

Massage for Low-back Pain: A Systematic Review within the Framework of the Cochrane Collaboration Back Review Group

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Background. Low back pain (LBP) is one of the most common and costly musculoskeletal problems in modern society. Proponents of massage therapy claim it can minimize pain and disability and speed return-to-normal function.

Objectives. To assess the effects of massage therapy for nonspecific LBP.

Search Strategy. We searched MEDLINE, Embase, *Cochrane Controlled Trials Register*, HealthSTAR, CINAHL, and dissertation abstracts through May 2001 with no language restrictions. References in the included studies and in reviews of the literature were screened. Contact with content experts and massage associations was also made.

Selection Criteria. The studies had to be randomized or quasirandomized trials investigating the use of any type of massage (using the hands or a mechanical device) as a treatment for nonspecific LBP.

Data Collection and Analysis. Two reviewers blinded to authors, journals, and institutions selected the studies, assessed the methodologic quality using the criteria recommended by the Cochrane Collaboration Back Review Group, and extracted the data using standardized forms. The studies were analyzed in a qualitative way because of heterogeneity of population, massage technique, comparison groups, timing, and type of outcome measured.

Results. Nine publications reporting on eight randomized trials were included. Three had low and five had high methodologic quality scores. One study was published in German, and the rest, in English. Massage was compared with an inert treatment (sham laser) in one study that showed that massage was superior, especially if given in combination with exercises and education. In the other seven studies, massage was compared with different active treatments. They showed that massage was inferior to manipulation and transcutaneous electrical nerve stimulation; massage was equal to corsets and exercises; and massage was superior to relaxation therapy, acupuncture, and self-care education. The beneficial effects of massage in patients with chronic LBP lasted at least 1 year after the end of the treatment. One study comparing two different techniques of massage concluded in favor of acupuncture massage over classic (Swedish) massage.

Conclusions. Massage might be beneficial for patients with subacute and chronic nonspecific LBP, especially when combined with exercises and education. The evidence suggests that acupuncture massage is more effective than classic massage, but this needs confirmation. More studies are needed to confirm these conclusions, to assess the effect of massage on return-to-work, and to measure longer term effects to determine cost-effectiveness of massage as an intervention for LBP. **[Key words:** systematic review, low back pain, massage, efficacy, effectiveness, Cochrane Collaboration] **Spine 2002;27:1896-1910**

Low back pain (LBP) is a major health problem in modern society. Seventy percent to 85% of the population will experience LBP at some time in their lives.² Each year, 5% to 10% of the workforce is off work because of their LBP, most of them for less than 7 days. Almost 90% of all patients with acute LBP get better quite rapidly, regardless of therapy. The remaining 10% are at risk of developing chronic pain and disability and account for more than 90% of social costs for back incapacity.³⁷

Although LBP is a benign and self-limiting condition, many patients look for some type of therapy to relieve their symptoms and to provide them with hope for a cure. For this reason, it is possible to list more than 50 potential therapies promising to relieve the pain, lessen the suffering, and offer a cure for this problem. However, there is sound evidence for only a minority of these therapies.³⁵

When an individual experiences pain or discomfort, the natural reaction is to rub or hold the affected area to reduce the sensation. The English word “massage” is derived from the Arabic word “mass’h,” which means to press gently. At its most basic, massage is a simple way of easing pain, while at the same time aiding relaxation and promoting a feeling of well-being and a sense of receiving good care. Soft tissue massage is thought to improve physiologic and clinical outcomes by offering the symptomatic relief of pain through physical and mental relaxation and increasing the pain threshold through the release of endorphins.⁷ The gate-control theory predicts that massaging a particular area stimulates large-diameter nerve fibers. These fibers have an inhibitory input onto T-cells (which within the spinal cord are the first cells that project into the central nervous system). T-cell activity is depressed (whereas, conversely, small-diameter nerve fibers [nociceptive fibers] have an excitatory input), and pain relief follows.²⁹

