9). • Group 2: relaxation massage: from baseline [11.6] (5.0) to week 10 [6.0] (5.3 to 6.8) to week 26 [6.4] (5.5 to 7.2) to week 52 [6.0] (5.2 to 6.9). • Group 3: control: from baseline [10.5] (5.3) to week 10 [9.0] (8.2 to 9.8) to week 26 [8.2] (7.3 to 9.0) to week 52 [7.4] (6.6 to 8.3). c. Well-being (physical and mental health Short Form-12 Health Survey) (range from 0 to 100, where a zero score indicates the lowest level of self-perceived health measured by the scales and 100 indicates the highest level. It tracks how patient feel affected by the medical condition to be able to do usual activities work outside the home and housework, climbing stairs, recreational activities, emotional self-perception and social interaction) From baseline [Mean] (SD) to short term week 10 [Mean Value] (95% CI) to long term week 52 [Mean Value] (95% CI) Physical Short Form-12: • Group 1: structural massage: from baseline [40] (9) to week 10 [37.2] (36.4 to 38.0) to week 52 [37.7] (36.8 to 38.7). • Group 2: relaxation massage: from baseline [38] (8) to week 10 [36.6] (35.7 to 37.5) to week 52 [37.9] (37.0 to 38.7). • Group 3: control: from baseline [39] (8) to week 10 [37.9] (37.1 to 38.8) to week 52 [37.7] (36.8 to 38.6). Mental Short Form-12: • Group 1: structural massage: from baseline [50] (9) to week 10 [53.7] (52.5 to 55.0) to week 52 [52.4] (50.9 to 53.8). • Group 2: relaxation Massage: from baseline [50] (10) to week 10 [55.3] (54.2 to 56.5) to week 52 [53.5] (52.2 to 54.8). • Group 3: control: from baseline [50] (9) to week 10 [50.9] (49.5 to 52.2) to week 52 [51.9] (50.2 to 53.6). Authors' conclusions: massage therapy may be effective for treatment of chronic back pain, with benefits lasting at least 6 months. No clinically meaningful difference between relaxation and structural massage was observed in terms of relieving disability or

	symptoms. In summary, our findings suggest that both relaxation massage and structural massage are reasonable treatment options for persons with chronic LBP. The findings may suggest a relative advantage for relaxation massage because it is based on techniques that are taught in almost all massage schools and is thus more readily accessible and slightly less expensive than structural and other more specialized forms of massage, which require additional training

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	The protocol describes a two stage randomization procedure. The first stage was to randomize to massage group and control. The second to randomize the type of treatment, by computer-generated sequence of blocked random numbers for each therapist to assign the participant, with equal probability to structural or relaxation massage
Allocation concealment (selection bias)	High risk	Protocol: the randomization database was built to ensure that treatment allocation cannot be viewed prior to randomization and cannot be changed after randomization Published trial: a research specialist (RS) provided the baseline questionnaire, asked participants about preferred location and provided the participant's contact information to the therapist and specified which type of massage the participant was to receive
Blinding (performance bias and detection bias) All outcomes - patients?	High risk	Participants knew whether they received massage but were blinded to type of massage. However, massage and control groups were not indistinguishable for the patients and the success of blinding was not tested among the patients
Blinding (performance bias and detection bias) All outcomes - providers?	High risk	Therapists were not blinded to the type of massage that they provided
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	High risk	Protocol: all interviews were conducted using computer assisted telephone interviews (CATI). Patients reporting the outcomes were not blinded. However, the outcomes are subjective and self-reported

Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	Follow-up was done for > 90% of the randomized patients, except for the controls at the 52 week that was 87%. Provided reasons for missing data
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Low risk	Adequate methods of imputation for missing data. All patients were analyzed in the group to which they were allocated by randomization
Selective reporting (reporting bias)	Low risk	Roland Morris Questionnaire and Short Form-12 Health Survey were completed as planned in the protocol
Other bias	Low risk	No other bias was identified.
Similarity of baseline characteristics?	Low risk	Figures are similar for age, gender, marital status, body mass index, educational level, income, physical demands at job, duration of LBP, medication use in past week, SF-12 and RMQ
Co-interventions avoided or similar?	High risk	Structural and relaxation massage groups received a predefined list of 7 exercises, 6 of which were common to both treatments. However, control group did not receive this information. Besides, in the relaxation massage group, therapists could provide a compact disk of a 2.5-minute relaxation exercise to be done at home, while the structural massage group was advised to continue with psoas stretch. It is not possible to measure the impact of any of these differences over the results
Compliance acceptable?	Low risk	Study treatment visits were: Structural massage: 8 to 10 visits: 116 (88%). 0 to 7 visits: 16 (12%). Relaxation massage: 8 to 10 visits: 126 (93%). 0 to 7 visits: 10 (7%).
Timing outcome assessments similar?	Low risk	10, 26 and 52 weeks for all groups.

Eghbali 2012

Methods	Country: USA. Funding: Isfahan University of Medical SciencesBlinding. Recruited: 50 patients. Randomized: 25 to intervention group and 25 to control group Followed: 50. Analysis: descriptive and inferential statistics, including independent t-test and Chi² test, were used to analyze the data
Participants	Population: the study population consisted of all nurses working in hospitals affiliated to Isfahan University of Medical Sciences. Nurses were included if they had LBP, chronic non-specific back pain diagnosed by a neurosurgery specialist for > 3 months, healthy feet without injury or damage, and willingness to participate in the study Settings: every day, the researchers referred to Al-Zahra and Kashani Hospitals to carry out the interventions in the morning from 8 to 12 and in the afternoon from 2 to 6, respectively Funding: patients were all nurses working in hospitals affiliated to Isfahan University of Medical Sciences, the same institution that approved and supported the study Mean age: the mean (SD) age of subjects was 42.28 (8.02) years in the test group and 39.48 (5.73) years in the control group Ethnicity: not described. The study was done in Isfahan, Iran Work status: mean (SD) work experience was 17.68 (8.06) in the test group and 15.72 (5.79) in the control group Pain duration: > 3 months. Onset (weeks): not described. Previous surgery: not described. Diagnoses: not described. Exclusion criteria: subjects were excluded if they had participated in another clinical research during the past 3 months, had an experience or knowledge of reflexology, were pregnant or lactating, used other methods of complementary therapy during the study, or had a vascular disease, thrombophlebitis or diseases such as urinary tract infection or kidney stones (with pain in the lower back). They were also excluded if any physical damage, making the subjects unable to continue their participation, was made or if they used new medical treatments (new drugs effective on pain, physical therapy or other methods)
Interventions	Massage technique: reflexology to the intervention group and massage to feet and low back in the control group. The intervention was applied as 6 forty-minute sessions of interventions, i.e. twice a day, three days a week for two weeks Experience of therapist: after learning the technique under the supervision of a qualified reflexology expert, the researchers performed the intervention. Interventions in the test and control groups were conducted during the first and second two weeks, respectively • Group 1: "In the test group, first the legs were washed with body shampoo and dried. Then, the subjects were placed in a comfortable position, usually lying on the back, with their pants being removed up to their knees. While standing in front of the patient, the researcher started a simple massage from the lower legs to the ankles, soles and finally toes. This was repeated for several times. As the heel was supported by one hand, the ankle was twisted many times to loosen the legs and make the subject ready for the specific reflexology. The specific massage was then performed on all reflex points on the feet. Some points were massaged by using thumbs or other fingers continuously

	without losing contact with the skin. Massaging was also conducted on the lower arch-edge of the foot (corresponding to lumbar region) for about 5 to 10 minutes. Index and pointing fingers were placed on reflex points. They moved apart and reached back for several times in a worm-like movement" (n = 25 randomized to this group). • Group 2: "However, simple massaging was not followed by deep stimulation of reflexology points in the control group" (n = 25 randomized to this group).
Outcomes	Measured at baseline: Numerical Analogue Scale for pain. Measured immediately after: Numerical Analogue Scale for pain Measured in the short-term: none. Measured in the long-term: none.
Notes	Pain intensity (PNRS (Pain numeric rating scale) (range 0-100, lower means "better") Results: • Group 1: reflexology + massage: from [baseline] 5.0 (0.7071) to [immediately after] 2.72 (0.8907). • Group 2: massage: from [baseline] 5.24 (0.7789) to [immediately after] 3.88 (0.9713). Authors' conclusions: recognizing the impact of reflexology on chronic back pain makes it possible to use this technique as a complementary intervention with other treatments for complicated conditions such as back pain in which patients do not usually benefit from other methods. In addition, reflexology can be easily taught to people in order to take effective steps to reduce chronic pain. The treatment team can also take advantage of this method for treating LBP patients

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	The method for generating random numbers is not described. After participants were recruited they were randomly numbered. Then, individuals with odd and even numbers were assigned to treatment or control interventions respectively
Allocation concealment (selection bias)	Unclear risk	Individuals with odd and even numbers were assigned to each of the groups, respectively. The independence of the person performing the allocation to each groups is not described
Blinding (performance bias and detection bias) All outcomes - patients?	Unclear risk	The patients and the questioner were blinded to the groupings. However, it is unclear how this was done
Blinding (performance bias and detection bias) All outcomes - providers?	High risk	Providers were not blinded. Interventions in the test and control groups were conducted during the first and second two

		weeks, respectively. There are no descriptions about the strategies that were taken to blind the outcome providers to the fact that patients were distributed in different weeks
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	Unclear risk	Outcome assessors (questioner) was blinded to the groupings. However, it is unclear how the patients were blinded and the outcomes are subjective
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	The study does not mention any drop-outs
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Low risk	The patients were analyzed in the same group that they were assigned
Selective reporting (reporting bias)	Low risk	The study assessed and reported pain as it was intended in the objectives and methodology
Other bias	Unclear risk	The study population consisted of all nurses working in hospitals affiliated to Isfahan University of Medical Sciences, the same school approving the study
Similarity of baseline characteristics?	Low risk	The study reported that there were no significant statistical differences between the two groups when the age, gender, pain characteristics, and pain scores were compared
Co-interventions avoided or similar?	Low risk	Patients were excluded if other methods of complementary therapy during the study or if they used new medical treatments (new drugs effective on pain, physical therapy or other methods)
Compliance acceptable?	Unclear risk	The compliance of the participants is not described, either in the intervention or control group
Timing outcome assessments similar?	Unclear risk	The time and the strategies to control the timing of outcome assessments in both groups are not well described

Farasyn 2006

Methods	Country: Belgium. Funding: not reported. Blinding: outcome assessor for Pressure Pain Thresholds (PPT) measurement. Recruited: 170. Randomized: 60. Followed: 60. Analyses: baseline: ANOVA for continuous variables and Chi² for categorical variables, including post-hoc comparisons with LSD-tests. Owestry Disability Questionnaire (ODQ) and Visual Analogue Scale (VAS) scores were analyzed by Wilcoxon-tests
Participants	Mean age: 43 in placebo group, 41 in treatment group and 40 in control group. % female: 55% males in placebo group, 65% males in treatment group and 56% males in control group. % White: not reported. Work status: not reported. Pain duration: between three and 12 weeks (subacute Low Back Pain (LBP)). Previous surgery: not reported. Diagnoses: non-specific LBP.
Interventions	Massage technique: roptrotherapy: 30-minute deep cross-friction massage with the aid of a myofascial T-bar made of bronze (neutral material to skin) to use by hand and to contribute to the compression force by their weight (0.8 kg), within the threshold of pain that was tolerable, applying a compressive force of 5 to 10 kg/cm². One session. Experience of therapist: not reported. Endermology (placebo): 30-minute session of endermology to account for the touching effects of massage, a device with a suction head was adjusted to a minimal but continuous section power and applied across the middle and lower back (T6-L3) and buttocks Groups: • Roptrotherapy (N = 20). • Placebo (endermology) (N = 20). • Control: No intervention (wait-list) (N = 20).
Outcomes	* used in the meta-analyses: When measured: one week after session*. a. Pain: PPT. Pain VAS in mm (before and one week after the treatment*). b. Function: Oswestry Disability Questionnaire (ODQ)*. c. Overall improvement: no. d. Patient satisfaction: no. e. Adverse events: not reported. f. Costs: not reported. g. Work-related: no.
Notes	Results: a. Pain (VAS): • Group 1: from 56 to 37. • Group 2: from 57 to 59. • Group 3: from 49 to 52. b. Function (Oswestry):

	• Group 1: from 34 to 16. • Group 2: from 36 to 38. • Group 3: from 29 to 31. Authors' conclusions: "The results of this study provide direct evidence that one deep cross-friction massage with the aid of copper myofascial T-bar applied to the lumbo pelvic region, can reduce effectively local pressure pain sensitivity, pain rating and disability in patients with subacute non-specific LBP."

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Unclear from text. Done by an statistician. A different article that resembles this study described this procedure: Journal of Musculoskeletal Pain, Vol. 15(1) 2007: The group was randomly assigned, blocked per 5 subjects
Allocation concealment (selection bias)	Unclear risk	Not reported.
Blinding (performance bias and detection bias) All outcomes - patients?	Unclear risk	Not reported.
Blinding (performance bias and detection bias) All outcomes - providers?	Unclear risk	Not reported.
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	High risk	The outcome assessor was blinded only for the PPT outcome. With regards to pain and disability, there was no blinding of outcome assessors
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	No dropouts.
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Low risk	All patients were analyzed in the group to which they were allocated by randomization
Selective reporting (reporting bias)	Unclear risk	Pain: PPT and VAS and Back specific functional status measured by standard Oswestry Disability Questionnaire were all reported at 1 week
Other bias	Unclear risk	1. Control group consist of patients without pain. Only to assess reliability (ICC) when measuring pain pressure

		thresholds. But descriptions are confusing. 2. Instead of comparisons between placebo (P group) and treatment (T group), results seem to be done within each group before and after. But unclear descriptions and tables are confusing about a real comparison between P and T groups. 3. In the alternative article (Journal of Musculoskeletal Pain, Vol. 15(1) 2007), the same trial authors reported dropouts after the first session of treatment n = 42 patients in the treatment group. One explanation could be that in the following year, more pt were added.
Similarity of baseline characteristics?	High risk	The following variables were analysed: age, gender, body mass index, weeks of onset of LBP, PPTs measured at the level of the Erector spinae of L1 & L3, and Gluteus maximus, ODI. However, the baseline VAS was much higher in the T group than in the C group, and the Oswestry was much higher in the T group than in the C group
Co-interventions avoided or similar?	Unclear risk	Unclear from text.
Compliance acceptable?	Low risk	All patients received only one session.
Timing outcome assessments similar?	Low risk	Reported as measured in all patients at baseline and follow-up

Field 2007

Methods	Country: USA. Method of randomization: not described. Methods of recruitment: not described. Funding: National Institute of Mental Health Research Scientist Award and Research Grant. Blinding: not blinded. Recruited: not described. Randomized: 30. Followed: not described. Analyses: repeated measures ANOVA.
Participants	Mean age: 41. 16 male, 14 female. 67% Caucasian, 9% Hispanic, 16% African American, 8% Asian.

Field 2007 (*Continued*)

	Work status: not reported. Pain duration: at least six months. Previous surgery: not reported. Diagnoses: Chronic Low Back Pain (CLBP) co-morbidity: not reported
Interventions	Massage to the entire back, legs and knees, using a Biotone oil, two 30 minute sessions per week for five weeks Experience of therapist: not reported Groups: 1. Two 30-min massage therapy sessions per week over five weeks (total 10 sessions) by trained massage therapist who used Biotone Spa Replenishing Light Body Oil each session starting with the participants in the prone position, resting the ankles on a small cushion. Massage consisted of the following techniques applied to the entire back: (1) moving the flats of the hands across the back; (2) kneading and pressing the muscles; and (3) short back and forth rubbing movements on the muscles next to the spine and the muscles that attach to the hip bone. The following techniques were administered to the legs: (1) long gliding strokes toward the torso, to the entire leg; (2) kneading and moving the skin in the thigh area; (3) pressing and releasing, and back and forth rubbing movements on the area between the hip and the knee on the back of the thigh; and (4) short rubbing movements to the small muscles around the knees. In the supine position with a bolster under the knee, the participants received: (1) long gliding strokes and kneading of the neck muscles; (2) moving the flats of the hands across the abdomen; (3) pinching and moving the skin on the abdomen in all directions; and (4) kneading with mixed wringing the muscles that bend the trunk forward (rectus and oblique muscles). Then, to the entire leg: (1) stroking; (2) kneading followed by pressing and releasing the anterior thigh region; (3) flexing of the thigh and knee; and (4) pulling of both legs at the same time using direct longitudinal traction. (number of people randomized was not described). 2. Relaxation therapy (number of people randomized was not described): a relaxation therapy group, which was included to control for potential placebo and increased attention effects, was shown how to use progressive muscle relaxation exercises including tensing and relaxing large muscle groups starting with the feet and progressing to the calves, thighs, hands, arms, back and face. The participants were asked to conduct these 30-min sessions at home twice a week for five weeks and to keep a log on the times they spent in relaxation therapy.
Outcomes	When measured: pre and post last day (immediately after the end of the 10 sessions*) a. Pain: Visual Analogue Scale (VAS)*. b. Function: trunk Range of Motion (ROM). c. Depression: Profil e of Mood State s Depres sion Scale (POMS-D). d. Stress: State Anxiety Inventory (STAI). e. Sleep scale: VAS. f. Adverse events: not reported. g. Costs: not reported. h. Work-related: level of job productivity 0 to 5.

Notes	Results: Pain • Group 1: from 5.1 (2.9) to 1.4 (1.6) post last day • Group 2: from 4.4 (2.1) to 2.7 (2.4) post last day Authors' conclusions: These data, nonetheless, suggest that massage effectively reduces pain, sleep disturbances and the anxiety and depressed mood states associated with lower back pain

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	The method of randomization is not described.
Allocation concealment (selection bias)	Unclear risk	The method of allocation concealment is not described.
Blinding (performance bias and detection bias) All outcomes - patients?	High risk	Patients were not blinded.
Blinding (performance bias and detection bias) All outcomes - providers?	High risk	Providers were not blinded.
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	High risk	Not described, but since patients were not blinded and all outcomes are subjective and self-reported, there is high risk of detection bias
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Unclear risk	Not described.
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Unclear risk	Not described.
Selective reporting (reporting bias)	Unclear risk	Pain (Visual analogue scale (VAS) - VITAS) was reported in a table. Absenteeism measure (Ordinal scale of productivity 0-5) was described in the text has showing no differences
Other bias	Low risk	No other bias was identified.
Similarity of baseline characteristics?	Unclear risk	Unclear from text. There are no tables about it.
Co-interventions avoided or similar?	Unclear risk	Unclear from text. Not described.

Field 2007 (*Continued*)

Compliance acceptable?	Unclear risk	Unclear from text. Two 30-min massage therapy sessions per week over 5 weeks. And 30-min sessions at home twice a week for 5 weeks and to keep a log on the times they spent in relaxation therapy. No results were published about what happened at the end of the 5 week study
Timing outcome assessments similar?	Low risk	Five-week study.