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The use of massage for LBP is very popular. In Eastern cultures, massage is believed to have powerful analgesic effects, particularly if applied to acupuncture points, a technique known as acupressure. In 1998 and 1999, almost 17% of the Canadian population aged 18 or older reported having sought the care of alternative health care practitioners in the previous year. These included chiropractors, massage therapists, acupuncturists, homeopaths, and naturopaths. The most common indication was chronic pain, including back problems.³³ In 1998, Wainapel et al³⁸ surveyed an urban rehabilitation medicine outpatient office in New York addressing the use of alternative therapy and its perceived effectiveness. The results indicated that 29% of the patients used one or more alternative medical therapies in the past 12 months, and the most common therapy cited was massage. Musculoskeletal pain syndromes involving the spine and extremities were the most commonly reported problems. Fifty-three percent of the patients who used alternative treatments reported some degree of effectiveness.

Massage is recognized as a safe therapeutic modality, without risks or adverse effects. However, there are contraindications, such as applying massage over an area with acute inflammation, skin infection, nonconsolidated fracture, burn area, deep vein thrombosis, or active cancer tumor.³⁶

Massage has been investigated in the pain management area for its efficacy in relieving headaches,¹⁷ post-exercise muscle pain,³⁹ cancer pain,⁴⁰ and mechanical neck pain.¹³ These studies show little or no effect of massage in relieving these pain conditions. Two systematic reviews assessed the effects of massage for LBP^{7,10} and concluded that there was insufficient evidence about the effects of massage. But these reviews are out of date because of more recently published trials. Therefore, there is a need for an updated review on this topic.

■ Objectives

The main objective of this review was to update our previously published Cochrane systematic review to assess the effectiveness of massage therapy in patients with nonspecific LBP compared with:

- 1) Sham or placebo massage (explanatory trials)
- 2) Other medical treatments (pragmatic trials)
- 3) No treatment

Secondary objectives were to compare the addition of massage to other treatments and to assess the effectiveness of different techniques of massage.

■ Criteria for Considering Studies for This Review

Types of Studies

Published and unpublished reports of completed randomized controlled trials, quasirandomized trials, and controlled clinical trials with no language restrictions were included. Abstracts of ongoing studies were included.

Types of Participants

Adults (> 18 years) with acute (< 4 weeks), subacute (4–12 weeks), or chronic (>12 weeks) nonspecific LBP were included.¹ Low back pain was defined as pain localized from the costal margin or 12th rib to the inferior gluteal fold. “Nonspecific” meant that no specific cause was detectable, such as infection, neoplasm, metastasis, osteoporosis, rheumatoid arthritis, fracture, inflammatory process, or radicular syndrome. Randomized controlled trials that included patients with specific causes of LBP were excluded.

Types of Interventions

Massage in this review was defined as soft tissue manipulation using the hands or a mechanical device. Examples of soft tissue massage are Shiatsu, rolfing (soft tissue manipulation), Swedish massage, reflexology, myofascial release, and craniosacral therapy. Massage can be applied to any body part, to the lumbar region only, or to the whole body. Any technique can be used: Cyriax, effleurage, pétrissage, friction, kneading, or hacking. 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 use massage as the only intervention. In this review, we analyzed massage alone because it is difficult to reach definitive conclusions when multiple treatments are involved, unless the effects of massage could be extracted separately from the other interventions.