Franke 2000

Methods	Country: Germany Design: 2 x 2 factorial design. 190 patients were randomized. Methods of recruitment: not mentioned. Period of study: 14 months, until the end of 1997. All medications needed to be discontinued before the beginning of the study protocol. Follow-up: until end of sessions. Drop-outs: 11 patients (5.8%).
Participants	Settings: study conducted in Bad Andersheim City, Park Rehabilitation Clinic Duration of pain: > one year. Participants needed to speak German to be included. Age: 25 to 55 years (45 ± 8.1), 61% male. Previous treatments: analgesics, anti-inflammatory drugs, muscle relaxants, antidepressants. Most diagnoses included: lumbar disc prolapse without myelopathy, 28% LBP and 23% ischialgia
Interventions	1. Acupuncture massage according to Penzel: follow the rules of massage from Physical Medicine and of acupuncture from neural therapy according to Huneke and Quirotherapy Uses a manual metal roller for meridians treatment. Treats one unique point with a special vibrating instrument that stimulates the acupuncture point superficially (not needle insertion) 2. Teil massage (classic Sweedish massage (SM)). The objective is to tonify and defonify muscle structures by increasing circulation in the skin and muscle, decrease adhesions 3. Individual exercises: • Gymnastics with music. • Swimming. • Ergometric training. • Specific low-back exercises (not specified which). • Brügger treatment for musculoskeletal functional diseases (not specified). • Posture correction. • Muscle strengthening. • Increase resistance. • Increase in coordination and rhythm. • Increase in mobility and flexibility. 4. Group exercises same as individual exercises, but in group mode Study groups: (1) + (3)

	(1) + (4) (2) + (3) (2) + (4)
Outcomes	Measured before and after the sessions: a. Pain: VAS (1 to 10 cm). b. Overall improvement: not measured. c. Function: Hanover Function Score Questionnaire for Low Back Pain (LBP) (FFbH-R) 0 to 100% d. Physical examination: lumbar flexion and extension (degrees) e. adverse events: not reported. f. Costs: not reported. g. Work-related outcomes: not measured.
Notes	Authors' conclusions: the observed effect sizes with acupuncture massage are promising and warrant further investigation in replication studies. Acupuncture massage showed beneficial effects for both disability and pain compared with SM. Marked improvement observed in Acupuncture massage + group exercise. Acupuncture massage improved function (with individual or group exercises). Classic massage did not change function. Most decrease in pain occurred in the acupuncture massage + individual exercise group. Acupuncture massage (with individual or group exercise) reduced pain. Mean difference between acupuncture and classic massage groups: 7.0% (function) and 0.8cm Visual Analogue Scale (VAS) ANOVAS: Acupuncture massage is more effective than SM for function (P = 0.008) and for pain (P = 0.038) Both exercises groups (individual or in group) are not statistically significantly different for function (P = 0.55) or for pain (P = 0.55)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Random number tables.
Allocation concealment (selection bias)	Low risk	Sealed envelopes.
Blinding (performance bias and detection bias) All outcomes - patients?	High risk	Not feasible for physiotherapists and patients; not possible for investigator due to capacity problems in routine care of the hospital
Blinding (performance bias and detection bias) All outcomes - providers?	High risk	Not feasible for physiotherapists and patients; not possible for investigator due to capacity problems in routine care of the hospital

Franke 2000 (*Continued*)

Blinding (performance bias and detection bias) All outcomes - outcome assessor?	High risk	Not mentioned, but because the outcomes were subjective and self-reported by patients, there is high risk of detection bias
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	Only 11 patients (5.8%) abandoned the study protocol.
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	High risk	3 out of 109 patients changed treatment on own request and were unwilling to complete the questionnaires. A sensitivity analysis was carried out to estimate the robustness of the results. For this reason missing post-treatment values were replaced by the worst values found between the 10th and 90th percentile of the sample
Selective reporting (reporting bias)	Unclear risk	Both outcome variables were presented at the end of the study. Pain: VAS (1 to 10cm) and Function: Hanover Function Score Questionnaire for LBP (FFbH-R) 0 to 100%
Other bias	Low risk	No other bias was identified.
Similarity of baseline characteristics?	High risk	Due to some differences between groups at baseline, groups-standardized outcomes were used for analysis
Co-interventions avoided or similar?	Low risk	All medications needed to be discontinued before the beginning of the study protocol
Compliance acceptable?	Low risk	11 patients (5.8%) abandoned the study protocol.
Timing outcome assessments similar?	Low risk	Study period was 14 months. The study had to be finished prior to the intended sample size due to remarkable changes within the German system of welfare regarding rehabilitation

Geisser 2005

Methods	Country: USA. Funding: National Institute of Health. Blinding: outcome assessor. Recruited: 100 patients. Randomized: 100 patients. Followed: 72 patients. Analyses: MANOVA and MANCOVA for comparisons between groups.
Participants	Settings: University of Michigan Spine Program. Mean age: 40.7 years old. 41% female. 85% white. 34% not working due to pain. Pain duration: mean 76.9 months. 18% had previous surgery. Diagnoses: not reported.
Interventions	Massage: muscle energy technique (MET) weekly for five weeks Experience of therapists: physical therapist with 12 years postgraduate training in manual medicine * post-treatment scores. (N = randomized, completed the study). • Group 1: massage + specific exercises (N = 26, 21*). • Group 2: massage + non-specific exercises (N = 24,15*). • Group 3: sham massage + specific exercises (N = 25, 18*). • Group 4: sham massage + non-specific exercises (N = 25, 18*).
Outcomes	* used in the meta-analyses. Measures taken at baseline, then at the end of the 5th session (last visit) a. Pain: a1) pain rating scales (from McGill Questionnaire) and a2) Visual Analogue Scale (VAS)* b. Function: b1) QBPDS* and b2) Interference subscale of the Multidimensional Pain Inventory (MPI) c. Overall improvement: not measured. d. Patient satisfaction: four questions with seven-point Likert scale f. Adverse events: not measured. g. Costs: not reported. h. Work-related: not measured.
Notes	a. Pain (VAS): • Group 1: from 4.45 to 2.40. • Group 2: from 3.91 to 3.39. • Group 3: from 3.84 to 3.46. • Group 4: from 5.20 to 4.29. b. Function (Quebec): • Group 1: from 36.05 to 31.05. • Group 2: from 38.47 to 31.80. • Group 3: from 34.25 to 33.28. • Group 4: from 51.08 to 42.50.

	c. Satisfaction with overall therapy: • Group 1: 6.3. • Group 2: 6.0. • Group 3: 5.1. • Group 4: 5.9. Authors' conclusions: "massage therapy with specific adjuvant exercise appears to be beneficial in treating chronic low-back pain. Despite changes in pain, perceived function did not improve"

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Unclear from text. "Participants were randomly assigned to 1 of 4 treatment conditions. To obtain equal numbers of patients in each group, the randomization order was determined prior to the study"
Allocation concealment (selection bias)	Unclear risk	Not described.
Blinding (performance bias and detection bias) All outcomes - patients?	Low risk	"The treating therapist ...attempted to keep patients blind to their group assignment". Group 2: "sham manual therapy with specific adjuvant exercise (sham MT-SE)". Group 4: "sham manual therapy and nonspecific exercise (sham MT-NE)"
Blinding (performance bias and detection bias) All outcomes - providers?	High risk	"The treating therapist was not blind to the treatment group of the patient…"
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	Low risk	"...the principal investigator, who was blind to the treatment condition of the patient". The outcomes are subjective, but the patients were kept blinded to the group they were assigned
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	Drop outs: 5 and 4 for each group. Reasons were not given. "The rate of attrition in the study was 28%". patients who dropped out of the study displayed significantly higher levels of pain and disability, were more likely to be receiving compensation, and were more likely to be male
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	High risk	They analysed only 72 of the 100 randomized patients. No method for inputation of missing data was used

Selective reporting (reporting bias)	Unclear risk	All outcome variables were presented. PAIN: VAS, MPQ, DISABILITY: QBPDS, WELL BEING: Interference subscale of the Multidimensional Pain Inventory (MPI), SATISFACTION: 1) satisfaction with the feedback provided by the therapist about their condition; 2) satisfaction with the amount of pain relief from therapy; 3) overall satisfaction with therapy; and 4) overall satisfaction with the therapist
Other bias	Low risk	No other bias was identified.
Similarity of baseline characteristics?	High risk	Although there are some big differences in the baseline characteristics presented in table 1, the authors conclude: "Chi-square tests and ANOVA were used to compare the groups… no significant group differences were observed, although there was a trend for patients in the sham MT-NE group to be older" Patient's age in the sham MT-NE group was 46.3, while in the other groups it was: 39.3; 38.7 and 36.5." "According to the authors: "none". However, even though they were not statistically significant, the authors wisely used multivariate analyses and adjusted for baseline characteristics."
Co-interventions avoided or similar?	Unclear risk	1. All patients were allowed to continue their use of pain medications, but were asked to not change their usage during the course of the study. 25 took no prescription medication for pain, 48 took NSAIDs, 35 took opioids, 25 were on antidepressants (for depression, analgesia, sleep disturbance or a combination of all these), 12 took antispasmodic medication and 8 were on anxiolytics and 6 took anticonvulsants. 2."... and were also given exercises specifically designed to treat identified musculoskeletal dysfunctions". 3. Examples of these exercises included: 1) quadriceps stretch; 2) double or single knee to chest stretch; 3) sitting hamstring stretch; and 4) prone on elbows. In addition, patients in this group were asked to

Geisser 2005 (*Continued*)

		perform aerobic exercise 3 times per week. Participants were free to choose how they performed aerobic exercise. 4. "...patients were asked to do stretches and/or self-corrections twice daily (usually 10 repetitions each time). Patients were asked to hold each stretch for 30 seconds
Compliance acceptable?	Low risk	Not with massage, only with exercise.
Timing outcome assessments similar?	Low risk	After 5th session (weekly sessions). "... Some patients rescheduled visits, prolonging the time between the first and last visit. " It seems to be the same for both groups

Hernandez-Reif 2001

Methods	Country: USA. Funding: National Institutes of Mental Health and Johnson & Johnsons. Method of randomization: not described. 24 were randomized. Recruitment of patients: self-referred. Study conducted in the USA. Period of study: not described. Follow-up: post sessions and last day of sessions
Participants	Settings: not described. Average age: 39.6 years. 54.1% women. 67% Caucasians, 8% Hispanic, 17% African American and 8% Asian. Duration of pain: at least six months. Previous treatments: not described
Interventions	1. 30-minute massage therapy sessions per week over five weeks by trained massage therapist. Each session started with the participant in the prone position resting the ankles on a small cushion. The massage consisted of the following techniques applied to the entire back at a level tolerant to the subject: 1) moving the flat of the hands across the back, 2) kneading and pressing of muscles and 3) short back and forth rubbing movements to the muscles next to the spine and later to the hip bones. The following techniques were administered to the legs: 1) long gliding strokes to the entire leg, 2) kneading and moving the skin in the thigh area, 3) pressing and releasing, and back and forth rubbing movements to the area between the hip and the knee and 4) short rubbing movements to the small muscles around the knees. In the supine position with a bolster under the knee, subjects received: 1) long gliding strokes and kneading of the neck muscles, 2) moving the flats of the hands across the abdomen, 3) pinching and moving the skin on the abdomen in all directions and 4) kneading the muscles that bend the trunk forward. Then, to the entire leg: 1) stroking, 2) kneading followed by pressing and releasing the anterior thigh region, 3) slow flexing of the thigh and knee, and 4) slow pulling of both legs. 2. Relaxation therapy: (to control for potential placebo effects and the effects of increased attention given to the massage subjects): The relaxation group was instructed on progressive muscle relaxation exercises tensing

	and relaxing large muscle groups starting with the feet and progressing to the calves, thighs, hands, arms, back and face. The subjects were asked to conduct these 30-minute session at home twice a week for five weeks and to keep a log
Outcomes	* used in the meta-analyses. Measured before and after each session*. a. Pain measures: • Short-form MPQ (SF-MPQ): 11 questions based on sensory dimensions and 4 questions based on affective dimensions. • VITAS: present pain with a VAS ranging from 0 to 10*. b. Function: none. c. Adverse events: not reported. d. Other measures: • Stress measures: Profile of Mood States Depression Scales (POMS-D): 5-point scale ranging from "not at all" to "extremely". Adequate concurrent validity and good internal consistency. Adequate measure of intervention effects. • State Anxiety Inventory (STAI): 20 items scale. The STAI scores increase in response to stress and decrease under relaxing conditions. Adequate concurrent validity and internal consistency. • Range of Motion (ROM): trunk flexion = C7-L1. • Pain flexion ROM measure (touch toes with pain). • Costs: not reported. • Work-related outcomes: not measured.
Notes	Authors' conclusions: massage therapy is effective in reducing pain, stress hormones and symptoms associated with CLBP

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not described.
Allocation concealment (selection bias)	Unclear risk	Not described.
Blinding (performance bias and detection bias) All outcomes - patients?	Unclear risk	Not described.
Blinding (performance bias and detection bias) All outcomes - providers?	Unclear risk	Not described.
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	Unclear risk	Not described.

Hernandez-Reif 2001 (*Continued*)

Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Unclear risk	Not described.
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Unclear risk	Not described.
Selective reporting (reporting bias)	Unclear risk	The pain was measured with the McGill and VITAS questionnaires. Both were reported as mentioned in the methodology: First day (pre and post), last day (pre and post)
Other bias	Low risk	No other bias was identified.
Similarity of baseline characteristics?	Low risk	Baseline characteristics in Table 1. No major differences.
Co-interventions avoided or similar?	Unclear risk	Not described.
Compliance acceptable?	Unclear risk	Not described.
Timing outcome assessments similar?	Low risk	The assessments were made before and after the sessions on the first and last days of the 5 week study

Hsieh 2004

Methods	Country: Taipei, Taiwan, China. Funding: not reported. Recruited: 250. Randomized: 146. Followed: post treatment = 146; at six months = 121. Analyses: independent t-test for continuous variables; Chi² test for categorical variables; Wilcoxon rank sum test for comparisons between the two treatment groups; Wilcoxon sign-rank test for changes before and after treatment
Participants	Settings: regional. orthopedic hospital in the Kaoshiung, Taiwan area, which offers routine orthopedic operation and rehabilitation of physical therapy Mean age: acupressure group: 47.6; physical therapy (control) group: 47.6 Gender: acupressure group: 30 male, 39 female; physical therapy (control) group: 40 male, 37 female Ethnicity: not reported (possible that all were Chinese patients) Work status: (n) acupressure versus PT. Labour 15 versus 10; office 21 versus 31; householder 21 versus 19; other 12 versus 17 Pain duration: 67% of patients over 6 months (range one month to over 10 years) Previous surgery: not reported. Diagnoses: not detailed.

Hsieh 2004 (*Continued*)

Interventions	Massage technique: six acupressure sessions over a four-week period, lasting approximately 15 minutes (no more details were reported) Experience of therapist: performed by a designed senior therapist to render uniform technique and to ensure consistent experience to all patients Groups: • Group 1: acupressure (N = 69 randomized to this group). • Group 2: conventional physical therapy (N = 77) included thermotherapy, infrared light therapy, electrical stimulation, exercise therapy and pelvic manual traction (no more details were reported).
Outcomes	* used in the meta-analyses. Measured at baseline, then immediately after 6 sessions of treatment*, and at the six-month follow-up*: a. Pain: • Pain visual scale (0 to 5). • Pain score based on the validated Chinese version of Short-Form Pain Questionnaires (SF-PQ), 15-item: each descriptor was ranked on a intensity from zero (none) to three (severe). Summation of these 15 intensity scale numbers yielded a pain score for each patient (range 0 to 45)*. b. Function: not measured. c. Adverse events: no adverse direct of side effects were reported in the acupressure group d. Other measures: • Overall improvement: not measured. • Patient satisfaction: not measured. • Costs: not reported. • Work-related outcomes: not reported.
Notes	a. Pain score (range 0 to 45, where zero is no pain): • Group 1: from 9.29 to 2.28 to 1.08. • Group 2: from 7.68 to 5.13 to 3.15. b. SF-PQ: pain descriptors: significant difference between groups. Post treatment: throbbing, shooting, stabbing, sharp, cramping, aching, sickening, punishing-cruel; At 6 month FU: cramping, aching, tiring-exhausting Authors' conclusions: "Our results suggest that acupressure is another effective alternative medicine in reducing low-back pain, although the standard operating procedures involved with acupressure treatment should be carefully assessed in the future."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Random allocation number generated from a random table.
Allocation concealment (selection bias)	Low risk	The random allocation numbers were managed by an independent research assistant and not decoded until the intervention was assigned

Blinding (performance bias and detection bias) All outcomes - patients?	Unclear risk	Not described. Not possible to define whether the Index and control groups were indistinguishable for the patients (physical therapy or acupressure). No sham therapy for acupressure
Blinding (performance bias and detection bias) All outcomes - providers?	Unclear risk	Not described. Not possible to decide whether the Index and control groups were indistinguishable for the care providers
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	High risk	The research assistant who conducted the follow-up interviews by telephone was informed beforehand not to ask the participant about the details of intervention to keep blind to the intervention group as much as they can do. For SF-PQ, each participant was requested to answer the inventories, but patients were not blinded. Since all outcomes are subjective and self-reported, there is high risk of detection bias
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	Low risk for the follow-up after 1 month. Drop outs after 6 months were 18% and 15% of the initial samples of acupressure and physical therapy groups, respectively
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Low risk	For the short-term follow-up there was low risk because all patients were analyzed in the group to which they were allocated by randomization
Selective reporting (reporting bias)	Unclear risk	Short-Form Pain Questionnaires (SF-PQ) was reported for pre and post treatment pain scores as mentioned in the methodology
Other bias	Low risk	No other bias was identified.
Similarity of baseline characteristics?	High risk	The duration of LBP episodes for these patients ranged from 1 month to over 10 years. This was not analysed in Table 1.
Co-interventions avoided or similar?	Unclear risk	Unclear from text.
Compliance acceptable?	Low risk	Methodology: "Both groups received six treatment sessions over a 4-week period". Not described in detail in the results

Hsieh 2004 (*Continued*)

Timing outcome assessments similar?	Low risk	Yes.

Hsieh 2006

Methods	Country: Taiwan, China. Funding: none. Recruited: 188. Randomized: 129. Followed: 122 at one month; 109 at six months. Analyses: for comparisons between groups: 1) Wilcoxon rank sum test (Roland and Morris), jack-knife method to calculate 95% confidence intervals (CIs); 2) ANCOVA for VAS and Oswestry, adjusted for pretreatment score alone or together with other possible baseline variables such as duration of LBP; 3) logistic regression to estimate the odds ratio of having significant disability as measured by Roland and Morris; 4) cumulative logit models to the ordinal property of disability defined by Oswestry
Participants	Settings: outpatients of a specialist orthopaedic clinic in Kaoshiung, Taiwan, which offered standardised physical therapy Mean age: 50.2 in the acupressure group; 52.6 in the physical therapy group Gender: 41% female. Ethnicity: not reported, (assume all Chinese). Work status: N (%) acupressure versus PT. Household keeper 18 (28) versus 16 (25); office worker 17 (27) versus 8 (12); heavier labour 9 (14) versus 8 (12); other 20 (31) versus 33 (51) Pain duration: median (range) time since onset of pain (years): acupressure group: 3.3 (0.2 to 33.3) versus physical therapy group: 1.6 (0.2 to 34.3) Median (range) length of latest pain period (months): acupressure group: 14.5 (0.02 to 360) versus physical therapy group: 12 (0.25 to 432) Previous surgery: none (inclusion criteria) Diagnoses: CLBP over four months by orthopaedic surgeon.
Interventions	Massage technique: acupressure six sessions within a month. Experience of therapist: one senior acupressure therapist delivered each session to ensure a consistent experience. No detail on time of experience • Group 1: acupressure (N = 64 randomized to this group). • Group 2: conventional physical therapy received in routine physical therapy offered by the orthopaedic specialist clinic, including pelvic manual traction, spinal manipulation, thermotherapy, infrared light therapy, electrical stimulation and exercise therapy, as decided by the physical therapist (N = 65).
Outcomes	* used in the meta-analyses: Measured at baseline, after six sessions of treatment* and at six months FU* a. Pain: VAS (01-100)*. b. Function: 1. RMDQ (primary outcome) (range: 0 - 24); 2. modified Oswestry disability questionnaire* c. Overall improvement: Chinese version of the standard core outcome measures (degree of how bothersome) d. Patient satisfaction: as part of the core outcome measures: satisfaction of life with

	symptoms; satisfaction with previous treatment f. Adverse events: not reported.
Notes	a. Pain (100 mm VAS): • Group 1: from 58.8 to 30.6 to 16.1. • Group 2: from 57.0 to 48.0 to 41.4. b1. Function (Roland and Morris): • Group 1: from 10.9 to 5.4 to 2.2. • Group 2: from 10.0 to 9.2 to 6.7. b2. Function (Oswestry): • Group 1: from 24.4 to 17.0 to 12.2. • Group 2: from 21.1 to 20.6 to 17.9. c. Satisfaction of life with symptoms: • Group 1: from 1.39 to 2.38 to 3.63. • Group 2: from 1.57 to 1.97 to 2.95. d. Days off work: • Group 1: from 4.2 to 1.5 to 0.6. • Group 2: from 3.3 to 3.5 to 2.5. Authors' conclusions: "This study shows that acupressure is more efficacious in alleviating low-back pain than is physical therapy, as measured by pain VAS, core outcome measures, Roland and Morris disability questionnaire and Oswestry disability questionnaire."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Pre-determined random table.
Allocation concealment (selection bias)	Low risk	A research assistant independently randomized participants and they were randomly allocated to two arms
Blinding (performance bias and detection bias) All outcomes - patients?	High risk	Patients were not blinded.
Blinding (performance bias and detection bias) All outcomes - providers?	High risk	Not possible to define whether the Index and control groups were indistinguishable for the care providers
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	High risk	"The research assistant who did the post-treatment and six month follow-up interviews by telephone was also blind to pre-treatment assessment and was told beforehand not to ask the participants about the details of the intervention in order to remain blind to the intervention as far as possible." "...assessor was blind to interven-

		tion group before analysis of data was complete". However the outcomes were subjective and self-reported by the patients who were not blinded
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	Drop outs after 1 month were 3% and 9% of the initial samples of acupressure and physical therapy groups, respectively. Drop outs after 6 months were 14% and 17% of the initial samples of acupressure and physical Therapy groups, respectively. Two patients swapped the group in each arm of the study
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Low risk	Researchers substituted missing data for patients lost to follow-up with baseline or posttreatment data by assuming no change since last contact All patients were analyzed in the group to which they were allocated by randomization
Selective reporting (reporting bias)	Unclear risk	Pain (VAS) and back-specific functionality (RMDQ) were all reported at pretreatment, post-treatment and at 6 months follow-up
Other bias	Low risk	No other bias was identified.
Similarity of baseline characteristics?	Low risk	Table 1: age, gender, marital status, education level, occupation, time since onset of pain, length of latest pain period
Co-interventions avoided or similar?	Unclear risk	Unclear from text.
Compliance acceptable?	Unclear risk	Unclear from text.
Timing outcome assessments similar?	Low risk	Yes.