Types of Outcome Measures

Trials were included that used at least one of the four primary outcome measures

- Pain
- Return-to-work or work status
- Subjective change of symptoms
- Functional status expressed by validated instruments, such as the Roland Morris Disability Questionnaire, McGill Pain Questionnaire, SF-36 (the MOS 36-item short-form survey), or the Oswestry Disability Index

Physical examination measures such as range of motion, spinal flexibility, degrees of straight leg raising, or muscle strength were considered secondary outcomes. They were extracted only if no primary outcomes were available because they correlate poorly with the clinical status of the patient.⁶

The timing of the outcome measurements were divided into two categories: 1) short-term: when the outcome assessment was taken at the end of the intervention period; and 2) long-term: when the outcome assessment was taken more than 3 months after randomization.³⁴

Search Strategy for Identification of Studies

The following databases were searched:

- *Index Medicus* through MEDLINE from 1966 to May 2001 using OVID 3.0 (Appendix 1)

- HealthSTAR from 1991 to May 2001 using OVID 3.0 (Appendix 1)
- CINAHL from 1982 to May 2001 using OVID 3.0 (Appendix 1)
- *Excerpta Medica* through EMBASE from 1980 to May 2001 using Silver Platter 3.10 (Appendix 2)
- Dissertation abstracts from 1861 to May 1999 using Silver Platter 3.10
- The *Cochrane Controlled Trials Register* in the Cochrane Library, Issue 2, 2001
- Contact with experts, including the American Massage Therapy Association, the Touch Research Institute (USA), Fundacion Kovacs (Spain), the National Center for Complementary and Alternative Medicine from the National Institutes of Health (USA), the National Association of Nurse Massage Therapists (USA), the Rolf Institute (USA), and the Ontario Massage Therapist Association
- Hand search of reference lists in review articles, guidelines, and retrieved trials
- Contact with experts in the field of spine disorders, including the Editorial Board of the Cochrane Collaboration Back Review Group and the Cochrane Complementary Medicine Field

The search strategy recommended by the Cochrane Collaboration Back Review Group³⁴ was used to find controlled trials for spinal diseases. The search strategies were reviewed and conducted by an experienced librarian (E.I.).

Methods of Review

Selection of Papers. One reviewer (E.I.) conducted the electronic searches in MEDLINE, HealthSTAR, CINAHL, and Embase. The results were merged using Reference Manager 9.5, and duplicates were manually removed. Two reviewers (L.B., M.I.), blinded to authors, journal, and institutions, applied the inclusion criteria described above. A third reviewer (A.D.F.) verified the included trials and conducted the searches in dissertation abstracts and the *Cochrane Controlled Trials Register* and contacted experts in the field. For articles written in languages other than English, we sought help from the Cochrane Collaboration Back Review Group to translate and extract the data.

Methodologic Quality. For the selected articles, two reviewers (L.B., M.I.), blinded to authors, institutions, and journals, assessed the methodologic quality of each paper. In the case of disagreement, reviewers tried to reach consensus, and if necessary, a third reviewer (A.D.F.) helped to solve disagreements. The methodologic quality of the articles was assessed using the criteria recommended in the method guidelines for systematic reviews in the Cochrane Collaboration Back Review Group³⁴ (Appendix 3). Only the 10 items reflecting the internal

validity of randomized controlled trials were used to assess the methodologic quality. Each criterion was scored as “yes,” “no,” or “don’t know.” A randomized controlled trial was considered to be of higher quality if more than 50% of the internal validity items scored positively, *i.e.*, scores of 6, 7, 8, 9, or 10 out of 10 or scores of 5, 6, 7, or 8 out of 8 when blinding was not possible. In our previous review,¹⁰ a sensitivity analysis changing the threshold to 40% and 60% showed no important difference; therefore, we chose to continue to use the 50% cutoff point.

Data Extraction. Two reviewers (L.B., M.I.), blinded to authors, institutions, and journals, extracted the data from each trial using a standardized form. A third reviewer (A.D.F.) checked the data extracted from each article. The following data were extracted from each single study, in addition to the data extracted for the methodologic quality assessment: methods of patient recruitment, age of patients, country, number of patients included in each arm, length of LBP episode, causes of LBP, previous treatments for LBP (including surgery), types of interventions, number of sessions, types of outcomes measures, timing of outcome assessment, statistical analyses, and the author’s conclusions about the effectiveness of the interventions.