Kamali 2014

Methods	Country: Iran. Funding: Vice-Chancellery for Research Office, Shiraz University of Medical Sciences Recruited: 30. Randomized: 30 to two groups (not stated but assumed 15 per group) Followed: 30. Analysis: paired t-tests and independent sample t-tests were run with a significance level of 0.05
Participants	Population: patients with subacute or chronic non-specific LBP Settings: physical therapy centre of Shiraz University of Medical Sciences Funding for participants: not described. Mean age: 33.96 ± 10.93 years. % female: 100%. Ethnicity: not described. Iran. Work status: not described. Pain duration: 9.68 ± 3.38 months. Previous surgery: excluded. Diagnoses: several conditions were excluded; nothing specific included
Interventions	Massage technique: Group 1: massage (n = 15?). SM performed by physical therapists. 15 minutes a day for 10 days. Prescribed exercise too Group 2: physical therapy (n = 15?). Received electro therapy, TENS, ultrasound and exercise. Unclear how long each session was or how many sessions provided
Outcomes	Measured at baseline and immediately after: a. Pain: pain intensity (Numerical Rating Scale). b. Function: functional disability (ODI). c. Adverse events: not reported. d. Other measures: • function (modified Schober test). Measured in the short-term: none. Measured in the long-term: none.
Notes	a. Pain intensity (Numerical Rating Scale, lower means "better"): • Group 1: from 6.00 ± 1.92 [baseline] to 1.80 ± 1.61 [immediately after]. • Group 2: from 7.33 ± 1.75 [baseline] to 4.06 ± 2.98 [immediately after]. b. Function (ODI, lower means "better"): • Group 1: from 12.53± 3.94 [baseline] to 5.73± 3.05 [immediately after]. • Group 2: from 16.26± 5.99[baseline] to 10.53± 6.34 [immediately after]. c. Function (Flexion ROM, lower means "worse") • Group 1: from 6.26 ± 0.96 [baseline] to 7.13 ± 0.61 [immediately after]. • Group 2: from 6.46 ± 1.39 [baseline] to 7.13 ± 1.24 [immediately after]. Given the large differences in baseline between groups, the results of this study have not been included in the meta-analyses of this current review

Risk of bias

Bias	Authors' judgement	Support for judgement

Random sequence generation (selection bias)	Unclear risk	The method of randomization was not described.
Allocation concealment (selection bias)	Unclear risk	The method of allocation was not described.
Blinding (performance bias and detection bias) All outcomes - patients?	High risk	Patients were not blinded to the group.
Blinding (performance bias and detection bias) All outcomes - providers?	High risk	Providers were not blinded to the group.
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	High risk	Assessors were blinded to the group but the patients were not. Two of the tools were self-report and the participants likely knew which group they were in. This could have introduced bias into the study. Only one was objective (external assessor). The blinding of these assessors likely had little impact on the bias in the study
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Unclear risk	It was not reported whether there were dropouts or not.
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Unclear risk	It was not described.
Selective reporting (reporting bias)	Low risk	All primary outcomes were reported according to the methodology
Other bias	Low risk	No additional bias found.
Similarity of baseline characteristics?	High risk	No details provided about baseline characteristics.
Co-interventions avoided or similar?	High risk	Medication or other interventions were not clearly reported. Exercise seems to be different in both groups
Compliance acceptable?	Unclear risk	No data about compliance.
Timing outcome assessments similar?	Unclear risk	It is unclear whether it was similar or different between the groups

Kumnerddee 2009

Methods	Country: Thailand. Funding: the study was supported by The Institute of Thai Traditional Medicine by sending qualified masseurs to perform Thai massage. The trial author wishes to thank Dr. Ukrit Jirapatarasuntorn for assistance in pain threshold evaluation Recruited: 26 recruited; 8 excluded. The on-service male military personnel from the 4th Battalion, 1^{st} Regiment, King-own Bodyguard were enrolled for the study. The aim, including procedures of the massage and acupuncture was explained and also demonstrated to all volunteers Randomized: 18. Followed: 17; 1 dropped out of the massage group. Analysis: mean and SDs for descriptive statistics. Paired t-tests were used to compare change scores from baseline to follow-up. Unpaired t-test were used to compare scores between groups
Participants	Population: on-service Thai male military personnel, King-own bodyguard between 20 to 40, with history of posture-induced LBP plus the tender spot producing the referred pain down to the hip or leg Settings: Department of Physical Medicine and Rehabilitation, Phramongkutklao College of Medicine Funding: for patients is not indicated. Mean age: Thai massage = 26.25 ± 6.84; acupuncture = 29.00 ± 6.84 % female: 0%. Ethnicity: only Thai men recruited (no additional details). Work status: only on-service military personnel recruited. Pain duration: onset (weeks): Thai massage = 12.78 + 22.71; acupuncture = 14.81 + 22.73. Previous surgery: excluded Diagnoses: several conditions were excluded; nothing specific included Exclusion criteria: individuals with the history of acute back injury within 3 months, previous history of back surgery, disc herniation, spine fracture, spine infection, spondyloarthropathy, presence of coagulation disorder, skin infection over the area of the selected acupoints, neurodeficit or spinal deformity
Interventions	Massage technique: Thai massage (Rachasmnak) - 5 sessions every 2 to 3 days over 10 days. One hour treatment to legs, back (from feet to level of 7^{th} vertebrae) including 40 sec on femoral artery called "open the wind gate" Experience of therapist: 4 Thai traditional massage therapists from Institute of Thai Traditional Medicine who had passed 800 hours of training by the Ministry of Public Health Group 1: Thai massage (n = 8 randomized to this group). Group 2: Acupuncture (n = 9 randomized to this group).
Outcomes	* used in the meta-analyses. Measured at baseline and in the short-term: a. Pain: Back symptom = Thai version of MPQ, VAS (mm)(before day 3 and day 8 and end of treatment)*, The pain threshold in each trigger point was measured by a pressure algometer. The minimal pressure required to produce pain at each point was summarized and recorded in kilogram (kg) b. Function: none. c. Adverse events: one patient of the Thai massage group experienced intense posttreat-

	ment soreness and asked to be withdrawn from the study Measured immediately after: none Measured in the long-term: none
Notes	Results: a. Back symptom (Thai MPQ - pain descriptors) (15 items from 0-3, lower means "better") Group 1: from 16.13 ± 8.94 [baseline] to 12.13 ± 7.72 [day 3] to 9.13 ± 7.45 [day 8] to 10.25 ± 11.02 [day 10] to Group 2: from 15.78 ± 8.41 [baseline] to 6.67 ± 5.79 [day 3] to 3.11 ± 2.71 [day 8] to 10.25 ± 11.02 [day 10 b. Pain threshold algometry: lower means "worse") Group 1: from 9.08 ± 5.83 [baseline] to 9.54 ± 5.05 [day 3] to 10.41 ± 5.75 [day 8] to 12.48 ± 7.04 [day 10] Group 2: from 9.69 ± 5.16 [baseline] to 13.71 ± 10.28 [day 3] to 16.61 ± 9.41 [day 8] to 9.74 ± 12.46 [day 10] c. Back Symptom (Thai MPQ - VAS) (1 item from 10 to 100mm, lower means "better") Group 1: from 4.56 ± 1.37 [baseline] to 3.46 ± 1.98 [day 3] to 2.66 ± 1.71 [day 8] to 2.15 ± 2.61 [day 10] Group 2: from 4.19 ± 2.70 [baseline] to 2.08 ± 1.65 [day 3] to 1.28 ± 1.69 [day 8] to 0.46 ± 0.71 [day 10] Authors' conclusions: five sessions of Thai traditional massage and acupuncture were effective in the treatment of myofascial back pain in young Thai military personnel. Significant effects in both groups began after the first session. Acupuncture was more effective than Thai traditional massage when affective aspects were also evaluated

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Method not described in detail. "Patients were randomly divided into two groups (simple randomization)"
Allocation concealment (selection bias)	Unclear risk	Not described.
Blinding (performance bias and detection bias) All outcomes - patients?	High risk	Patients not blinded.
Blinding (performance bias and detection bias) All outcomes - providers?	High risk	Providers knew what they were providing.
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	High risk	Blind measurements were collected by a family physician. It is unclear how the physician was unaware of the type of treatment. In addition, patients were not blinded and the outcomes are all subjective

Kumnerddee 2009 (*Continued*)

		and self-reported
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	Only one subject in the massage group dropped out because of post-massage soreness
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Low risk	Drop out was very low and all patients were analyzed in the group to which they were allocated by randomization
Selective reporting (reporting bias)	Low risk	Thai version of MPQ and VAS (mm) were measured as defined in the methods section of the manuscript
Other bias	Unclear risk	Personnel in military service would have different daily activities according to their range, experience, charge or division. The effect of their daily activities, regular exercise, demands at workplace, fitness status, body mass index or state of license are not described, so it is not possible to be measured or controlled over the results Two patients had myofascial pain of the upper back and shoulder. Their group allocation is unknown
Similarity of baseline characteristics?	Low risk	Age, onset of pain, McGill and VAS were similar at baseline.
Co-interventions avoided or similar?	Unclear risk	The regular practice of exercise in this military sample was not described
Compliance acceptable?	Low risk	Eight patients at the massage group and 9 in the Thai group completed the study
Timing outcome assessments similar?	Low risk	From baseline and day 10.

Lara-Palomo 2013

Methods	Country: Spain. Funding: the research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors Recruited: 80 recruited; 62 met inclusion criteria and consented. They were referred by their primary care physician to the clinical unit of the Health Science School of the University of Almeria (Spain) between 1 September 2011 and 29 February 2012 Randomized: 62. Followed: 61; 1 was lost to follow-up in the experimental group Analysis: mean and SDs for descriptive statistics. Paired t-tests were used to compare change scores from baseline to follow-up. Independent Student t-tests for continuous data and Chi² tests for categorical data were used to compare scores between groups. Separate 2 × 2 mixed model ANOVA with repeated measurements for the time factor need to be conducted in order to test between-groups differences in VAS, McQuade Test, range of trunk anteflexion motion, ODI, Roland Morris Disability Questionnaire (RMDQ), Tampa Scale for Kinesiophobia and quality of life as the dependent variables, with group (electro-massage or superficial massage) as the between-subjects variable and time (baseline, post treatment). Frequency counts were used to quantify clinically meaningful worsening of functional status (RMDQ increase of 2.5 according to baseline affection values points or more), such that absolute risk reduction (ARR), relative risk reduction (RRR) and number needed to treat (NNT) could be calculated. Effect size was tested
Participants	Population: patients between 18 and 65 years, with non-specific CLBP. They were referred by primary care physician Settings: Health Science School of the University of Almeria (Spain) Funding for participants: not indicated. Mean age: 48 ± 15 years. % female: 67.80%. Ethnicity: not indicated. Work status: not indicated. Pain duration: > 3 months. Not specifically indicated. Previous surgery: excluded. Diagnoses: LBP longer than 3 months, localized below the costal margin persisting for 12 weeks or more, score ≥ 4 on the RMDQ and inability to achieve lumbar muscle flexion-relaxation in trunk flexion Exclusion criteria were: clinical signs of radiculopathy, presence of lumbar stenosis, fibromyalgia or spondylolisthesis, a history of spinal surgery or neuromuscular kinesiotape therapy, treatment with corticosteroids in the past two weeks, and disease of the central or peripheral nervous system
Interventions	Massage technique: superficial manual massage - effleurage, superficial pressure and skin rolling on lower back for 20 mins Experience of therapist: not indicated. • Group 1: massage (n = 31 randomized to this group). • Group 2: interferential current (n = 31 randomized to this group).
Outcomes	* used in the meta-analyses: Measured at baseline and in the short-term (10 weeks)*: a. Pain: pain with the VAS*. b. Function: disability with ODI and RMDQ.

	c. Adverse events: not reported. d. Other measures: • health status with the SF-36 Quality of life questionnaire. Measured immediately after: none. Measured in the long-term: none.
Notes	Results: a. Pain intensity (VAS) (lower means "better"): • Group 1: from 6.52 ± 1.18 [baseline] to 6.06 ± 1.34 [short term]. • Group 2: from 6.67 ± 1.27 [baseline] to 5.01 ± 1.89 [short term]. b. Function (ODI): • Group 1: from 37.94 ± 11.53 [baseline] to 36.00 ± 12.21 [short term]. • Group 2: from 36.07 ± 10.47 [baseline] to 30.60 ± 9.99 [short term]. c. Function (RMDQ): • Group 1: from 11.13 ± 2.93 [baseline] to 10.97 ± 3.09 [short term]. • Group 2: from 10.33 ± 3.23 [baseline] to 7.96 ± 3.31 [short term]. Authors' conclusions: "individuals with non-specific chronic low back pain experienced a significant improvement in pain level, disability and quality of life after 20 interferential current electro-massage sessions, but these effects may be medium to be clinically worthwhile. Further research is warranted on outcomes of electro-massage therapy for longer periods and/or in combination with exercise programs."

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Patients were randomized by computer-generated randomized table of numbers
Allocation concealment (selection bias)	Low risk	Concealed allocation by a researcher (ICL-P) not involved in either recruitment or treatment of the patients. A second therapist (AMC-S) blinded to the baseline findings opened the envelope and proceeded with treatment according to the group assignment
Blinding (performance bias and detection bias) All outcomes - patients?	Unclear risk	Not described.
Blinding (performance bias and detection bias) All outcomes - providers?	High risk	The massage provider was not blinded to which type of therapy the patient was receiving (massage with interferential current versus superficial massage)
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	High risk	All outcomes are subjective and self-reported by patients who were not blinded to which treatment they were receiving. All

Lara-Palomo 2013 (*Continued*)

		data were gathered before the first treatment session (baseline) and immediately after the final treatment session by a trained physical therapist assessor blinded to the treatment allocation of the patients
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	There was a drop out of one of 31 patients that was randomized to electromassage. No drop-outs in the control group
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Low risk	Low drop-out rate and all patients were analyzed in the group to which they were allocated by randomization
Selective reporting (reporting bias)	Low risk	Outcomes were assessed as proposed by the study: pain with the VAS, disability with ODI and RMDQ; health status with the SF-36 Quality of life questionnaire. These outcomes were measured at the baseline and at the end of the study 10 weeks after
Other bias	Unclear risk	The onset of pain, demands at workplace, fitness status, body mass index or medications were not measured
Similarity of baseline characteristics?	Low risk	Age, gender, mild acute complaints in past 2 years and sleep difficulties were similar at baseline
Co-interventions avoided or similar?	Unclear risk	There is no description about injections, medications or other modalities of therapies
Compliance acceptable?	Low risk	The study does not report concerns about the compliance. It describes that patients completed the 20 sessions of the intervention in each group
Timing outcome assessments similar?	Low risk	10 weeks in both groups.

Little 2008

Methods	Country: UK. Funding: Medical Research Council and the Rufford Maurice Laing Foundation
Participants	Total sample size: 579. % male: 30.5. Mean age: 45.5 years.

	Eligibility: patients with recurrent or CLBP, presenting to primary care with LBP > 3 months (currently scoring ≥ 4 on Roland Morris Disability Questionnaire (RMDQ), current pain for ≥ 3 weeks (to exclude recurrence of short duration)
Interventions	* Data used in the meta-analysis. * 1a. Massage only versus normal care n = 147. * 1b. Massage versus exercise, n = 147. 2a. Six Alexander technique lessons. 2b. Six Alexander lessons + exercise, n = 144 3a. 24 Alexander lessons. 3b. 24 Alexander lessons + exercise, n = 144. 4a. Normal care = 72. 4b. Normal care + exercise, n = 144. Frequency and treatment duration: 1. 6 sessions, 6 weeks. 2. 6 sessions, 4 weeks. 3. 24 lessons in 5 months. 4. 4b started exercise tx at 6 weeks. Personal communication with author (Paul Little): "all groups had usual care which was GPs normal practice for treatment and/or referral so like most normal care somewhat variable and not standardised, but well distributed across the trial groups"
Outcomes	* used in the meta-analyses: Data measured at 3 and 12 months: a. Pain: median days with no pain (IQR), Von Korff Pain*. b. Function: Roland disability score*. c.Adverse events: worse pain in one patient. d. Other measures • QoL: SF-36 physical score.
Notes	Results: a. Pain intensity (Von Korff Pain) (lower means "better"): • Group 1a: Massage from 4.6± 1.8 [baseline] to 5.3± 3.84 [long term] versus Control from 4.7 ± 1.8 [baseline] to 4.74 ± 2.2 [long term]. • Group 1b: Massage from 4.6± 1.8 [baseline] to 5.3± 3.84 [long term] versus control from 4.6 ± 1.8 [baseline] to 4.43 ± 4.09 [long term]. b. Function (Roland Disability score): • Group 1a: Massage from 11.3± 4.7 [baseline] to 8.78± 8.15 [long term] versus control from 10.8±4.8 [baseline] to 9.23±5.3 [long term]. • Group 1b: Massage from 11.3± 4.7 [baseline] to 8.78± 8.15 [long term]. Control from 10.7 ± 4.8 [baseline] to 7.58 ± 8.5 [long term] Conclusions: Massage is helpful in the short term, which supports tentative conclusions from previous research. Benefit in the longer term is probably less, which is supported by previous comparison with a self care booklet,35 although this trial did find benefit compared with acupuncture. Acupressure may possibly be more effective than the classic massage we used
Risk of bias	

Little 2008 (*Continued*)

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomized to one of eight groups by the practice nurse telephoning the central coordinating centre. A statistician had prepared a secure program using computer-generated random numbers so that the next allocation could not be guessed. For each practice contributing 10 patients, a block of eight numbers existed, and two were added from a block that supplied four other practices. Practices were not told how many patients would be recruited to each trial group or informed of the block randomization
Allocation concealment (selection bias)	Low risk	Participants were randomized to one of eight groups by the practice nurse telephoning the central coordinating centre
Blinding (performance bias and detection bias) All outcomes - patients?	Unclear risk	Not mentioned.
Blinding (performance bias and detection bias) All outcomes - providers?	Unclear risk	Not mentioned.
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	Unclear risk	Not mentioned.
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	The trial authors reported: "We found no evidence of confounding or bias from losses to follow-up". Follow-up was 80.1% at 3 months and 79.9% at 6 months
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Unclear risk	Not described.
Selective reporting (reporting bias)	Low risk	The back specific functionality (RMDQ), Quality of Life (SF36-physical score), pain (number of days free of pain) and overall improvement (Von Korff scale, Deyo "troublesomeness" scale and health transition) were all reported at three months and 1 year. Exept for the SF36-physical score, using health transition and the specific scale

Little 2008 (*Continued*)

		developed by the trial authors, the rest of the measures were reported for the baseline
Other bias	Low risk	No other bias was identified.
Similarity of baseline characteristics?	Low risk	Yes: Age, gender, marital status, education status, unemployment, von Korff overall, Roland Disability score, Deyo troublesomeness, Median No of days (interquartile range) in pain in past four weeks
Co-interventions avoided or similar?	Unclear risk	Not mentioned.
Compliance acceptable?	Low risk	Good adherence (see bmj.com for definitions) was achieved by 91% (108/119) of patients in the group receiving massage, 94% (106/113) in the group receiving six Alexander technique lessons, and 81% (95/117) in the group receiving 24 lessons. Adequate adherence for exercise prescription was achieved by 76% (211/278) of patients
Timing outcome assessments similar?	Low risk	Similar in both groups.

Mackawan 2007

Methods	Country: Thailand. Funding: 2002 to 2003 Khon Kaen University research grant, Khon Kaen University, Khon Kaen, Thailand. Recruited: not reported. Randomized: 67. Followed: 67. Analyses: Ancova to compare the difference between groups.
Participants	Mean age: Traditional Thai Massage (TTM): 38.97 (SD = 7.85). Joint mobilization (Mob): 38.57 (SD = 7.66). % female: 61.19%. % white: not reported. Work status: • Government service: TTM: 18; Mob: 15. • Private officer: TTM: 11; Mob: 11. • Student: TTM: 1; Mob: 3. • Business owner: TTM: 5; Mob: 3. Pain duration: > 12 weeks Previous surgery: excluded from study. Diagnoses: non-specific LBP.