Data Analysis. Statistical pooling was considered in this updated review, but it was not appropriate because of differences among comparison groups, use of different outcome measures, and insufficient data reported. A qualitative analysis was performed considering the methodologic quality scores and using the best-evidence synthesis originally developed for the US Agency for Healthcare Research and Quality guidelines for acute LBP, then the US Agency for Health Care Policy and Research,³ and adapted by Van Tulder et al³⁵ in a review of conservative therapies for acute and chronic LBP.

- **Level 1.** Strong research-based evidence—provided by consistent findings in multiple relevant high-quality studies.
- **Level 2.** Moderate research-based evidence—consistent findings in at least one high-quality study or multiple low-quality studies
- **Level 3.** Limited evidence—consistent findings in one or more low-quality randomized controlled trials
- **Level 4.** No evidence—no randomized controlled trials or results that were conflicting

A subgroup analysis between acute, subacute, and chronic conditions and between high- and low-quality papers was not possible because of the paucity of data.

Description of Studies

In our previous review, we had identified five publications reporting on four trials in which massage was the control group for other therapeutic interventions. In these five publications, the main interventions were spi-

nal manipulation^{12,15,16,31} and transcutaneous electrical nerve stimulation (TENS).²⁸ The publications by Hsieh et al¹⁶ and Pope et al³¹ reported on the same clinical trial; therefore, in this review, it is considered to be one study. For this updated review, we identified four additional randomized controlled trials^{5,9,14,32} that were published after our previous review. These four recent trials studied massage as one of the main therapeutic interventions.

Of the eight studies, four were conducted in the United States (466 patients),^{5,14-16,31} three in Canada (235 patients),^{12,28,32} and one in Germany (190 patients).⁹ The studies conducted in the United States and in Canada were published in English, and the study conducted in Germany was published in German.

The population included in the studies was similar regarding the diagnosis, which was nonspecific LBP, but it differed with respect to duration of pain, previous treatments, and distributions of age. One study¹² was limited to patients with acute pain (< 14 days' duration), two studies^{16,31,32} included patients with subacute and chronic pain, and four studies^{5,9,14,28} were limited to patients with chronic pain. In one study,¹⁵ the duration of pain was not clear.

The types of massage technique, duration, and frequency of treatments varied among the studies. In two studies,^{9,28} massage was applied using a mechanical device, whereas in the remaining studies it was done with the hands. In one study,⁹ two distinct techniques were compared: acupuncture massage and classic massage.

With respect to the outcome measures, pain intensity was used in all of the studies. Three studies^{14,28,32} also included other dimensions of pain, *i.e.*, pain characteristics/quality. Five studies^{5,9,12,16,31,32} assessed function/disability. Return-to-work was not assessed in any of the studies, and costs were reported in only two studies.^{5,32} The timing of outcome measures varied from "immediately after the end of sessions" to 52 weeks after randomization. Most of the studies included only short-term follow-up.

Details about each included trial are given in Table 1. Many controlled trials studied massage associated with other therapies.^{8,11,18-27,41} Although it is very common for massage to be used as an adjunct treatment for other physical treatments, these trials were not included in this review because the effect of massage could not be extracted separately.

Methodologic Quality of Included Studies

The agreement between the two reviewers (L.B., M.I.) regarding the methodologic quality of the trials was good, as indicated by a kappa statistic of 0.62.

Two publications reporting on the same study received different quality scores. The article by Hsieh et al¹⁶ achieved 4 of 8 points (low-quality score), whereas the article by Pope et al³¹ achieved 5 of 8 points (high-quality score). Although the scores were different, when

we refer to this study in this review, we consider it as one study having a high score.

The maximum quality score that any of the articles could achieve was 8, because blinding of patients and therapists was not feasible. The scores ranged from 2 to 8, with an average of 5.2. Three studies scored low, and five scored high according to the Van Tulder et al³⁴ criteria. Three of the four recent trials included in this update were rated as high quality. Two of the most recent trials achieved the maximum quality score of 8.

All eight studies were described as randomized; however, the method of randomization was explicit in only five studies. None of the studies were described as double-blinded (patient or therapist); six studies blinded the outcome assessors for secondary measures such as range of motion. The dropout rate and losses to follow-up in the data analyzed were acceptable in five studies. Five studies conducted an intention-to-treat analysis. A major problem with the studies was with respect to the timing of the outcome measures. In five studies, the outcome measures were taken during the course of the treatment or immediately after the end of the session. Only three studies included a follow-up visit; of these, two had a visit very shortly after the end of treatment (Hoehler et al,¹⁵ 3 weeks; Preyde,³² 1 month), and one study had two follow-up visits after the end of the study (Cherkin et al,⁵ 10 weeks and 52 weeks after randomization). The long-term follow-up visit is particularly important in studies with chronic pain conditions because of the nature and course of this disorder.

For more details about the scoring of each article see Table 2.

■ Results

The studies compared massage therapy with various control treatments. Only one study used an inert (placebo or sham) control group,³² whereas the others compared massage with various active treatments. One study compared two different techniques of massage.⁹ The comparisons are described below.

Massage Versus Inert Treatment (Placebo, Waiting List, or no Treatment)

One study³² showed that massage alone was significantly better than sham laser in measurements of function on both short- and long-term and on measurements of pain (short-term only) but not on measurements of quality of pain.

Massage Versus Other Active Treatments

Comparison Between Massage and Spinal Manipulation. In the study by Godfrey et al¹² (low quality), there was no difference between the groups in any outcome assessment at the end of all sessions. Both treated and control patients improved rapidly in the observation period of 2 to 3 weeks.

Table 1. Included Randomized Controlled Trials on the Effectiveness of Massage in Low Back Pain

Study	Methods	Participants
Cherkin 2001	Method of randomization: computer-generated random sequence. Outcome assessors were blinded. Patients were HMO enrollees, 6 weeks after a primary care visit for back pain. Period of study: May–Oct 1997. Intention-to-treat analysis. Follow-up: 4, 10, and 52 weeks after randomization. Quality score: 8/8	3966 letters were mailed. 693 consent forms returned. The first 262 enrollees confirmed eligible were randomly assigned. 95% were followed up to 52 weeks. 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 more than 1 year.
Franke 2000	Method of randomization: random numbers table, closed envelopes. Design: 2 × 2 factorial design. Methods of recruitment not mentioned. Study conducted in Bad Andersheim City, Germany. Period of study: 14 months, until the end of 1997. No intention-to-treat analysis. All medications needed to be discontinued before the beginning of the study protocol. Follow-up: until end of sessions. Dropouts: 11 patients (5.8%). Quality score: 5/8	190 patients were randomly assigned. Duration of pain: >1 year. Participants needed to speak German to be included. Age: 25–55 years (45 ± 8.1). 61% male. Previous treatments: analgesics, anti-inflammatory drugs, muscle relaxants, antidepressants. Most diagnoses included: lumbar disc prolapse without myelopathy, 28% low back pain, and 23% ischialgia.
Godfrey 1984	Method of randomization not described. Patients were recruited through contact with physicians in the Toronto area (Canada). Period of study: 2.5 years. No intention-to-treat analysis: Follow up: 2–3 weeks. Quality score: 2/8	200 patients were referred, 109 entered the protocol, 90 were randomly assigned, 81 were followed up (90%). Acute pain (< 14 days) of mechanical origin in the lumbosacral joints. Age: 18–68 years.

(Table continues)

In the study by Hoehler et al¹⁵ (low quality), patients in the manipulation group showed better results in subjective measures of pain and in straight leg raising immediately after the end of the first session. These differences were not maintained at the end of treatments or 3 weeks after discharge.