Interventions	Massage technique: TTM: deep massage with prolonged pressure (5 to 10sec per point) on low-back muscles between L2 and L5 using the theory of "10 Sens". Experience of therapist: experienced physiotherapist (time not specified). One session of 10 minute duration. Groups: 1. TTM (N = 35) 2. Joint mobilization (N = 32): at spinous process of L2 to L5 by experienced physiotherapist's thumbs over the spinous processes. One session of 10 minute duration.
Outcomes	* used in the meta-analyses: Measured: immediately after a. Pain: VAS (before and five minutes after the treatment)* b. Function: no c. Overall improvement: no d. Patient satisfaction: no e. Adverse events: not reported
Notes	Results: a. Pain Visual Analogue Scale (VAS): • Group 1: from 4.22 to 2.45. • Group 2: from 4.35 to 3.39. Authors' conclusions: "Based on the results of this study, we conclude that both TTM and joint mobilization can temporarily relieve pain in patients with non-specific low-back pain. However, TTM yields slightly more beneficial effects than joint mobilization" Review authors' comments: poor description of the population, demographics, co-medications, previous use of TTM or mobilization, prior beliefs, co-morbidity, duration of pain episode, previous treatments

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	67 patients who met the inclusion criteria and were randomly assigned to one of the two treatment arms using block randomized allocation with block sizes of 2, 4 and 6. Groups were assigned using a pre-generated random assignment scheme enclosed in envelopes
Allocation concealment (selection bias)	Low risk	Groups were assigned using a pre-generated random assignment scheme enclosed in envelopes
Blinding (performance bias and detection bias) All outcomes - patients?	Unclear risk	Not described.

Mackawan 2007 (*Continued*)

Blinding (performance bias and detection bias) All outcomes - providers?	Unclear risk	Not described.
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	Unclear risk	The evaluation was done by one person only, who was blind to the treatment group allocation. However all outcomes were subjective and self-reported by the patients
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	The outcome measures were analyzed 5 min after each treatment. No losses to follow-up
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Low risk	All patients were analysed in the same group to which they were allocated
Selective reporting (reporting bias)	Unclear risk	Pain (VAS) was reported before and after treatment with 1 session of TTM, as mentioned in the methodology
Other bias	Low risk	No other bias was identified.
Similarity of baseline characteristics?	Unclear risk	Unclear from text. The duration of pain is not reported in the baseline characteristics
Co-interventions avoided or similar?	Unclear risk	Unclear from text. Not described in the article (unclear to define whether patients had taken medications before the therapy sessions or not)
Compliance acceptable?	Low risk	Yes.
Timing outcome assessments similar?	Low risk	Yes. Five minutes after the therapy sessions.

Poole 2007

Methods	Country: England. Funding: not reported. Patients were recruited from primary care sources. Recruited: 650 letters sent by 12 GPs - 278 replies. Randomized: 243. Follow-up: 191 at baseline (78%); 165 at end of six sessions (68%); 156 at six months (64% of 243). ITT analysis: no. Analyses: repeated measures ANCOVA.

Poole 2007 (*Continued*)

Participants	Setting: Private clinic. Reflexology: mean 47.2 (SD 10.5). Relaxation: mean 45.6 (SD 12.0). Non intervention: mean 47.45 (SD 10.2). Gender (female/male): Reflexology: 48/29. Relaxation: 53/29. Non-intervention: 38/37. Working status: reflexology: > 50%; relaxation: > 50%. Non-intervention: > 50%. Duration of pain (months): reflexology: 120.6; relaxation: 128. No intervention: 114.7. Co-morbidity: not described.
Interventions	Massage technique: foot reflexology - Morrell technique (application of firm but gentle compression to the feet). No standardized protocol provided. Six sessions of approximately one hour duration over a period of six to eight weeks. Experienced therapist: trained to diploma level, professional indemnity insurance and extensive experience Adjuvant therapy: usual care. Groups: 1. Reflexology (N = 77). 2. Relaxation (N = 82): progressive muscle relaxation. 3. Usual care (N = 75)
Outcomes	* used in the meta-analyses. Measured at: baseline, after the end of all sessions, at six months after the end of sessions: a. Pain: VAS* b. Function: Oswestry (primary)* c. Adverse events: not reported d. Other measures: • Beck Depression Inventory • SF-36 (primary) • Costs: not reported • Work related: not reported
Notes	Results: SF-36 Pain - Mean (SD): • Group 1: from 38.4 (22.9) to 50.0 (25.7) to 50.7 (27.1) • Group 2: from 43.8 (23.3) to 47.2 (26.3) to 48.8 (25.9) • Group 3: from 37.5 (20.3) to 41.8 (25.6) to 44.4 (28.5) VAS • Group 1: from 44.5 (24.8) to 35.0 (25.9) to 39.8 (29.2) • Group 2: from 40.7 (28.6) to 37.9 (27.0) to 41.3(28.5) • Group 3: from 40.6 (26.7) to 48.9 (29.3) to 42.7 (28.4) Authors' conclusions: "The current study does not indicate that adding reflexology to usual care for the management of CLBP is any effective than usual care alone."

Poole 2007 (*Continued*)

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Minimization technique.
Allocation concealment (selection bias)	High risk	Not concealed. The first trial author randomized patients to one of three groups
Blinding (performance bias and detection bias) All outcomes - patients?	High risk	Patients were informed of their group of allocation by letter
Blinding (performance bias and detection bias) All outcomes - providers?	High risk	The therapists were not blinded to the type of therapy they were providing
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	High risk	Patients completed the self report questionnaire booklet on their own and returned by post to the first author. Patients were not blinded to the group of allocation
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	Drop outs after assessment #1 were 11%, 28% and 15% of the initial samples for reflexology, usual care and relaxation groups, respectively. Drop outs after assessment # 2 were 15%, 42% and 30% for reflexology, usual care and relaxation groups, respectively
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	High risk	The trial authors mentioned that the analysis was based on ITT, but they had a lot of dropouts and it is unclear if they had any imputation of missing data. Therefore, they analyzed all patients available at follow-up and not all patients randomized
Selective reporting (reporting bias)	Unclear risk	Pain (VAS), Quality of Life (SF36), back specific functionality (RMDQ) and depression (Beck depression inventory II (BDI-II)) were all reported at pretreatment, post-treatment and at six months follow-up
Other bias	Low risk	No other bias was identified.

Poole 2007 (*Continued*)

Similarity of baseline characteristics?	Unclear risk	Unclear from text. Work status was not reported in tables or results, although mentioned to be taken in account in methodology. Duration of pain was taken in account
Co-interventions avoided or similar?	High risk	Were not similar, according to Table 2.
Compliance acceptable?	Unclear risk	Unclear from text.
Timing outcome assessments similar?	Low risk	It seems to be similar.

Preyde 2000

Methods	Country: Canada. Funding: College of Massage Therapists of Ontario. 165 patients were recruited, 107 met the inclusion criteria and 104 were randomized. 92% were followed Outcome assessor of range of motion was blinded. Patients were recruited by university e-mails, flyers sent to family physicians and advertisements in the local newspapers in Ontario Period of study: 1998 to 1999. Follow-up: one month after end of treatment.
Participants	Settings: this study was conducted at the Health and Performance Centre, University of Guelph, Guelph, Ontario, which offers multidisciplinary services such as sports medicine, physiotherapy and chiropractic manipulation Average age: 46 years. 51% female. Average duration of pain: three months (1 week to 8 months). Previous treatments not described.
Interventions	1. Comprehensive Massage Therapy (CMT): various soft-tissue manipulation techniques such as friction, trigger points and neuromuscular therapy to promote circulation and relaxation of spasm or tension. Duration: 30 to 35 minutes. Stretching exercises for the trunk, hips and thighs, including flexion and modified extension. Stretches were to be within a pain-free range, held on one occasion per day for the related areas and more frequently for the affected areas. 15 to 20 minutes of education on posture and body mechanics, particularly as they related to work and daily activities. 2. Soft-tissue manipulation only (STM). This group received the same soft-tissue manipulation as the subjects in the CMT group. 3. Remedial exercise only (RE). This group received the same exercise and education sessions as subjects in the CMT group. 4. The control group received 20 minutes of sham low-level laser (infrared) therapy (SLL). The laser was set up to look as if it was functioning but was not. The subject was "treated" lying on his or her side with proper support to permit relaxation.The instrument was held on the area of complaint by the treatment provider.

Preyde 2000 (*Continued*)

Outcomes	* used in the meta-analyses: Measured at baseline, at the end of the treatment* and at one month follow-up: a. Pain: Present Pain Index (PPI): PPI score* (valid, reliable), PRI: PRI score (valid, reliable) b. Function: RMDQ: RMDQ score* (valid, reliable, sensible). c. Adverse events: not reported. d. Other measures: • State Anxiety Index Score (reliable, valid, internal consistent). • Modified Schoeber test.
Notes	Authors' conclusions: massage is beneficial for patients with subacute LBP Measured at the end of all sessions and one month after the end of sessions

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Random numbers table.
Allocation concealment (selection bias)	Unclear risk	Not described.
Blinding (performance bias and detection bias) All outcomes - patients?	Unclear risk	Not reported in the text. Patients either received comprehensive massage, with exercises and postural education, soft tissue manipulation only, posture and remedial exercises only or placebo of sham laser. The method to blind patients to the treatment is not clearly described, in particular comprehensive massage therapy versus soft tissue manipulation
Blinding (performance bias and detection bias) All outcomes - providers?	Unclear risk	Unclear from text.
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	Unclear risk	Unclear whether patients were blinded for pain and function outcomes. It seems like patients under sham therapy were blinded, but is unclear for other groups
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	Drop outs were 7%, 18% , 12% and 11% of the initial samples of comprehensive massage therapy, soft tissue manipulation, remedial exercise and posture education, placebo (sham with laser treatment) groups, respectively

Preyde 2000 (*Continued*)

Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Low risk	Outcome data were analysed by ITT. All patients were analyzed in the group to which they were allocated by randomization
Selective reporting (reporting bias)	Unclear risk	The MPQ (PPI for intensity of pain and PRI for quality of pain), the RMDQ for LBP specific functionality were reported. All measures were reported as mentioned in the methodology, after 1 month of treatment and follow-up measures that were obtained 1 month after treatment ended
Other bias	Low risk	No other bias was identified.
Similarity of baseline characteristics?	Low risk	Described in Table 2: age, gender, marital status, education, mean body mass index, occupational activity, duration of LBP, previous episode of LBP, possible etiology factor and outcome measures at baseline
Co-interventions avoided or similar?	Low risk	Co-interventions were avoided. Participants were invited to stop medication and they were asked not to seek additional therapy for their backs for the 2 months that they were involved in the study
Compliance acceptable?	Low risk	Yes. Described in Table 1.
Timing outcome assessments similar?	Low risk	Yes.

Quinn 2008

Methods	Country: UK. Funding: not reported.
Participants	Total sample size: 15. % male: 32.2. Mean age: 43.5 years. Eligibility: staff employed at the University of Ulster with non-specific LBP, any physiotherapy, medication or other treatments for LBP has been stabilized for at least 3 months Pain duration: not reported if acute or chronic, but assumed to be sub-acute or chronic
Interventions	Group 1: massage - reflexology, n = 7 Group 2: sham (foot massage), n = 8 Frequency: 1 treatment/week Duration: 6 weeks

Quinn 2008 (*Continued*)

Outcomes	Data measured at 3 months: a. Pain: VAS-primary outcome measure; MPQ. b. Function: RMDQ; SF-36 health survey. c. Adverse effects: no harms reported.
Notes	Results: median (1st and 3rd interquartiles). Group 1 versus Group 2. VAS: baseline 4.7 (3.5 to 6.6) versus 3.4 (3.0 to 4.2). Roland-Morris: baseline 5 (4 to 8.6) versus 7.5 (3 to 9.3). Conclusion: reflexology appears to offer promise as a treatment in the management of LBP; however, an adequately powered trial is required before any more definitive pronouncements are possible

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated random number table.
Allocation concealment (selection bias)	Unclear risk	Not described.
Blinding (performance bias and detection bias) All outcomes - patients?	Low risk	All participants were blinded to their group allocation. Participants were told that they would either receive a reflexology treatment or a foot massage. As participants were reflexology-naive they should not have been aware of which treatment they received
Blinding (performance bias and detection bias) All outcomes - providers?	High risk	It was not possible to conceal group allocation from the therapist, as this person administered the treatment
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	Low risk	The outcome assessor was also blinded to group allocation. Patients scored the VAS and MPQ and they were previously blinded to the group of allocation
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	No loss to follow-up. No drop outs.
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Low risk	All patients were analyzed in the group to which they were allocated by randomization
Selective reporting (reporting bias)	Low risk	The VAS for pain, the MPQ (PRI for quality of pain), the RMDQ for LBP specific functionality and SF 36 for quality of life were all reported. All measures were reported as men-

Quinn 2008 (*Continued*)

		tioned in the methodology, at baseline (before the first treatment in week 1), post-treatment (after the last treatment in week 6), week 12 (follow-up), and week 18 (follow-up)
Other bias	Low risk	No other bias was identified.
Similarity of baseline characteristics?	Low risk	Table 1 describes baseline characteristics regarding the intensity of pain, Roland Morris Questionnaire and MPQ. Gender was 6/1 in reflexology group, 4/4 in sham group for woman/man. However, other variables were not included, such as occupation and duration of pain
Co-interventions avoided or similar?	Unclear risk	"Any physiotherapy, medication or other treatment for their LBP had been stabilized for at least 3 months, no involvement in other research projects within the past 3 months, reflexology naïve (with no detailed knowledge of specific reflexology points), not pregnant." "Two participants received physiotherapy during the follow-up period". No further details were described, regarding co-interventions
Compliance acceptable?	Low risk	It is described that all participants received the treatment
Timing outcome assessments similar?	Low risk	Yes.

Sritoomma 2014

Methods	Country: Thailand. Funding: unclear. Recruited: 164 assessed, 24 excluded. Randomized: 140. Followed: 138; 2 discontinued TTM intervention. Analysis: means and SDs presented for continuous variables; repeated measures ANOVA
Participants	Population: people aged ≥ 60 who were diagnosed with CLBP (lasting > 12 weeks) Settings: massage clinic. Funding for participants: unclear. Mean age: not described. % Female: 80%. Ethnicity: Thailand. Work status: labourer, business, teaching, jobless. Pain duration: minimum 12 weeks. Previous surgery: excluded.

Sritoomma 2014 (*Continued*)

	Diagnoses: several conditions were excluded; nothing specific included
Interventions	Massage technique: • Group 1: Swedish with ginger oil (n = 70). Participants in this group received SM (superficial massage) combined with ginger oil, 30 min sessions, 2 times a week, for 5 weeks. • Group 2: TTM (n = 70). Participants in this group received TTM (deep massage with acupressure, over meridians on the back) starting at the left foot, following meridian lines, 30 min sessions, 2 times a week for 5 weeks.
Outcomes	Measured at baseline and immediately after end of 10 sessions (6 weeks) and short-term (15 weeks): a. Pain: VAS for back pain, present pain intensity scale, MPQ b. Function: Oswestry Disability Questionnaire c. Adverse effects: no adverse events were identified. d. Other outcomes were: n/a Note: the VAS was also measured immediately after each single session of massage
Notes	a. Back symptom (Thai MPQ - pain descriptors) (15 items from 0 to 3, lower means "better"): • Group 1: from 14.83 ± 7.91 [baseline] to [4.31 ± 5.6 [end of 10 sessions] to 6.70 ± 7.2 [short-term]. • Group 2: from 14.19 ± 7.49 [baseline] to 6.99 ± 6.14 [end] to 9.69 ± 7.61[short-term]. b. Pain intensity (VAS from 0 to 100, lower means "better"): • Group 1: from 66.66 ± 24.17[baseline] to 19.31 ± 22.83 [end] to 26.63 ± 26.46[short-term]. • Group 2: from 63.27 ± 19.15 [baseline] to 27.80 ± 23.46 [end] to 38.64 ± 25.09 [short-term]. c. Pain intensity (present pain intensity): • Group 1: from 2.86 ± 1.07[baseline] to 1.10 ± 1.01 [end] to 1.29 ± 1.13[short-term]. • Group 2: from 2.71 ± 1.04 [baseline] to 1.29 ± 0.99 [end] to 1.70 ± 1.18 [short-term]. d. Function (Oswestry Disability Questionnaire (lower means less disabled)): • Group 1: from 26.94 ± 13.43 [baseline] to 9.11 ± 11.06 [end] to 12.49 ± 12.02[short-term]. • Group 2: from 29.49 ± 13.91 [baseline] to 12.63 ± 11.82 [end] to 17.40 ± 12.61 [short- term]. Authors' conclusions: both types of massage resulted in positive change in back pain intensity over time, although there was a significant difference between Swedish and Thai massage groups in the extent of that change. Although the study lacked a placebo group, it still compared the treatment intervention with a relevant control group

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**

Random sequence generation (selection bias)	Low risk	A statistician not involved in the study prepared a randomization schedule using a random number generated by computer with permuted block randomization (blocks of 10) prior to the enrolment of the first participant
Allocation concealment (selection bias)	Low risk	Another person not involved in the study placed randomized numbers into opaque envelopes. The assignments were placed in sealed opaque numbered envelopes prior to the onset of the study and treatments were determined after the baseline assessments had been completed. Each person who met the eligibility criteria was given the next opaque envelope treatment in sequential order
Blinding (performance bias and detection bias) All outcomes - patients?	Unclear risk	Participants may have known which group they were in (ginger odour versus no ginger odour or type of techniques depending on familiarity)
Blinding (performance bias and detection bias) All outcomes - providers?	High risk	Providers knew which intervention they were providing.
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	High risk	Patients were not blinded in self-report measures.
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	Only two patients dropped out in the control group.
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Low risk	All patients were analyzed in the group to which they were allocated by randomization
Selective reporting (reporting bias)	Low risk	All measures seemed to be used and reported as defined in the methodology
Other bias	Low risk	No additional risk identified.
Similarity of baseline characteristics?	Unclear risk	Duration of pain was not compared between the two groups.
Co-interventions avoided or similar?	High risk	Possible other interventions, such as exercise or injections were not described. Medi-

Sritoomma 2014 (*Continued*)

		cations were not published, in spite of monitoring their use. One group receives massage and ginger oil. A second group receives Thai massage. Two different types of massage and the addition of a treatment additive
Compliance acceptable?	Low risk	Patients completed the protocol, according to Figure 1.
Timing outcome assessments similar?	Low risk	They were all assessed at similar timing intervals (6 weeks and 15 weeks)

Yip 2004

Methods	Country: Hong Kong, China. Funding: partial support of the School of Nursing, Departmental Research Committee for this study. Recruited: 61. Randomized: 61. Followed: 51 (84%). Analyses: Mean ratio change = X2/X1, where X2 was the mean score at post one-week follow-up, X1 was the mean score at baseline, comparison between groups by Mann-Whitney U test
Participants	Settings: the research was carried out among members of the community centre, Old-Aged Home and Women Workers Association, recruited via notices on bulletin boards Mean age: 45.81 years. % female: 97%. Ethnicity: not reported, but assume all Chinese. Work status: not reported. Previous surgery: not reported. Diagnoses: non-specific sub-acute LBP defined as pain on most days in the past 4 weeks in the area between the lower coastal margins and the gluteal folds without known specific cause, such as a spinal deformity Pain duration: of current episode: • Group 1: 39.16 hours • Group 2: 51.45 hours
Interventions	Massage technique: Acupressure consisting of the application of a light to medium finger press with 3% lavender oil with grape seed oil as the massage lubricant on eight (4 bilateral) fixed acupoints for 2 minutes each: San-Jiao-Shu (UB22), Shen-Shu (UB23), Da-Chang-Shu (UB25) and Wei-Zhong (UB40); for 35 to 40 minutes, 8 times over a 3-week period Before massage: 10 minutes 'relaxation' with a digital Electronic Muscle Stimulator (7.69 Hz at 0.05 mA) delivered by five pairs of medium sized (2.5 cm) electrode pads on five bilateral acupoints [Shou-San-Li (LI10), Qu-Chi (LI11), Nao-Shu (SI10), Tian-Liao (TW15) and Tian-Zhu (BL10)

Yip 2004 (*Continued*)

	Experience of therapist: nurse trained in Chinese Medicinal Nursing. The precision of the acupressure was confirmed by deqi • Group 1: acupressure massage (N = 32 randomized to this group). • Group 2: usual care only (not described in detail) (N = 29).
Outcomes	* used in the meta-analyses: Measured at baseline and one week after the end of treatment: a. Pain: VAS (primary outcome)*. b. Function: ROM of lateral spine flexion (lateral fingertip-to-ground distance in cm) , walking time for 15m (50ft); interference in daily activities (modified Aberdeen LBP scale* - effect of LBP on sleeping, walking distance, housework/work and leisure-time activities). Higher scores mean greater interference c. Adverse events: No adverse effects were reported from subjects d. Other measures: • Work-related: part of Aberdeen scale.
Notes	a. Pain (VAS) • Group 1: from 6.38 to 3.95 • Group 2: from 5.70 to 5.62 Mean ratio change: • Group 1: 39% reduction in VAS • Group 2: unchanged pain intensity b. Function: ROM (P = 0.01) • Group 1: 4% improvement • Group 2: 1% decline Walking time (P = 0.05): • Group 1: 9% improvement • Group 2: 3% decline Insignificant interference with daily activities. Authors' conclusions: "Our results show that eight-sessions of acupoints stimulation followed by acupressure with aromatic lavender oil were an effective method for short-term LBP relief. No adverse effects were reported. To complement mainstream medical treatment for sub-acute LBP, the combined therapy of acupoint stimulation followed by acupressure with aromatic lavender oil may be one of the choices as an add-on therapy for short-term reduction of LBP."

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Random numbers table into intervention or control group.
Allocation concealment (selection bias)	Unclear risk	Unclear. Participants were allocated by the research team.

Yip 2004 (*Continued*)

Blinding (performance bias and detection bias) All outcomes - patients?	Unclear risk	Not mentioned.
Blinding (performance bias and detection bias) All outcomes - providers?	Unclear risk	Not mentioned.
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	High risk	Outcome measures were collected by nursing staff using face-to-face interviews and body measurements. The nurses were not blinded to patient group
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	Drop outs were 17% and 16% of the initial samples of control and intervention groups, respectively
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	High risk	ITT was not done.
Selective reporting (reporting bias)	Unclear risk	The pain intensity-VAS and modified Aberdeen LBP Scale (Interference with daily activities (sleeping, walking distance, housework/work and leisure-time activities) were all reported. Results were reported as difference in the scores of mean of score in post-1 week/mean of score at baseline between both groups. The duration of pain was described in the text
Other bias	Low risk	No other bias was identified.
Similarity of baseline characteristics?	Low risk	At baseline, there were no significant differences between the groups regarding age, gender, occupation, education level and the outcome measures of pain intensity, pain duration, interference on daily activities, walking time and spinal flexion
Co-interventions avoided or similar?	Unclear risk	Co-interventions not described. The conventional treatment alone is not described, however both groups received it
Compliance acceptable?	Unclear risk	Unclear from text.
Timing outcome assessments similar?	Low risk	Yes.

Yoon 2012

Methods	Country: Korea. Funding: this study was supported by a grant of the Korea Healthcare Technology R&D Project (A091220), Ministry for Health, Welfare & Family Aff airs, Republic of Korea Recruited: 26 but two were exclude afterwards due to lumbar surgery and history of recent injury respectively Randomized: 24 patients were randomly divided into two groups Followed: 22. Analysis: the Mann-Whitney test was used to compare group age, duration and initial data for PNRS, ODI, and RMDQ. A Chi² test was used to compare group gender. A Wilcoxon signed rank test was used to compare the effect between baseline and immediate after treatment, and baseline and 2 weeks after cessation of treatment in each group. A P value < 0.05 were considered statistically significant
Participants	Population: people with LBP for over 3 months and a PNRS (0-100) over 30, between the ages of 20 and 65 were included Settings: Department of Rehabilitation Medicine, Jesus Hospital, 68, Seowonro, Wansangu, Jeonju 560-750, Korea Funding: No funding for patients. Mean age: roptrotherapy group: 50.25 (6.69), TENS group: 53.30 (6.67) % Female: roptrotherapy group: (7/12), TENS group: (6/10). Ethnicity: not reported. The study is published from the city of Jeonju, Korea Work status: not described. Pain duration: LBP for over 3 months. Previous surgery: one patient, who was excluded. Diagnoses: people 20 to 65 years old with LBP rated by the numeric rating scale (PNRS, 0-100) over 30. The exclusion criteria included: acute or subacute LBP within 3 months, recent LBP treated within the previous 1 month, history of diabetes or thyroid disease, general disease such as rheumatic disease, pregnancy or breastfeeding, pacemaker or implanted electrical device, suspicious malignancy or thrombosis, scoliosis, vertebral fracture, myopathy, traumatic LBP, current disc herniation, history of lumbar surgery, neurological problems of the central or peripheral nervous systems
Interventions	Massage technique: • Group 1: roptrotherapy (n = 12). Deep cross-friction massage was performed for 20 minutes with the HT-bar at both the thoracolumbar regions (T6-L3) and hip muscles including the region where the patients complained of pain. Pressure was maintained at a level that the patients were able to endure within the range of 5-10 kg/cm. It was done by two therapists, 6 times over 2 weeks, 3 times a week with 2-day rest intervals. • Group 2: TENS (n= 12). High frequency electrical stimulation was continuously applied (100 Hz, rectangular 250 μs pulses) to the painful region, by using a two channel portable TENS. The maximal intensity of electrical stimulation tolerable to the patients was applied, for a total of 10 times over 2 weeks, 5 times a week, for 20 minutes at a time.
Outcomes	* used in the meta-analyses: Measured at baseline, immediately after and in the short-term*: a. Pain: PNRS*. b. Function: ODI RMDQ*. c. Adverse effects: One patient complained of skin discomfort deep cross-friction massage

	using the HT-bar Measured in the long-term: None.
Notes	a. Pain intensity (PNRS) (range 0 to 100, lower means "better") • Group 1 - Roptrotherapy: from [baseline] 56.67 (15.13) to [immediately after] 31.00 (16.15) to [short term] 22.92 (12.76). • Group 2 - TENS: from [baseline] 55.56 (13.37) to [immediately after] 37.50 (10.34) to [short term] 34.00 (13.29). b. Function (ODI) (range 0 to 100%, lower means "better") • Group 1 - Roptrotherapy: from [baseline] 34.06 (8.80) to [immediately after] 20.83 (11.55) to [short term] 13.62 (8.61). • Group 2 - TENS: from [baseline] 30.43 (9.12) to [immediately after] 22.43 (8.65) to [short term] 21.07 (11.47). c. RMDQ, (range from 0 to 23 points, lower means "less limitations due to the back pain") • Group 1 - Roptrotherapy: from [baseline] 7.50 (2.46) to [immediately after] 3.66 (1.96) to [short term] 2.33 (1.49). • Group 2 - TENS: from [baseline] 7.30 (3.46) to [immediately after] 3.50 (1.95) to [short term] 2.80 (2.49).

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Patients were randomly divided into two groups. The method of randomization is not described
Allocation concealment (selection bias)	Unclear risk	The allocation is not described.
Blinding (performance bias and detection bias) All outcomes - patients?	High risk	Patients were not blinded to group.
Blinding (performance bias and detection bias) All outcomes - providers?	Unclear risk	Not described.
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	High risk	Patients were not blinded to group and all outcomes were subjective and self-reported by patients
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	All 12 patients randomized to the treatment group were analysed. Two out of 12 patients dropped out from the control group

Yoon 2012 (*Continued*)

Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Low risk	Drop out was very low and all patients were analyzed in the group to which they were allocated by randomization
Selective reporting (reporting bias)	Low risk	Pain and function were reported according to the methodology
Other bias	Low risk	No other bias were detected.
Similarity of baseline characteristics?	High risk	Occupation or level of activity was not described at the baseline. Other potential conditions that could affect the report of outcomes were not reported, such as: educational level, physical demands at job
Co-interventions avoided or similar?	Unclear risk	Medication at baseline or follow-up is not described. Other therapies were avoided by the group, but there is no report whether the patients visited other centres for the management of pain
Compliance acceptable?	Low risk	Patients completing < 10 sessions were excluded.
Timing outcome assessments similar?	Low risk	All patients were evaluated at baseline, immediately after and at 2 weeks

Zheng 2012

Methods	Country: China. Funding: not indicated. Recruited: 64. Randomized: 64. Followed: 60. There were four drop-out cases in this study; 2 failed to adhere to treatment and follow-up in the control group and 2 discontinued treatment due to a worse pain after the deep massage. Analysis: mean and SDs for descriptive statistics. Independent sample t-test were used to compare scores between groups
Participants	Population: patients with non-specific LBP lasting > 3 months and between 21 to 75 years Settings: outpatients from the rehabilitation medicine centre of Chinese PLA General Hospital Funding: for patients not indicated. Mean age: massage group = 43 ± 15; control group = 42 ± 15. % Female: massage group = 44%; control group = 50%. Ethnicity: not indicated as per Chinese population. Work status: not indicated.

	Pain duration: treatment versus control group: course of disease ranging from 4.0 months to 6.0 years (2.7 ± 1.1) versus from 5.0 months to 7 years (2.6 ± 1.4) Previous surgery: not indicated. Diagnoses: several conditions were excluded; nothing specific included. Non-specific LBP is defined as pain under the scapulas, above the cleft of the buttocks, with or without radiation to the lower extremities Exclusion criteria: language barriers and those with LBP caused by neoplasm, osteoporosis, vertebral fracture, rheumatoid arthritis, acute herniated disc accompanied by nerve root entrapment and unstable spondylolisthesis
Interventions	Massage technique: deep slide massage, 8 to 10 seconds following feeling of slight discomfort, repeated 4 to 5 times; treatment twice a week with lumbar traction once daily. Treatment over 3 weeks Experience of therapist: not indicated. • Group 1: massage and lumbar traction (n = 32 randomized to this group). • Group 2: lumbar traction only (n = 32 randomized to this group).
Outcomes	* used in the meta-analyses: Measured at baseline and immediately after*: a. Pain: pain threshold, pain intensity*. b. Function: none. c. Adverse effects: not reported. d. Other measures: • muscle hardness. Measured in the short-term: not measured. Measured in the long-term: not measured.
Notes	Results: Pain intensity (VAS) (0 to 100 mm, lower means "better"): • Group 1: from 6.7 ± 1.6 [baseline] to 4.9 ± 1.3 to [short term] 3 weeks after treatment started. • Group 2: from 6.9 ± 1.6 [baseline] to 5.9 ± 1.3 [short term] 3 weeks after treatment started. Authors' conclusions: "We found a statistically significant (P < 0.05) increase in PPT, decreased muscle hardness, and lower VAS score after treatment in the treatment group compared to the control group in this study, suggesting improved therapeutic efficiency from the application of tender point deep tissue massage in combination with lumbar traction than with lumbar traction alone."

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Random numbers were generated using Microsoft Office Excel.
Allocation concealment (selection bias)	Unclear risk	Not clearly described. "A single designated person was responsible for the allocation tableusing the treatment

Zheng 2012 (*Continued*)

		sequence"
Blinding (performance bias and detection bias) All outcomes - patients?	Unclear risk	Not clearly described.
Blinding (performance bias and detection bias) All outcomes - providers?	Unclear risk	Not clearly described.
Blinding (performance bias and detection bias) All outcomes - outcome assessor?	Unclear risk	Not clearly described.
Incomplete outcome data (attrition bias) All outcomes - drop-outs?	Low risk	Less than 10% in each group. Two patients were lost to follow-up in the lumbar traction group and two discontinued intervention in the massage group when got worst after deep massage
Incomplete outcome data (attrition bias) All outcomes - ITT analysis?	Low risk	Patients that were lost to follow-up or discontinued the treatment were not included for analysis at the end of the study. However the number of drop-outs was very low 4/64 (6.25%) and this might not have biased the results if these patients did not receive the intervention that they were randomized to
Selective reporting (reporting bias)	Low risk	The pain intensity was measured at the end of the study, as proposed in the methodology
Other bias	Unclear risk	However, demands at workplace, current treatments, fitness status or body mass index were not measured
Similarity of baseline characteristics?	Low risk	Gender, age, course of disease and VAS were measured and similar at the baseline
Co-interventions avoided or similar?	Unclear risk	Other interventions during the study were not recorded or if so, were not reported
Compliance acceptable?	Low risk	The study does not report concerns about the compliance.
Timing outcome assessments similar?	Low risk	In both groups it was 3 weeks after treatment started.

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

Study	Reason for exclusion
Anderson 2005	This doctoral thesis is a RCT that compared the effect of Pilates versus massage in patients having CLBP and recurrent LBP (RLBP). We excluded this article because the definition used for this study included patients with lesions of inert structures, such as disc lesions, ligament lesions, joint instabilities and bony abnormalities (e.g. osteophytes, stenosis and degenerative changes), as well as ligament and capsular sprains, disc fissures and herniations, stress fractures, and effects of disc degeneration that can lead to a mechanical compromise of neural structures
Barnes 1997	This RCT compared a group that received myofascial release versus no myofascial release. We excluded this study because it included patients with unilateral anterior rotation rather than LBP and the outcome was the amount of change in mean linear distance from each ASIS to a central reference point. These are not inclusion criteria for this Cochrane Review, regarding the population and the primary outcomes
Buerger 1980	We excluded this RCT because massage was not applied as in routine practice. It was used as a sham treatment for manipulation
Dishman 2001	This RCT was excluded because the population consisted of asymptomatic volunteers. They were randomized to either a spinal manipulation, massage or control group. The purpose of the study was to compare the magnitude and duration of motoneuron inhibition occurring as a sequel to spinal manipulation or paraspinal and limb massage
Farasyn 2007	This is a RCT of roptrotherapy versus placebo on 65 patients with subacute LBP. Even though they measure pain-VAS and Oswestry disability, the only outcome reported is PPT. We excluded this trial because PPT is not considered a primary outcome in this Cochrane Review. The placebo group also received roptrotherapy after the 2nd week
Ferrell 1997	This RCT investigated a mixed population with chronic musculoskeletal pain including LBP. Patients were randomly assigned to one of three groups: 1) supervised program of walking; 2) pain education program: heat, cold, massage, relaxation and distraction; and 3) usual care. We excluded it from this review because of a mixture of patients and because the effects of massage could not be extracted separately
Fraser 1993	This RCT was designed to measure the effects of back massage on anxiety levels of elderly residents in a long-term care facility. We excluded it from this review because massage is not applied to treat LBP
Ginsberg 1987	This double-blinded placebo controlled trial was designed to test the effects of Rado-Salil ointment in mechanical LBP compared to placebo. Massage was employed in both groups (Rado-Salil and placebo)
Godfrey 1984	We included this RCT in the two previous versions of this Cochrane Review (Furlan 2000; Furlan 2002). However, we decided to exclude this trial from Furlan 2008 because it uses massage as a control group for another active intervention, and therefore massage therapy was not delivered appropriately as it is in practice
Haas 2014	This is a RCT that randomized 400 participants with non-specific CLBP to receive a dose of 0, 6, 12 or 18 spinal manipulative therapy (SMT) sessions from a chiropractor to the intervention groups and non-time-equivalent sessions of massage. We excluded this study because massage was applied to the control group as 5-minutes-light massage, so it was not properly delivered

(*Continued*)

Hoehler 1981	We included this RCT in the two previous versions of this Cochrane review (Furlan 2000; Furlan 2002) . However, we excluded this trial from Furlan 2008 because it uses massage as a control group for another active intervention, and therefore massage therapy was not delivered appropriately as it is in practice
Kalaoukalani 2001	This article is a sub-analysis of the data derived from the RCT published by Cherkin 2011 et al (which is included in this review). Kalaoukalani 2001 does not have information about the effects of the interventions. The objective of this sub-analysis was to evaluate the association of a patient's expectation for benefit from a specific treatment with improved functional outcome
Kankaanpää 1999	This is a RCT of 59 patients with non-specific CLBP. The main intervention was "active rehabilitation" consisting of exercises, behavioral support and ergonomic advice. The control group received massage plus thermal therapy, once a week (four treatment sessions). The study authors stated that the control group was considered a placebo treatment because massage and thermal therapy are assumed to be ineffective in the treatment for LBP. We excluded this trial from Furlan 2008 because: 1) the effects of massage could not be distinguished from the effects of thermal therapy; and 2) massage was seen as placebo therefore it was applied with no intention to relieve the patient's symptoms
Koes 1992	This is a randomized clinical trial of 256 patients with non-specific back and neck complaints. Patients were given three types of management: physiotherapy (exercises, massage, physical modalities), manual therapy (manipulation or mobilization) and care delivered by general practitioner (drugs: analgesics, advices about posture, home exercise and bed rest). A 4th group received placebo treatment consisting of detuned shortwave and detuned ultrasound. We excluded this trial from this review because the population consists of a mixture of back and neck complaints, and because the effects of massage therapy could not be extracted separately from the other interventions
Kolich 2000	This RCT was designed to determine the effects of a massaging lumbar support system on low-back muscle activity. We excluded it because the population consisted of healthy subjects
Kong 2012	This RCT included patients with non-specific LBP. We excluded it from this review because both groups received massage and the intervention under study was the herbal ointment
Konrad 1992	Intervention was underwater massage, which consisted of massage and movement while a stream of hot water (37°C), 1 atm, 10 cm) was applied to the affected part. In this case it is difficult to know if the therapeutic effect was due to the massage, the water relaxation or the superficial heat
Lauche 2012	This study assessed the pain (VAS) in 21 patients with chronic neck pain and 19 patients with CLBP that were randomized to Gua Sha Therapy or a waiting list control group. We excluded this study because such a technique was not considered a massage therapy
Lei 2011	This RCT analyzed the effects on pain by comparison between Santong tuina therapy versus tuina therapy. However, we excluded it because it included patients with lumbar intervertebral disc protrusion (LIDP) diagnosed by CT or MRI, and not only patients with non-specific LBP
Li 2006	This is a RCT comparing acupuncture massage with mobilization in a population with typical symptoms of lumbar intervertebral disc protrusion with clinical positive signs and diagnosed by CT or MRI aged between 20 to 55 years. The trial was excluded from this review because the LBP was caused specifically by confirmed disc herniation

(*Continued*)

Lindström 1970	This is a RCT of 62 patients with LBP and sciatica. The interventions were: 1) hot packs, massage, mobilizing and strengthening exercises for the spine; 2) intermittent pelvic traction, isometric training of the abdominal and hip extensor muscles; and 3) hot packs and rest only. We excluded this RCT because the effects of massage could not be extracted separately
Liu 2009	This RCT included patients with shoulder and back fasciitis. We excluded it from this systematic review because both groups received massage
Maniche 1991	Three articles reporting on the same controlled trial of intensive extensor exercises compared to: 1) light extensor exercises; and 2) thermotherapy, massage and mild exercises. We excluded it from this review because the effects of massage therapy cannot be extracted separately from the other therapies
Melzack 1980	Intervention was ice massage, which consisted of holding an ice cube with a gauze pad and gently massaging the skin. In this case it is difficult to know if the therapeutic effect was due to the superficial cold or the massage
Melzack 1983	We included this RCT in the two previous versions of this systematic review (Furlan 2000; Furlan 2002) . However, we excluded this trial from Furlan 2008 because it uses massage as a control group for another active intervention, and therefore massage therapy was not delivered appropriately as it is in practice
Movaghar 2012	This is a semi-empirical study, which might suggest that this is not a well-defined randomized study. We excluded it because it included only patients with discopathy, which does not match with the population of this review as idiopathic LBP
Pope 1994	We included this RCT in Furlan 2000 and Furlan 2002. However, we decided to exclude this trial from Furlan 2008 because it uses massage as a control group for another active intervention, and therefore massage therapy was not delivered appropriately as it is in practice
Rasmussen-Barr 2003	The manual treatment described does not fit with "massage therapy". They applied stretching, traction, manipulation and mobilization techniques
Romanowski 2012	This study compared the effectiveness of two different kind of massage in patients with CLBP: therapeutic and deep tissue massage. We excluded it because it is a non-RCT. The patients were separated into 2 groups with no randomization
Silveira 2006	This study included massage as a therapeutic measure for triathlon athletes. There was no LBP and it was not a randomized study. We excluded it because it did not match the population nor the methodology for this Cochrane Review
Walach 2003	This is a RCT of classic massage compared to standard medical care. We excluded it because it included a mixed population of back, neck, shoulders, head and limbs pain
Wang 2005	This is a quasi-randomized study by the order of entry of patients with non-specific LBP to assess the effects of massage and exercise on pain. We excluded it because both groups received Tuina massage and the only difference was the exercise, which is not the scope of this review

(*Continued*)

Werners 1999	This is a RCT of 152 patients with LBP in a primary care setting, comparing interferential therapy with motorized lumbar traction plus massage. We excluded it from this review because the effects of massage could not be extracted separately
Wilkinson 1997	This Master's thesis investigated the effect of therapeutic touch on the acute pain experience in postoperative lumbar laminectomy patients. We excluded this RCT from this review because the intervention did not involve touch, and did not have manual contact between the therapist and patient. Hands were moved over the subject's body from head to toe at a distance of 2 to 4 inches over the body
Wu 2004	This was a quasi-RCT (method of randomization involved visit number) of early intervention consisting of exercise plus massage for non-specific LBP. It compared exercise plus massage to massage alone. We excluded it from this review because both groups received massage
Zhang 2004	This was a quasi-randomized clinical trial (divided into groups according to hospitalization time) of traction, massage and massage plus exercise for patients with lumbar disc herniation. We excluded it from this review because the population included a specific cause of LBP (disc herniation)
Zhou 2008	In this controlled clinical trial, the population does not seem to have non-specific LBP. The intervention is manipulation and not massage. We excluded it because the study design does not seem to be randomized and the outcome is "deviation of the spinous process", which is not an outcome of interest in our review

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

Mandala 2001

Trial name or title	Mandala 2001
Methods	Randomized trial
Participants	Chronic low-back pain
Interventions	Shiatsu massage reflex therapy
Outcomes	Not reported
Starting date	
Contact information	
Notes	Abstract presented at a conference.