In the studies by Hsieh et al¹⁵ and Pope et al³¹ (high quality), they showed that patients who received chiropractic manipulation improved their function scores significantly over those of the massage group. However, the manipulation group's baseline function score was lower than the massage group's score. When the outcome measures were pain intensity, range of motion, extension

effort, or muscle fatigue, comparisons revealed no significant contrast among the treatment groups.

In summary, three studies showed that manipulation is better than massage in relieving pain and improving activity immediately after the first session. During the course of treatment, there is moderate evidence that the effect of manipulation over massage is maintained for measurements of function. However, for pain, range of motion, effort, and fatigue, there is moderate evidence that these interventions have equal effects. At the end of all sessions and at 3 weeks after discharge, the effect of manipulation appears to equal that of massage, but this evidence is limited.

Table 1. Continued

Interventions	Outcomes	Results/Conclusions
<p>(1) Licensed therapist. At least 3 years of experience. Manipulation of soft tissue (<i>i.e.</i>, muscle and fascia). Swedish (71%), movement re-education (70%), deep tissue (65%), neuromuscular (45%), trigger and pressure point (48%), and moist heat or cold (51%). Prohibited: energy techniques (Reiki, therapeutic touch). Proscribed meridian therapies (acupressure and Shiatsu) and approaches deemed too specialized (craniosacral and Rolfling).</p> <p>Massage therapists recommended exercise, typically stretching. 59% also used “body awareness” techniques to help clients become more aware of their physical and kinesthetic sensations, including potential early warning signals of injury.</p> <p>Means (SD) number of visits = 8.0 (2.4).</p> <p>(2) Traditional Chinese medical acupuncture. Mean (SD) number of visits = 8.3 (2.3).</p> <p>(3) Self-care education: high-quality and inexpensive educational material designed for persons with chronic back pain: a book and two professionally produced videotapes.</p>	<p>Primary outcome measures:</p> <ol style="list-style-type: none"> 1. Bothersomeness of back pain (0–10), bothersomeness of leg pain (0–10), or bothersomeness of numbness or tingling (0–10). The higher (of the three) score was used (valid). 2. Modified Roland Disability Scale (reliable, valid, and sensitive). <p>Secondary outcome measures:</p> <ol style="list-style-type: none"> 3. Disability: National Health Interview Survey. 4. Utilization: provider visits, prescription drugs, operations, hospitalizations, medication use, visits to other massage or acupuncture practitioners. 5. Costs. 6. Satisfaction. 7. SF-12, Mental Health summary scales 8. Number of days of exercise. 	<p>Authors’ conclusions: therapeutic massage was effective for persistent low back pain, apparently providing long-lasting benefits.</p>
<p>(1) Acupuncture massage: follow the rules of massage from Physical Medicine and of acupuncture from neural therapy. 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).</p> <p>(2) Teil massage (classic massage). The objective is to tonify and detonify muscle structures by increasing circulation in the skin and muscle, decrease adhesions.</p> <p>(3) Individual exercises:</p> <ol style="list-style-type: none"> 1. Gymnastics with music 2. Swimming 3. Ergometric training 4. Specific low back exercises (not specified which) 5. Brügger treatment for musculoskeletal functional diseases (not specified) 6. Posture correction 7. Muscle strengthening 8. Increase resistance 9. Increase in coordination and rhythm 10. Increase in mobility and flexibility. <p>(4) Group exercises same as individual exercises, but in group mode.</p> <p>Study groups:</p> <p>(1) + (3)</p> <p>(1) + (4)</p> <p>(2) + (3)</p> <p>(2) + (4)</p>	<p>Measured before, after 4, 10, and 52 weeks of the randomization.</p> <ol style="list-style-type: none"> 1. Pain: VAS (1 to 10 cm). 2. Function: Hanover Function Score Questionnaire for low back pain 0–100%. 3. Physical examination: lumbar flexion and extension (degrees). <p>Measured before and after the sessions.</p>	<p>Authors’ conclusions: the observed effect sizes with acupuncture massage are promising and warrant further investigation in replication studies.</p> <p>Acupuncture massage showed beneficial effects for both disability and pain compared with Swedish massage. Marked improvement observed in acupuncture massage plus 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 plus individual exercise group. Acupuncture massage (with individual or group exercise) reduced pain. Mean difference between acupuncture and classic massage groups: 7% (function) and 0.8 cm (VAS).</p> <p>ANOVAS:</p> <p>Acupuncture massage is more effective than Swedish massage for function ($P = 0.008$) and for pain ($P = 0.038$).</p> <p>Both exercise groups (individual or in group) are not statistically significantly different for function ($P = 0.55$) or for pain ($P = 0.55$).</p>
<p>(1) Massage administered by a kinesiologist to an area from the sciatic notch to the thoracolumbar junction with light effleurage for 10 min. Maximum of five treatments, every 2–3 days. (2) Maigne method of manipulation. (3) Faradic current delivered in pulses for 4 min, through saline-soaked electrodes to cause a minimally perceived “electrical” feeling.</p>	<p>(a) pain. (b) tenderness. (c) stiffness. (d) functional impairment for activities of everyday living on a 5-point scale. (e) location of pain, aggravating factors, medications, and other treatments. (f) physical exam: SLR, ROM</p>	<p>Author’s conclusions: no difference between the groups in any outcome assessment. Both treated and control patients improved rapidly during observation period.</p>