DATA AND ANALYSES

Comparison 1. Massage versus inactive controls for acute LBP

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Pain intensity (higher scores mean more pain)	1		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 Short-term follow-up	1	51	Std. Mean Difference (IV, Random, 95% CI)	-1.24 [-1.85, -0.64]
2 Function (higher scores mean more disability)	1		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
2.1 Short-term follow-up	1	51	Std. Mean Difference (IV, Random, 95% CI)	-0.50 [-1.06, 0.06]
3 Adverse events	1	51	Risk Difference (M-H, Random, 95% CI)	0.0 [-0.07, 0.07]

Comparison 2. Massage versus inactive controls for sub-acute and chronic LBP

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Pain intensity (higher scores mean more pain)	8		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 Short-term follow-up	7	761	Std. Mean Difference (IV, Random, 95% CI)	-0.75 [-0.90, -0.60]
1.2 Long-term follow-up	3	615	Std. Mean Difference (IV, Random, 95% CI)	0.02 [-0.15, 0.18]
2 Function (higher scores mean more disability)	7		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
2.1 Short-term follow-up	6	725	Std. Mean Difference (IV, Random, 95% CI)	-0.72 [-1.05, -0.39]
2.2 Long-term follow-up	3	615	Std. Mean Difference (IV, Random, 95% CI)	-0.16 [-0.32, 0.01]
3 Adverse events	4	624	Risk Difference (M-H, Random, 95% CI)	0.06 [0.00, 0.11]

Comparison 3. Massage versus active controls for sub-acute and chronic LBP

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Pain intensity (higher scores mean more pain)	13		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 Short-term follow-up	12	964	Std. Mean Difference (IV, Random, 95% CI)	-0.37 [-0.62, -0.13]
1.2 Long-term follow-up	5	757	Std. Mean Difference (IV, Random, 95% CI)	-0.40 [-0.80, -0.01]
2 Function (higher scores mean more disability)	7		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
2.1 Short-term follow-up	6	618	Std. Mean Difference (IV, Random, 95% CI)	-0.24 [-0.62, 0.13]
2.2 Long-term follow-up	4	616	Std. Mean Difference (IV, Random, 95% CI)	-0.21 [-0.60, 0.17]
3 Adverse events	5	585	Risk Difference (M-H, Random, 95% CI)	0.01 [-0.01, 0.03]

Analysis 1.1. Comparison 1 Massage versus inactive controls for acute LBP, Outcome 1 Pain intensity (higher scores mean more pain).

Review: Massage for low-back pain

Comparison: 1 Massage versus inactive controls for acute LBP

Outcome: 1 Pain intensity (higher scores mean more pain)

Study or subgroup	Massage N	Mean(SD)	Inactive controls N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
1 Short-term follow-up							
Yip 2004	27	0.61 (0.31)	24	0.99 (0.29)		100.0 %	-1.24 [-1.85, -0.64]
Subtotal (95% CI)	**27**		**24**			**100.0 %**	**-1.24 [-1.85, -0.64]**
Heterogeneity: not applicable							
Test for overall effect: Z = 4.03 (P = 0.000055)							
Test for subgroup differences: Not applicable							

Analysis 1.2. Comparison 1 Massage versus inactive controls for acute LBP, Outcome 2 Function (higher scores mean more disability).

Review: Massage for low-back pain

Comparison: 1 Massage versus inactive controls for acute LBP

Outcome: 2 Function (higher scores mean more disability)

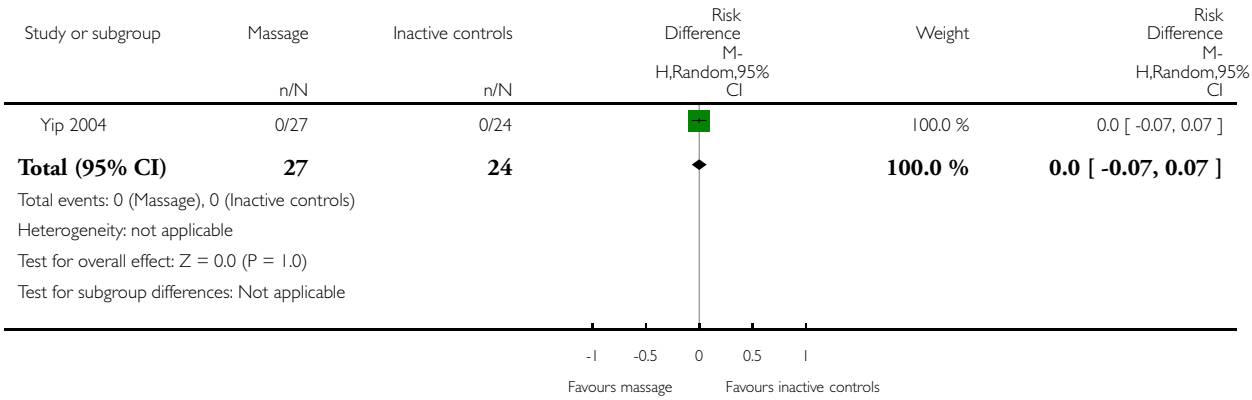
Study or subgroup	Massage N	Mean(SD)	Inactive controls N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
1 Short-term follow-up							
Yip 2004	27	0.9 (0.15)	24	1 (0.24)		100.0 %	-0.50 [-1.06, 0.06]
Subtotal (95% CI)	**27**		**24**			**100.0 %**	**-0.50 [-1.06, 0.06]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.75 (P = 0.080)							
Test for subgroup differences: Not applicable							

Analysis 1.3. Comparison 1 Massage versus inactive controls for acute LBP, Outcome 3 Adverse events.

Review: Massage for low-back pain

Comparison: 1 Massage versus inactive controls for acute LBP

Outcome: 3 Adverse events



Analysis 2.1. Comparison 2 Massage versus inactive controls for sub-acute and chronic LBP, Outcome 1 Pain intensity (higher scores mean more pain).

Review: Massage for low-back pain

Comparison: 2 Massage versus inactive controls for sub-acute and chronic LBP

Outcome: 1 Pain intensity (higher scores mean more pain)

Study or subgroup	Massage N	Mean(SD)	Inactive control N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
1 Short-term follow-up							
Ajimsha 2014	38	13.1 (6.9)	36	18.3 (7.5)		10.5 %	-0.71 [-1.19, -0.24]
Buttagat 2011	18	2.6 (1.9)	18	4.8 (1.4)		4.4 %	-1.29 [-2.01, -0.56]
Cherkin 2011 (1)	127	3.8 (2.01)	61	5.2 (1.6)		23.6 %	-0.74 [-1.05, -0.42]
Cherkin 2011 (2)	130	3.5 (2.03)	62	5.2 (1.6)		23.4 %	-0.89 [-1.21, -0.57]
Farasyn 2006	20	37 (19)	20	59 (21)		5.2 %	-1.08 [-1.74, -0.41]
Geisser 2005 (3)	15	3.39 (2.5)	18	4.29 (2.7)		4.9 %	-0.34 [-1.03, 0.35]
Geisser 2005 (4)	21	2.4 (2)	18	3.46 (2)		5.7 %	-0.52 [-1.16, 0.12]
Poole 2007	65	35 (25.9)	43	48.9 (29.3)		15.2 %	-0.51 [-0.90, -0.11]
Preyde 2000	25	1.04 (0.7)	26	1.65 (0.8)		7.1 %	-0.80 [-1.37, -0.23]
Subtotal (95% CI)	**459**		**302**			**100.0 %**	**-0.75 [-0.90, -0.60]**
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 7.22$, df = 8 (P = 0.51); $I^2 = 0.0\%$							
Test for overall effect: Z = 9.63 (P < 0.00001)							
2 Long-term follow-up							
Cherkin 2011 (5)	123	3.9 (2.26)	58	4.2 (1.55)		27.9 %	-0.14 [-0.46, 0.17]
Cherkin 2011 (6)	127	4.6 (2.29)	58	4.2 (1.55)		28.2 %	0.19 [-0.12, 0.50]
Little 2008	75	5.03 (3.84)	72	4.74 (2.2)		26.1 %	0.09 [-0.23, 0.42]
Poole 2007	57	39.8 (29.2)	45	42.7 (28.4)		17.8 %	-0.10 [-0.49, 0.29]
Subtotal (95% CI)	**382**		**233**			**100.0 %**	**0.02 [-0.15, 0.18]**
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 2.78$, df = 3 (P = 0.43); $I^2 = 0.0\%$							
Test for overall effect: Z = 0.23 (P = 0.82)							
Test for subgroup differences: $Chi^2 = 44.98$, df = 1 (P = 0.00), $I^2 = 98\%$							

(1) Structural massage

(2) Relaxation massage

(3) Geisser(2) massage + nonspecific exercises VERSUS sham massage + nonspecific exercises

(4) Geisser(1) massage + specific exercise VERSUS sham massage + specific exercises

(5) Relaxation massage

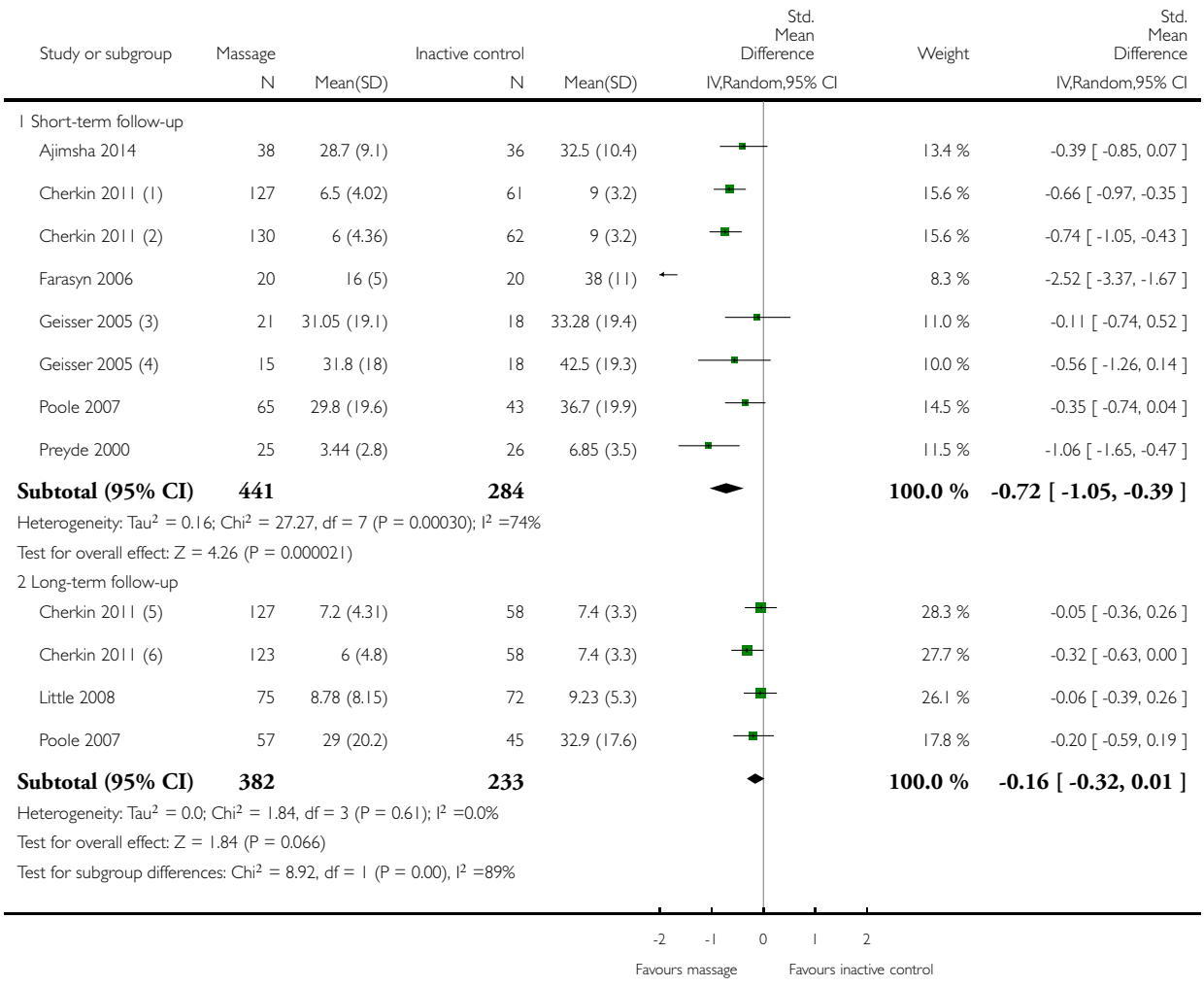
(6) Structural massage

Analysis 2.2. Comparison 2 Massage versus inactive controls for sub-acute and chronic LBP, Outcome 2 Function (higher scores mean more disability).

Review: Massage for low-back pain

Comparison: 2 Massage versus inactive controls for sub-acute and chronic LBP

Outcome: 2 Function (higher scores mean more disability)



(1) Cherkin 2011 - Structural massage

(2) Cherkin 2011 - relaxation massage

(3) Geisser(4) massage + specific exercise VERSUS sham massage + specific exercises

(4) Geisser(3) massage + nonspecific exercises VERSUS sham massage + nonspecific exercises

(5) Cherkin 2011 - Structural massage

(6) Cherkin 2011 - relaxation massage

Analysis 2.3. Comparison 2 Massage versus inactive controls for sub-acute and chronic LBP, Outcome 3 Adverse events.

Review: Massage for low-back pain

Comparison: 2 Massage versus inactive controls for sub-acute and chronic LBP

Outcome: 3 Adverse events

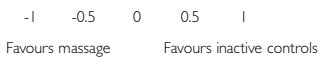
Study or subgroup	Massage n/N	Inactive control n/N	Risk Difference M-H,Random,95% CI	Weight	Risk Difference M-H,Random,95% CI
Ajimsha 2014 (1)	10/38	1/36		9.6 %	0.24 [0.09, 0.39]
Cherkin 2011 (2)	9/131	0/61		26.8 %	0.07 [0.02, 0.12]
Cherkin 2011 (3)	5/134	0/62		29.0 %	0.04 [0.00, 0.08]
Little 2008 (4)	1/75	0/72		29.7 %	0.01 [-0.02, 0.05]
Quinn 2008	0/7	0/8		5.0 %	0.0 [-0.22, 0.22]
Total (95% CI)	**385**	**239**		**100.0 %**	**0.06 [0.00, 0.11]**

Total events: 25 (Massage), 1 (Inactive control)

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 14.80$, df = 4 (P = 0.01); $I^2 = 73\%$

Test for overall effect: Z = 2.00 (P = 0.046)

Test for subgroup differences: Not applicable



(1) Ten patients from the MFR group and 1 from control group reported an increase of pain in the first week after initiation of treatment, and this was reported to have subsided within a week without any medications

(2) Structural massage

(3) Relaxation massage

(4) One patient mentioned that their back pain had been made considerably worse by massage. No adverse events were reported for control group

Analysis 3.1. Comparison 3 Massage versus active controls for sub-acute and chronic LBP, Outcome 1 Pain intensity (higher scores mean more pain).

Review: Massage for low-back pain

Comparison: 3 Massage versus active controls for sub-acute and chronic LBP

Outcome: 1 Pain intensity (higher scores mean more pain)

Study or subgroup	Massage N	Mean(SD)	Active therapy N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
1 Short-term follow-up							
Cherkin 2001 (1)	38	3.6 (1.89)	83	4.6 (3.25)		9.5 %	-0.34 [-0.73, 0.04]
Cherkin 2001 (2)	38	3.6 (1.89)	89	4 (3.6)		9.5 %	-0.12 [-0.50, 0.26]
Field 2007	15	1.4 (1.6)	15	2.7 (2.4)		5.9 %	-0.62 [-1.36, 0.12]
Hernandez-Reif 2001	12	1.7 (2.3)	12	2.9 (2.8)		5.3 %	-0.45 [-1.26, 0.36]
Hsieh 2004	65	2.28 (2.62)	72	5.05 (5.11)		9.9 %	-0.67 [-1.01, -0.32]
Hsieh 2006	64	30.6 (21.75)	65	48 (23.4)		9.8 %	-0.77 [-1.12, -0.41]
Kumnerddee 2009	8	2.15 (2.61)	9	0.45 (0.71)		4.0 %	0.87 [-0.14, 1.88]
Lara-Palomo 2013	31	6.06 (1.34)	30	5.01 (1.89)		8.0 %	0.63 [0.12, 1.15]
Mackawan 2007	35	2.45 (1.75)	32	3.39 (1.66)		8.3 %	-0.54 [-1.03, -0.06]
Poole 2007	65	35 (25.9)	57	37.9 (27)		9.8 %	-0.11 [-0.47, 0.25]
Preyde 2000	25	1.04 (0.7)	22	1.64 (0.8)		7.2 %	-0.79 [-1.38, -0.19]
Yoon 2012	12	22.92 (12.76)	10	34 (13.29)		4.8 %	-0.82 [-1.70, 0.06]
Zheng 2012	30	4.9 (1.3)	30	5.9 (1.3)		7.9 %	-0.76 [-1.28, -0.23]
Subtotal (95% CI)	**438**		**526**			**100.0 %**	**-0.37 [-0.62, -0.13]**
Heterogeneity: $Tau^2 = 0.13$; $Chi^2 = 37.53$, df = 12 (P = 0.00018); $I^2 = 68\%$							
Test for overall effect: Z = 2.96 (P = 0.0031)							
2 Long-term follow-up							

(*Continued* . . .)

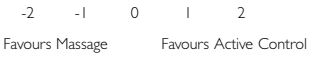
(. . . *Continued*)

Study or subgroup	Massage N	Mean(SD)	Active therapy N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
Cherkin 2001 (3)	38	3.2 (2.2)	83	3.8 (3.25)		16.4 %	-0.20 [-0.59, 0.18]
Cherkin 2001 (4)	38	3.2 (2.2)	90	4.5 (3.38)		16.5 %	-0.42 [-0.80, -0.04]
Hsieh 2004	56	1.08 (1.43)	65	3.15 (3.62)		16.7 %	-0.73 [-1.10, -0.36]
Hsieh 2006	64	16.1 (17.4)	65	41.4 (24.6)		16.6 %	-1.18 [-1.55, -0.80]
Little 2008	75	5.03 (3.84)	72	4.43 (4.09)		17.2 %	0.15 [-0.17, 0.47]
Poole 2007	57	39.8 (29.2)	54	41.3 (28.5)		16.6 %	-0.05 [-0.42, 0.32]
Subtotal (95% CI)	**328**		**429**			**100.0 %**	**-0.40 [-0.80, -0.01]**

Heterogeneity: $Tau^2 = 0.21$; $Chi^2 = 35.02$, df = 5 (P<0.00001); $I^2 = 86\%$

Test for overall effect: Z = 1.99 (P = 0.047)

Test for subgroup differences: $Chi^2 = 0.02$, df = 1 (P = 0.90), $I^2 = 0.0\%$



(1) Compared to Self-care education

(2) Compared to Acupuncture

(3) Comapred to self-care education

(4) Compared to acupuncture

Analysis 3.2. Comparison 3 Massage versus active controls for sub-acute and chronic LBP, Outcome 2 Function (higher scores mean more disability).

Review: Massage for low-back pain

Comparison: 3 Massage versus active controls for sub-acute and chronic LBP

Outcome: 2 Function (higher scores mean more disability)

Study or subgroup	Massage N	Mean(SD)	Active Control N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
1 Short-term follow-up							
Cherkin 2001 (1)	38	6.3 (3.79)	89	7.9 (6.73)		15.8 %	-0.26 [-0.65, 0.12]
Cherkin 2001 (2)	38	6.3 (3.79)	83	8.8 (6.5)		15.8 %	-0.43 [-0.82, -0.04]
Hsieh 2006	60	5.4 (5)	58	9.2 (5.8)		16.0 %	-0.70 [-1.07, -0.33]
Lara-Palomo 2013	31	10.97 (3.09)	30	7.96 (3.31)		13.7 %	0.93 [0.40, 1.46]
Poole 2007	65	29.8 (19.6)	57	33.4 (22.3)		16.2 %	-0.17 [-0.53, 0.19]
Preyde 2000	25	3.44 (2.8)	22	6.82 (5.6)		12.8 %	-0.77 [-1.36, -0.17]
Yoon 2012	12	2.33 (1.49)	10	2.8 (2.49)		9.7 %	-0.23 [-1.07, 0.62]
Subtotal (95% CI)	**269**		**349**			**100.0 %**	**-0.24 [-0.62, 0.13]**
Heterogeneity: Tau^2 = 0.19; Chi^2 = 28.33, df = 6 (P = 0.00008); I^2 =79%							
Test for overall effect: Z = 1.26 (P = 0.21)							
2 Long-term follow-up							
Cherkin 2001 (3)	38	6.8 (4.08)	83	6.4 (6.04)		19.8 %	0.07 [-0.31, 0.46]
Cherkin 2001 (4)	38	6.8 (4.08)	90	8 (6.53)		19.8 %	-0.20 [-0.58, 0.18]
Hsieh 2006	55	2.2 (3.2)	54	6.7 (5.5)		19.5 %	-1.00 [-1.39, -0.60]
Little 2008	75	8.78 (8.15)	72	7.58 (8.5)		20.9 %	0.14 [-0.18, 0.47]
Poole 2007	57	29 (20.2)	54	31.3 (21.1)		20.0 %	-0.11 [-0.48, 0.26]
Subtotal (95% CI)	**263**		**353**			**100.0 %**	**-0.21 [-0.60, 0.17]**
Heterogeneity: Tau^2 = 0.16; Chi^2 = 21.69, df = 4 (P = 0.00023); I^2 =82%							
Test for overall effect: Z = 1.07 (P = 0.28)							
Test for subgroup differences: Chi^2 = 0.01, df = 1 (P = 0.91), I^2 =0.0%							

(1) Compared to Acupuncture

(2) Compared to self-care education

(3) Compared to self-care education

(4) Compared to Acupuncture

Analysis 3.3. Comparison 3 Massage versus active controls for sub-acute and chronic LBP, Outcome 3 Adverse events.

Review: Massage for low-back pain

Comparison: 3 Massage versus active controls for sub-acute and chronic LBP

Outcome: 3 Adverse events

Study or subgroup	Massage n/N	Active control n/N	Risk Difference M-H,Random,95% CI	Weight	Risk Difference M-H,Random,95% CI
Cherkin 2001 (1)	3/39	10/94		4.0 %	-0.03 [-0.13, 0.07]
Cherkin 2001 (2)	2/39	0/90		7.4 %	0.05 [-0.03, 0.13]
Hsieh 2004 (3)	0/65	0/72		54.6 %	0.0 [-0.03, 0.03]
Kumnerddee 2009 (4)	1/8	0/9		0.6 %	0.13 [-0.15, 0.40]
Little 2008 (5)	1/75	0/72		32.5 %	0.01 [-0.02, 0.05]
Yoon 2012 (6)	1/12	0/10		1.0 %	0.08 [-0.13, 0.30]
Total (95% CI)	**238**	**347**		**100.0 %**	**0.01 [-0.01, 0.03]**

Total events: 8 (Massage), 10 (Active control)

Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 3.67$, df = 5 (P = 0.60); $I^2 = 0.0\%$

Test for overall effect: Z = 0.80 (P = 0.43)

Test for subgroup differences: Not applicable

(1) 11% of patients in the accupuncture group and 13% (3/39 massage vs acupuncture and 2/39 massage vs self care) in the massage group reported "significant discomfort or pain" during or shortly after treatment

(2) No adverse events reported for the self care group; 13% (3/39 massage vs acupuncture and 2/39 massage vs self care) in the massage group reported "significant discomfort or pain" during or shortly after treatment

(3) No adverse events were found

(4) One subject in the massage group dropped out because of post-massage soreness

(5) One patient mentioned that their back pain had been made considerably worse by massage. No adverse events were reported for exercise

(6) One patient complained of skin discomfort deep cross-friction massage using the HT-bar. No other side effect was observed

ADDITIONAL TABLES

Table 1. Taxonomy of massage practice (Sherman 2006)

Treatment goal	Relaxation massage	Clinical massage	Movement re-education	Energy work
Intention	Relax muscles, move body fluids, promote wellness	Accomplish specific goals such as releasing muscle spasms	Induce sense of freedom, ease and lightness in body	Hypothesized to free energy blockages
Commonly used styles (examples)	SM, spa massage, sports massage	Myofascial trigger points therapy, myofascial release, strain counterstrain	Proprioceptive, neuromuscular facilitation, strain counterstrain, trager	Acupressure, reiki, polarity, therapeutic touch, tuina
Commonly used techniques (examples)	Gliding, kneading, friction, holding, percussion, vibration	Direct pressure, skin rolling, resistive stretching, stretching manual, cross-fibre-friction	Contract-relax, passive stretching, resistive stretching, rocking	Direction of energy, smoothing, direct pressure, holding, rocking, traction

Abbreviations: SM: Swedish massage.

Table 2. Intervention effects

Intervention		Acute LBP		Sub-acute and chronic LBP	
		Pain	**Function**	**Pain**	**Function**
Massage (M) versus inactive (I) controls	Short-term follow-up	M better than I (SMD -1.24, 95% CI -1.85 to -0.64; 51 participants, 1 trial) "Very low"	M the same as I (SMD -0.50, 95% CI -1.06 to 0.06; 51 participants, 1 trial) "Very low"	M better than I (SMD -0.75, 95% CI -0.90 to -0.60; 761 participants, 9 trials; I^2 statistic = 0%) "Low"	M better than I (SMD -0.72, 95% CI -1.05 to -0.39; 725 participants, 8 trials; I^2 statistic = 74%) "Low"
	Long-term follow-up	No evidence	No evidence	M the same as I (SMD 0.02, 95% CI -0.15 to 0.18; 615 participants, 4 trials; I^2 statistic = 0%) "Very low"	M the same as I (SMD -0.16, 95% CI -0.32 to 0.01; 615 participants. 4 trials; I^2 statistic = 0%) "Very low"
Massage (M) versus active (A) controls	Short-term follow-up	No evidence	No evidence	M better than A (SMD -0.37, 95% CI -0.62 to -0.13; 964 participants. 13 trials; I^2 statistic =	M the same as A (SMD -0.24, 95% CI -0.62 to 0.13; 618 participants, 7 trials; I^2 statistic =

Table 2. Intervention effects (*Continued*)

				68%) "Very low"	79%) "Very low"
	Long-term follow-up	No evidence	No evidence	M better than A (SMD -0.40, 95% CI -0.80 to -0.01; 757 participants = 757, 6 trials; I^2 statistic = 86%) "Very low"	M the same as A (SMD -0.21, 95% CI -0.60 to 0.17; 616 participants = 616, 5 trials; I^2 statistic = 82%) "Very low"

Abbreviations: LBP: low-back pain; **M:** massage; **A:** active controls; **I:** inactive controls.

APPENDICES

Appendix 1. Electronic search strategies

MEDLINE

Last searched July 17, 2014. We revised the search strategy 2013.

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. exp Massage/
27. exp Therapeutic Touch/
28. exp Reflexotherapy/
29. myotherapy.mp.
30. rolfing.mp.
31. shiatsu.mp.
32. exp Acupressure/
33. reflexology.mp.
34. (polarity adj therapy).mp.
35. (myofascial adj release).mp.
36. (craniosacral adj therapy).mp.
37. reiki.mp.
38. (trager adj psychophysical).mp.
39. (hakomi adj method).mp.
40. (jin adj shin).mp.
41. (neuromuscular adj therapy).mp.
42. (pfrimmer adj25 therapy).mp.
43. (alexander adj technique).mp.
44. (feldenkrais adj method).mp.
45. or/26-44
46. massage.mp.
47. exp Heart Massage/
48. 46 not 47
49. 45 or 48
50. 12 and 25 and 49
51. limit 50 to yr=2013-2014
52. limit 50 to ed=20130601-20140717
53. 53 51 or 52

2008 search strategy

1. Clinical Trial.pt.
2. randomized.ab,ti.
3. placebo.ab,ti.
4. dt.fs.
5. randomly.ab,ti.
6. trial.ab,ti.
7. groups.ab,ti.
8. or/1-7
9. Animals/
10. Humans/
11. 9 not (9 and 10)
12. 8 not 11
13. dorsalgia.ti,ab.
14. exp Back Pain/
15. backache.ti,ab.
16. (lumbar adj pain).ti,ab.
17. coccyx.ti,ab.
18. coccydynia.ti,ab.
19. sciatica.ti,ab.
20. sciatica/
21. spondylosis.ti,ab.
22. lumbago.ti,ab.

23. exp low back pain/
24. or/13-23
25. exp Massage/
26. exp Therapeutic Touch/
27. exp Reflexotherapy/
28. myotherapy.mp.
29. rolfing.mp.
30. shiatsu.mp.
31. exp Acupressure/
32. reflexology.mp.
33. (polarity adj therapy).
34. (myofascial adj release).mp.
35. (craniosacral adj therapy).mp.
36. reiki.mp.
37. (trager adj psychophysical).mp
38. (hakomi adj method).mp.
39. (jin adj shin).mp.
40. (neuromuscular adj therapy).mp
41. (pfrimmer adj25 therapy).mp.
42. (alexander adj technique).mp.
43. (feldenkrais adj method).mp
44. or/25-43
45. 12 and 24 and 44
46. limit 45 to yr="2007 - 2008"

MEDLINE In-Process & Other Non-Indexed Citations

Searched July 17, 2014

1. random$.ti,ab.
2. placebo.ti,ab.
3. controlled.ti,ab.
4. prospective.ti,ab.
5. trial.ti,ab.
6. groups.ti,ab.
7. or/1-6
8. dorsalgia.ti,ab.
9. back pain.ti,ab.
10. backache.ti,ab.
11. (lumbar adj pain).ti,ab.
12. coccyx.ti,ab.
13. coccydynia.ti,ab.
14. sciatica.ti,ab.
15. spondylosis.ti,ab.
16. lumbago.ti,ab.
17. back disorder$.ti,ab.
18. or/8-17
19. massage.mp.
20. therapeutic touch.mp.
21. reflexotherapy.mp.
22. myotherapy.mp.
23. rolfing.mp.
24. shiatsu.mp.
25. acupressure.mp.

26. reflexology.mp.
27. (polarity adj therapy).mp.
28. (myofascial adj release).mp.
29. (craniosacral adj therapy).mp.
30. reiki.mp.
31. (trager adj psychophysical).mp.
32. (hakomi adj method).mp.
33. (jin adj shin).mp.
34. (neuromuscular adj therapy).mp.
35. (pfrimmer adj25 therapy).mp.
36. (alexander adj technique).mp.
37. (feldenkrais adj method).mp.
38. or/19-37
39. massage.mp.
40. heart massage.mp.
41. 39 not 40
42. 38 or 41
43. 7 and 18 and 42

EMBASE

Last searched July 17, 2014. We revised the animal studies filter in 2013 and the RCT filter in 2014.

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 or 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 BACKACHE/
40. (lumbar adj pain).mp.
41. coccyx.mp.
42. coccydynia.mp.
43. sciatica.mp.
44. exp ISCHIALGIA/
45. spondylosis.mp.
46. lumbago.mp.
47. exp Low Back Pain/
48. back disorder$.mp.
49. or/37-48
50. exp massage/
51. therapeutic touch.mp.
52. reflexotherapy.mp.
53. exp ROLFING/
54. exp SHIATSU/
55. exp reflexology/
56. myotherapy.mp.
57. (polarity adj therapy).mp.
58. (myofascial adj release).mp.
59. (craniosacral adj therapy).mp.
60. exp REIKI/ (244)
61. (trager adj psychophysical).mp.
62. (hakomi adj method).mp.
63. (jin adj shin).mp.
64. (neuromuscular adj therapy).mp.
65. (pfrimmer adj25 therapy).mp.
66. (alexander adj technique).mp.
67. exp Alexander Technique/
68. (feldenkrais adj method).mp.
69. MASSAGEMETHODEN.mp.
70. MASSAGEINST.mp.
71. MASSAGEBEHANDLUNG.mp.
72. MASSAGEE.mp.
73. MASSAGED.mp.
74. MASSAGE-WERE.mp.
75. MASSAGE-TYPE.mp.
76. MASSAGE-TUINA-THERAPIE.mp.
77. MASSAGE-LIKE.mp.
78. MASSAGE-INDUCED.mp.
79. MASSAGE-ENHANCED.mp.
80. MASSAGE-CONTROL.mp.
81. MASSAGE-CONTINUED.mp.
82. MASSAGE-AND-PRESSURE.mp.
83. or/50-82
84. fascia manipulation.mp.

85. massage.mp.
86. exp heart massage/ or exp carotid sinus massage/
87. 85 not 86
88. 83 or 84 or 87
89. 36 and 49 and 88
90. limit 89 to yr=2013-2014
91. limit 89 to em=201321-201428
92. 90 or 91

2008 search strategy

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. human/
33. Nonhuman/
34. exp ANIMAL/
35. Animal Experiment/
36. 33 or 34 or 35
37. 32 not 36
38. 31 not 36
39. 37 and 38
40. 38 or 39
41. dorsalgia.mp.
42. back pain.mp.
43. exp BACKACHE/
44. (lumbar adj pain).mp.

45. coccyx.mp.
46. coccydynia.mp.
47. sciatica.mp.
48. exp ISCHIALGIA/
49. spondylosis.mp.
50. lumbago.mp.
51. exp Low Back Pain/
52. or/41-51
53. exp massage/
54. therapeutic touch.mp.
55. reflexotherapy.mp.
56. exp ROLFING/
57. exp SHIATSU/
58. exp reflexology/
59. myotherapy.mp.
60. (polarity adj therapy).mp.
61. (myofascial adj release).mp.
62. (craniosacral adj therapy).mp.
63. exp REIKI/
64. (trager adj psychophysical).mp.
65. (hakomi adj method).mp.
66. (jin adj shin).mp.
67. (neuromuscular adj therapy).mp.
68. (pfrimmer adj25 therapy).mp.
69. (alexander adj technique).mp.
70. exp Alexander Technique/
71. (feldenkrais adj method).mp.
72. MASSAGEMETHODEN.mp.
73. MASSAGEINST.mp.
74. MASSAGEBEHANDLUNG.mp.
75. MASSAGEE.mp.
76. MASSAGED.mp.
77. MASSAGE-WERE.mp.
78. MASSAGE-TYPE.mp.
79. MASSAGE-TUINA-THERAPIE.mp.
80. MASSAGE-LIKE.mp.
81. MASSAGE-INDUCED.mp.
82. MASSAGE-ENHANCED.mp.
83. MASSAGE-CONTROL.mp.
84. MASSAGE-CONTINUED.mp.
85. MASSAGE-AND-PRESSURE.mp.
86. or/53-85
87. 40 and 52 and 86
88. limit 87 to yr="2007 - 2008"

CENTRAL

Last searched July 17, 2014
#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: [Massage] this term only
#30 MeSH descriptor: [Therapeutic Touch] explode all trees
#31 MeSH descriptor: [Reflexotherapy] explode all trees
#32 MeSH descriptor: [Acupressure] explode all trees
#33 myotherapy
#34 rolfing
#35 shiatsu
#36 reflexology
#37 “polarity therapy”
#38 “myofascial release”
#39 “craniosacral therapy”
#40 reiki
#41 trager
#42 hakomi
#43 “jin shin”
#44 “neuromuscular therapy”
#45 pfrimmer
#46 “alexander technique”
#47 feldenkrais
#48 “fascia manipulation”
#49 #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43 or #44 or #45 or #46 or #47 or #48
#50 massage
#51 massage:ti,ab,kw (Word variations have been searched)
#52 MeSH descriptor: [Heart Massage] this term only
#53 (cardiac or heart) and massage:ti,ab,kw (Word variations have been searched)
#54 ((#50 or #51) not (#52 or #53))
#55 #49 or #54
#56 #28 and #55

#57 #56 Publication Year from 2013 to 2014, in Trials

CINAHL

Last searched July 17, 2014. The strategy was revised for EBSCO in 2013.
S67 S65 OR S66
S66 S64 and EM 201306-
S65 S64 Limiters - Published Date: 20130601-20140731
S64 S49 AND S63
S63 S59 OR S62
S62 S60 NOT S61
S61 (MH "Heart Massage")
S60 "massage"
S59 S50 OR S51 OR S52 OR S53 OR S54 OR S55 OR S56 OR S57 OR S58
S58 "reflexotherapy"
S57 (MH "Reiki")
S56 (MH "Polarity Therapy")
S55 (MH "Therapeutic Touch")
S54 (MH "Structural-Functional-Movement Integration+")
S53 (MH "Reflexology")
S52 (MH "Myofascial Release")
S51 (MH "Craniosacral Therapy")
S50 (MH "Massage+")
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 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*
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+")

2008 search strategy. The service provider was Ovid.

1. Randomized Controlled Trials.mp.
2. clinical trial.pt.
3. exp Clinical Trials/
4. (clin$ adj25 trial$).tw.
5. ((singl$ or doubl$ or trebl$ or tripl$) adj25 (blind$ or mask$)).tw.
6. exp PLACEBOS/
7. placebo$.tw.
8. random$.tw.
9. exp Study Design/
10. (latin adj square).tw.
11. exp Comparative Studies/
12. exp Evaluation Research/
13. Follow-Up Studies.mp.
14. exp Prospective Studies/
15. (control$ or prospectiv$ or volunteer$).tw.
16. Animals/
17. or/1-15
18. 17 not 16
19. dorsalgia.mp.
20. exp Back Pain/
21. backache.mp.
22. (lumbar adj pain).mp
23. exp COCCYX/
24. exp SCIATICA/
25. coccyx.mp.
26. sciatica.mp.
27. exp Low Back Pain/
28. coccydynia.mp.
29. sciatica.mp. or exp SCIATICA/
30. exp Lumbar Vertebrae/ or exp Spondylolisthesis/ or exp Spondylolysis/
31. lumbago.mp.
32. or/19-31
33. exp MASSAGE/

34. exp Therapeutic Touch/
35. reflexotherapy.mp.
36. exp ROLFING/
37. exp SHIATSU/
38. exp REFLEXOLOGY/
39. myotherapy.mp.
40. (polarity adj therapy).mp.
41. (myofascial adj release).mp.
42. (craniosacral adj therapy).mp.
43. exp REIKI/
44. (trager adj psychophysical).mp.
45. (hakomi adj method).mp.
46. (jin adj shin).mp.
47. (neuromuscular adj therapy).mp.
48. (pfrimmer adj25 therapy).mp.
49. (alexander adj technique).mp.
50. exp Alexander Technique/
51. (feldenkrais adj method).mp.
52. or/33-51
53. 18 and 32 and 52
54. limit 53 to yr="2007 - 2008"

Index to Chiropractic Literature

Last searched July 21, 2014
S1 , Publication Type:Clinical Trial
S2 , Publication Type:Controlled Clinical Trial
S3 , Publication Type:Randomized Controlled Trial
S4 Subject:"Clinical Trials" OR Subject:"Clinical Trials as Topic" OR Subject:"Controlled Clinical Trials"
S5 All Fields:random* OR All Fields:placebo OR All Fields:sham
S6 All Fields:versus OR All Fields:vs
S7 Subject:"Randomized Controlled Trials as Topic" OR Subject:"Prospective Studies" OR Subject:"Comparative Study"
S9 All Fields:double-blind OR All Fields:"double blind"
S10 All Fields:single-blind OR All Fields:"single blind"
S11 All Fields:"Clinical Trial" OR All Fields:"Controlled Trial"
S12 , Publication Type:Clinical Trial OR , Publication Type:Controlled Clinical Trial OR , Publication Type:Randomized Controlled Trial OR Subject:"Clinical Trials" OR Subject:"Clinical Trials as Topic" OR Subject:"Controlled Clinical Trials" OR All Fields:random* OR All Fields:placebo OR All Fields:sham OR All Fields:versus OR All Fields:vs OR Subject:"Randomized Controlled Trials as Topic" OR Subject:"Prospective Studies" OR Subject:"Comparative Study" OR All Fields:double-blind OR All Fields:"double blind" OR All Fields:single-blind OR All Fields:"single blind" OR All Fields:"Clinical Trial" OR All Fields:"Controlled Trial"
S13 Subject:"Back" OR Subject:"Back Injuries" OR Subject:"Back Pain"
S14 Subject:"Low Back Pain" OR Subject:"Lumbar" OR Subject:"Lumbosacral Region"
S15 Subject:"Sciatica" OR All Fields:sciatica OR Subject:"Lumbar Vertebrae"
S16 Subject:"Coccyx" OR Subject:"Sacroiliac Joint" OR Subject:"Sacrum"
S17 Subject:"Back" OR Subject:"Back Injuries" OR Subject:"Back Pain" OR Subject:"Low Back Pain" OR Subject:"Lumbar" OR Subject:"Lumbosacral Region" OR Subject:"Sciatica" OR All Fields:sciatica OR Subject:"Lumbar Vertebrae" OR Subject:"Coccyx" OR Subject:"Sacroiliac Joint" OR Subject:"Sacrum"
S18 All Fields:massage OR Subject:"Massage"
S19 All Fields:"Therapeutic Touch" OR Subject:"Therapeutic Touch"
S20 All Fields:"Craniosacral Therapy" OR Subject:"Craniosacral Therapy"
S21 All Fields:"Myofascial Release" OR All Fields:Reflexology OR All Fields:"Polarity Therapy"
S22 All Fields:reiki OR All Fields:reflexotherapy
S23 All Fields:"acupressure" OR Subject:"Acupressure"

S24 Subject:“Shiatsu” OR All Fields:shiatsu
S25 All Fields:“Alexander Technique” OR All Fields:Feldenkrais OR All Fields:Hellerwork
S26 All Fields:trager OR All Fields:Rolfing
S27 All Fields:hakomi OR All Fields:pfrimmer
S28 All Fields:“fascia manipulation”
S29 All Fields:massage OR Subject:“Massage” OR All Fields:“Therapeutic Touch” OR Subject:“Therapeutic Touch” OR All Fields: “Craniosacral Therapy” OR Subject:“Craniosacral Therapy” OR All Fields:“Myofascial Release” OR All Fields:Reflexology OR All Fields:“Polarity Therapy” OR All Fields:reiki OR All Fields:reflexotherapy OR All Fields:“acupressure” OR Subject:“Acupressure” OR Subject:“Shiatsu” OR All Fields:shiatsu OR All Fields:“Alexander Technique” OR All Fields:Feldenkrais OR All Fields:Hellerwork OR All Fields:trager OR All Fields:Rolfing OR All Fields:hakomi OR All Fields:pfrimmer OR All Fields:“fascia manipulation”
S30 , Publication Type:Clinical Trial OR , Publication Type:Controlled Clinical Trial OR , Publication Type:Randomized Controlled Trial OR Subject:“Clinical Trials” OR Subject:“Clinical Trials as Topic” OR Subject:“Controlled Clinical Trials” OR All Fields:random* OR All Fields:placebo OR All Fields:sham OR All Fields:versus OR All Fields:vs OR Subject:“Randomized Controlled Trials as Topic” OR Subject:“Prospective Studies” OR Subject:“Comparative Study” OR All Fields:double-blind OR All Fields:“double blind” OR All Fields:single-blind OR All Fields:“single blind” OR All Fields:“Clinical Trial” OR All Fields:“Controlled Trial” AND Subject:“Back” OR Subject:“Back Injuries” OR Subject:“Back Pain” OR Subject:“Low Back Pain” OR Subject:“Lumbar” OR Subject:“Lumbosacral Region” OR Subject:“Sciatica” OR All Fields:sciatica OR Subject:“Lumbar Vertebrae” OR Subject:“Coccyx” OR Subject:“Sacroiliac Joint” OR Subject:“Sacrum” AND All Fields:massage OR Subject:“Massage” OR All Fields:“Therapeutic Touch” OR Subject:“Therapeutic Touch” OR All Fields:“Craniosacral Therapy” OR Subject:“Craniosacral Therapy” OR All Fields:“Myofascial Release” OR All Fields: Reflexology OR All Fields:“Polarity Therapy” OR All Fields:reiki OR All Fields:reflexotherapy OR All Fields:“acupressure” OR Subject: “Acupressure” OR Subject:“Shiatsu” OR All Fields:shiatsu OR All Fields:“Alexander Technique” OR All Fields:Feldenkrais OR All Fields:Hellerwork OR All Fields:trager OR All Fields:Rolfing OR All Fields:hakomi OR All Fields:pfrimmer OR All Fields:“fascia manipulation”
S31 , Year: from 2013 to 2014
S32 , Publication Type:Clinical Trial OR , Publication Type:Controlled Clinical Trial OR , Publication Type:Randomized Controlled Trial OR Subject:“Clinical Trials” OR Subject:“Clinical Trials as Topic” OR Subject:“Controlled Clinical Trials” OR All Fields:random* OR All Fields:placebo OR All Fields:sham OR All Fields:versus OR All Fields:vs OR Subject:“Randomized Controlled Trials as Topic” OR Subject:“Prospective Studies” OR Subject:“Comparative Study” OR All Fields:double-blind OR All Fields:“double blind” OR All Fields:single-blind OR All Fields:“single blind” OR All Fields:“Clinical Trial” OR All Fields:“Controlled Trial” AND Subject:“Back” OR Subject:“Back Injuries” OR Subject:“Back Pain” OR Subject:“Low Back Pain” OR Subject:“Lumbar” OR Subject:“Lumbosacral Region” OR Subject:“Sciatica” OR All Fields:sciatica OR Subject:“Lumbar Vertebrae” OR Subject:“Coccyx” OR Subject:“Sacroiliac Joint” OR Subject:“Sacrum” AND All Fields:massage OR Subject:“Massage” OR All Fields:“Therapeutic Touch” OR Subject:“Therapeutic Touch” OR All Fields:“Craniosacral Therapy” OR Subject:“Craniosacral Therapy” OR All Fields:“Myofascial Release” OR All Fields: Reflexology OR All Fields:“Polarity Therapy” OR All Fields:reiki OR All Fields:reflexotherapy OR All Fields:“acupressure” OR Subject: “Acupressure” OR Subject:“Shiatsu” OR All Fields:shiatsu OR All Fields:“Alexander Technique” OR All Fields:Feldenkrais OR All Fields:Hellerwork OR All Fields:trager OR All Fields:Rolfing OR All Fields:hakomi OR All Fields:pfrimmer OR All Fields:“fascia manipulation” AND , Year: from 2013 to 2014

LILACS

Last searched July 17, 2014
(“back pain” or “low back pain” or “Dolor de Espalda” or “Dor nas Costas” or backache or dorsalgia or Lumbosacra$ or Lombossacral or Sciatic$ or Ciática or Spondylosis or Espondilosis or Espondilose or Lumbalgia or Lumbociatica or “Dolor lumbosacro” or “dolor lumbo sacro” or “sacrolumbalgia” or ciatica or “dolor bajo de espalda” or Lombalgia or Lombalgias or “Dores nas costas” or “Dor lombar” or “Dores lombares” or “Dor ciática” or “Dor do nervo ciático” or Espondilolistese) AND (Massage or Masaje or Massagem or Reflexolog$ or “Zone Therapy” or “Therapeutic Touch” or “Tacto Terapéutico” or “Toque Terapêutico” or Reflexotherapy or Reflejoterapia or Reflexoterapia or Myotherapy or rolfing or shiatsu or shiatzu or “Chih Ya” or “Zhi Ya” or Acupressure or Acupresión or Acupressão or “polarity therapy” or “myofascial release” or “craniosacral therapy” “terapia cranio sacra” or reiki or “trager psychophysical” or hakomi method” or “método hakomi” or “pfrimmer therapy” or “terapia pfrimmer” or “alexander technique” or “técnica Alexander” or “feldenkrais method” or “método feldenkrais” or “jin shin” or “neuromuscular therapy” or “fascia manipulation” or “Manipulação fascial” or mioterapia or “liberación miofascial” or “terapia neuromuscular” or “manipulacion fascial” or “terapia tuina” or “masaje tuina” or “terapia polaridad”) , limited to 2013-2014

- using iAH form, searching Words field

Proquest Dissertation Abstracts

Last searched July 17, 2014, through Proquest aggregated databases (which included Dissertation Abstracts). We searched the database directly in 2013 and used the same strategy without any limits.
all ((dorsalgia OR "Back Pain" OR "backache" OR (lumbar NEAR/3 pain) OR coccyx OR coccydynia OR sciatic* OR spondylosis OR lumbago OR "low back pain" OR "back disorder*")) AND all((Massage OR "Therapeutic Touch" OR Reflexotherapy OR cryotherapy OR rolfing OR shiat?u OR Acupressure OR reflexology OR "polarity therapy" OR "myofascial release" OR "craniosacral therapy" OR reiki OR "trager psychophysical" OR "hakomi method" OR "jin shin" OR "neuromuscular therapy" OR "pfrimmer therapy" OR "alexander technique" OR feldenkrais OR "neuromuscular therapy" OR "fascia manipulation"))

- Limit to Dissertations & Theses and Conference Papers & Proceedings
- ALL field = Anywhere except full-text

Pubmed

Last searched August 7, 2014
((back pain[Title/Abstract]) AND massage[Title/Abstract]) AND ("2013/07/01"[Date - Publication] : "3000"[Date - Publication]) NOT MEDLINE[sb]

Appendix 2. 'Risk of bias' criteria

Random sequence generation (selection bias)

Selection bias (biased allocation to interventions) due to inadequate generation of a randomize**d sequence**
There is a low risk of selection bias if the investigators describe a random component in the sequence generation process such as: referring to a random number table, using a computer random number generator, coin tossing, shuffling cards or envelopes, throwing dice, drawing of lots, minimization (minimization may be implemented without a random element, and this is considered to be equivalent to being random).
There is a high risk of selection bia*s* if the investigators describe a non-random component in the sequence generation process, such as: sequence generated by odd or even date of birth, date (or day) of admission, hospital or clinic record number; or allocation by judgement of the clinician, preference of the participant, results of a laboratory test or a series of tests, or availability of the intervention.

Allocation concealment (selection bias)

Selection bias (biased allocation to interventions) due to inadequate concealment of allocations prior to assignment
There is a low risk of selection bias if the participants and investigators enrolling participants could not foresee assignment because one of the following, or an equivalent method, was used to conceal allocation: central allocation (including telephone, web-based and pharmacy-controlled randomization); sequentially-numbered drug containers of identical appearance; or sequentially-numbered, opaque, sealed envelopes.
There is a high risk of bias if participants or investigators enrolling participants could possibly foresee assignments and thus introduce selection bias, such as allocation based on: using an open random allocation schedule (e.g. a list of random numbers); assignment envelopes were used without appropriate safeguards (e.g. if envelopes were unsealed or non-opaque or not sequentially numbered); alternation or rotation; date of birth; case record number; or other explicitly unconcealed procedures.

Blinding of participants

Performance bias due to knowledge of the allocated interventions by participants during the study
There is a low risk of performance bias if blinding of participants was ensured and it was unlikely that the blinding could have been broken; or if there was no blinding or incomplete blinding, but the review authors judge that the outcome is not likely to be influenced by lack of blinding.

Blinding of personnel/care providers (performance bias)

Performance bias due to knowledge of the allocated interventions by personnel/care providers during the study

There is a low risk of performance bias if blinding of personnel was ensured and it was unlikely that the blinding could have been broken; or if there was no blinding or incomplete blinding, but the review authors judge that the outcome is not likely to be influenced by lack of blinding.

Blinding of outcome assessor (detection bias)

Detection bias due to knowledge of the allocated interventions by outcome assessors

There is low risk of detection bias if the blinding of the outcome assessment was ensured and it was unlikely that the blinding could have been broken; or if there was no blinding or incomplete blinding, but the review authors judge that the outcome is not likely to be influenced by lack of blinding, or:

- for patient-reported outcomes in which the patient was the outcome assessor (e.g. pain, disability): there is a low risk of bias for outcome assessors if there is a low risk of bias for participant blinding (Boutron 2005)
- for outcome criteria that are clinical or therapeutic events that will be determined by the interaction between patients and care providers (e.g. co-interventions, length of hospitalisation, treatment failure), in which the care provider is the outcome assessor: there is a low risk of bias for outcome assessors if there is a low risk of bias for care providers (Boutron 2005)
- for outcome criteria that are assessed from data from medical forms: there is a low risk of bias if the treatment or adverse effects of the treatment could not be noticed in the extracted data (Boutron 2005)

Incomplete outcome data (attrition bias)

Attrition bias due to amount, nature or handling of incomplete outcome data

There is a low risk of attrition bias if: there were no missing outcome data; reasons for missing outcome data were unlikely to be related to the true outcome (for survival data, censoring unlikely to be introducing bias); missing outcome data were balanced in numbers, with similar reasons for missing data across groups; for dichotomous outcome data, the proportion of missing outcomes compared with the observed event risk was not enough to have a clinically-relevant impact on the intervention effect estimate; for continuous outcome data, the plausible effect size (difference in means or standardized difference in means) among missing outcomes was not enough to have a clinically-relevant impact on observed effect size, or missing data were imputed using appropriate methods (if drop-outs are very large, imputation using even 'acceptable' methods may still suggest a high risk of bias) (van Tulder 2003). The percentage of withdrawals and drop-outs should not exceed 20% for short-term follow-up and 30% for long-term follow-up and should not lead to substantial bias (these percentages are commonly used but arbitrary, not supported by literature) (van Tulder 2003).

Selective reporting (reporting bias)

Reporting bias due to selective outcome reporting

There is a low risk of reporting bias if the study protocol is available and all of the study's pre-specified (primary and secondary) outcomes that are of interest in the review have been reported in the pre-specified way, or if the study protocol is not available but it is clear that the published reports include all expected outcomes, including those that were pre-specified (convincing text of this nature may be uncommon).

There is a high risk of reporting bias if not all of the study's pre-specified primary outcomes have been reported; one or more primary outcomes is reported using measurements, analysis methods or subsets of the data (e.g. subscales) that were not pre-specified; one or more reported primary outcomes were not pre-specified (unless clear justification for their reporting is provided, such as an unexpected adverse effect); one or more outcomes of interest in the review are reported incompletely so that they cannot be entered in a meta-analysis; the study report fails to include results for a key outcome that would be expected to have been reported for such a study.

Group similarity at baseline (selection bias)

Bias due to dissimilarity at baseline for the most important prognostic indicators.

There is low risk of bia*s* if groups are similar at baseline for demographic factors, value of main outcome measure(s), and important prognostic factors (examples in the field of back and neck pain are duration and severity of complaints, vocational status, percentage of patients with neurological symptoms) (van Tulder 2003).

Co-interventions (performance bias)

Bias because co-interventions were different across groups

There is low risk of bias if there were no co-interventions or they were similar between the index and control groups (van Tulder 2003).

Compliance (performance bias)

Bias due to inappropriate compliance with interventions across groups

There is low risk of bias if compliance with the interventions was acceptable, based on the reported intensity/dosage, duration, number and frequency for both the index and control intervention(s). For single-session interventions (e.g. surgery), this item is irrelevant (van Tulder 2003).

Intention-to-treat analysis

There is low risk of bias if all randomized patients were reported/analyzed in the group to which they were allocated by randomization.

Timing of outcome assessments (detection bias)

Bias because important outcomes were not measured at the same time across groups

There is low risk of bias if all important outcome assessments for all intervention groups were measured at the same time (van Tulder 2003).

Other bias

Bias due to problems not covered elsewhere in the table

There is a low risk of bias if the study appears to be free of other sources of bias not addressed elsewhere (e.g. study funding).

Appendix 3. GRADE approach to evidence synthesis

1. Study design

In this review we only included RCTs.

2. Risk of bias

Limitations in the study design and implementation may bias the estimates of the treatment effect. Our confidence in the estimate of the effect and in the following recommendation decreases if studies suffer from major limitations. We examined all studies on five types of biases: selection, performance, detection, attrition and selective reporting bias.

The overall risk of bias for each study was used in the GRADE synthesis. When we judged all studies to be at "low risk of bias" for all five types of categories, we did not downgrade the evidence. The evidence was downgraded as follows:

- by one level when < three categories were judged to be at either "high" or "unclear" risk of bias.
- by two levels when four or more categories were judged to be at either "high" or "unclear" risk of bias.

3. Inconsistency

Inconsistency refers to an unexplained heterogeneity of results. Widely differing estimates of the **treatment effect** (i.e. heterogeneity or variability in results) across studies suggest true differences in underlying treatment effect. Inconsistency may arise from differences in: **populations** (e.g. drugs may have larger relative effects in sicker populations), **interventions** (e.g. larger effects with higher drug doses), or **outcomes** (e.g. diminishing treatment effect with time). This item does not apply when there is only one study. We downgraded the quality of evidence as follows:

- by one level: when the heterogeneity or variability in results was large (e.g. I^2 statistic > 80%)
- by two levels: when the heterogeneity or variability in results was large and there was inconsistency arising from populations, interventions or outcomes.

4. Indirectness

Indirect population, intervention, comparator, or outcome - the question being addressed in this systematic review is different from the available evidence regarding the population, intervention, comparator or an outcome in the included RCT. The quality of evidence was downgraded as follows:

- by one level: when there was indirectness in only one area.
- by two levels: when there was indirectness in two or more areas.

5. Imprecision

Results are imprecise when studies include relatively few patients and few events and thus have wide CIs around the estimate of the effect. In this case we judged the quality of the evidence lower than it otherwise would because of resulting uncertainty in the results. Each outcome is considered separately.

Dichotomous outcomes

We considered imprecision for either of the following two reasons:

1. There is only one study. When there is > one study, the total number of events is < 300 (a threshold rule-of-thumb value) (Mueller 2007)
2. 95% CI around the pooled or best estimate of effect includes both 1) no effect and 2) appreciable benefit or appreciable harm. The threshold for "appreciable benefit" or "appreciable harm" is a relative risk reduction (RRR) or relative risk increase (RRI) greater than 25%.

We downgraded the quality of the evidence as follows:

- by one level: when there was imprecision due to (1) or (2).
- by two levels: when there was imprecision due to (1) and (2).

For continuous outcomes

We considered imprecision for either of the following two reasons:

1. There is only one study. When there is > one study, total population size is < 400 (a threshold rule-of-thumb value; using the usual α and β, and an effect size of 0.2 SD, representing a small effect)
2. 95% CI includes no effect and the upper or lower confidence limit crosses an effect size (SMD) of 0.5 in either direction.

We downgraded the quality of the evidence as follows:

- by one level: when there was imprecision due to (1) or (2).
- by two levels: when there was imprecision due to (1) and (2).

6. Publication bias

Publication bias is a systematic underestimate or an overestimate of the underlying beneficial or harmful effect due to the selective publication of studies. The quality of evidence was downgraded as follows:

- by one level: when the funnel plot suggested publication bias.

WHAT'S NEW

Last assessed as up-to-date: 17 July 2014.

Date	Event	Description
25 August 2015	New citation required and conclusions have changed	We included 12 new trials in this review update. In this review update we grouped the comparison groups to yield more meaningful comparisons. Massage was compared to active and inactive controls. More sources of bias were identified, lowering the quality of the evidence
17 July 2014	New search has been performed	We updated the literature search and revised the search strategies. There were no language restrictions. We included MEDLINE In-Process & Other Non-Indexed Citations, Index to Chiropractic Literature, Proquest Dissertation Abstracts, LILACS, and PubMed as new databases. Comparison groups have been combined into active and inactive controls
2 December 2009	New search has been performed	The literature search was updated. We identified eight additional trials: we included two (Little 2008; Quinn 2008), and excluded six (Buerger 1980; Li 2006; Rasmussen-Barr 2003; Wu 2004; Zhang 2004). The conclusions did not change.
11 July 2008	Amended	We converted to a new review format.
31 May 2008	New search has been performed	We updated the literature search.

HISTORY

Protocol first published: Issue 1, 2000

Review first published: Issue 4, 2000

Date	Event	Description
31 January 2002	New citation required and conclusions have changed	This first update included four recent trials that were published since the original review. The conclusions changed in face of the new evidence.
31 January 2002	New search has been performed	literature search updated

CONTRIBUTIONS OF AUTHORS

MG and AB selected the studies for this updated review. AF, EI, and MI selected and appraised the studies for the previous reviews.

MG, AB and AF performed 'Risk of bias' assessments and extracted data for this updated review.

AF and MG wrote the final manuscript draft.

MI, AB and EI reviewed and edited the final manuscript draft.

DECLARATIONS OF INTEREST

None of the authors has made or is involved in a clinical study which fulfills the inclusion criteria of this review. Amanda Baskwill is a registered massage therapist in Ontario. No funds from external sources were received to conduct this Cochrane Review.

SOURCES OF SUPPORT

Internal sources

- Institute for Work & Health, Canada.

External sources

- Canadian Institutes for Health Research (CIHR), Canada.

Andrea Furlan received a CIHR New Investigator Award (2012-2017)

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

In the previous versions of this Cochrane Review there were five primary outcomes: pain, overall improvement, back-specific functional status, well being and disability (Furlan 2000; Furlan 2002; Furlan 2008). In this review update, we included only three primary outcomes: pain, functional status and adverse events. We listed the other outcomes as secondary outcomes.

In the previous review versions the types of included studies were published and unpublished reports of completed RCTs, quasi-RCTs, and controlled clinical trials (CCTs) with no language restrictions (Furlan 2000; Furlan 2002; Furlan 2008). We included abstracts of ongoing studies. In the current review version we included only published RCTs.

In the previous versions of this review the comparisons consisted of the following: 1) Massage versus inert treatment; 2a) Massage versus spinal manipulation or joint mobilization; 2b) Massage versus exercise; 2c) Massage versus relaxation therapy; 2d) Massage versus acupuncture; 2e) massage versus self-care education; 2f) acupuncture massage versus physiotherapy; 3) massage as a component of a combined therapy versus other treatments without massage; 4) different techniques of massage (Furlan 2000; Furlan 2002; Furlan 2008). In this review update we grouped the comparison groups as follows: 1) massage versus inactive controls for acute LBP; 2) massage versus inactive controls for sub-acute and chronic LBP; 3) massage versus active controls for acute LBP; and 4) massage versus active controls for sub-acute and chronic LBP.

INDEX TERMS

Medical Subject Headings (MeSH)

Acute Pain [therapy]; Bias; Chronic Pain [therapy]; Low Back Pain [*therapy]; Manipulation, Spinal; Massage [*adverse effects; methods]; Randomized Controlled Trials as Topic

MeSH check words

Adult; Humans