(Table continues)

Comparison Between Massage and Electrical Stimulation. In the study by Melzack et al²⁸ (high quality), the authors reported that 38% of the massage group had pain relief greater than 50% compared with 85% of the patients in the TENS group during the course of treatments.

In the study by Godfrey et al¹² (low quality), the authors stated that there was no difference between the massage and faradic current group in any outcome assessment. Both treated and control patients improved rapidly during the observation period (which was 2–3 weeks).

In the studies by Hsieh et al¹⁶ and Pope et al³¹ (high quality), the authors showed that those who received transcutaneous muscular stimulation did improve their function scores, but there was no difference from the

scores of the massage group. When the outcome measures were pain intensity, range of motion, extension effort, or muscle fatigue, comparisons revealed no significant contrast among the treatment groups.

In summary, three studies compared the effects of massage to some kind of electrical stimulation. They showed that there is moderate evidence that TENS is better than massage in relieving pain and improving range of motion measured during the course of treatment. There is moderate evidence that massage and transcutaneous muscular stimulation have equal benefits during the course of treatment. At the end of all sessions, massage and faradic current are equally effective, but this evidence is limited.

Table 1. Continued

Study	Methods	Participants
Hernandez-Reif 2001	Method of randomization: not described. Blindedness not described. Recruitment of patients: self-referred. Study conducted in the United States. Period of study: not described. Follow-up: post sessions and last day of sessions. No intention-to-treat analysis. Quality score: 4/8	24 were randomly assigned. No drop-outs. Average age: 39.6 years. 54.1% women, 67% Caucasians, 8% Hispanic, 17% African-American, 8% Asian. Duration of pain: <6 months. Previous treatments: not described.
Hoelher 1981	Method of randomization not described. Outcome assessor blinded to intervention. Patients were referred to the university hospital in California. Period of study: June 1973–June 1979. Co-interventions avoided. Follow-up: 3 weeks. No intention-to-treat analysis. Quality score: 3/8	95 were randomly assigned, 95 (100%) interviewed after first session, 69 (72%) interviewed after discharge, 58 (61%) interviewed 3 weeks after discharge. Age: average 31 years. 59% male. No previous surgery. Length of pain: mixed acute and chronic pain. Most were acute cases.
Hsieh 1992, Pope 1994	Method of randomization: predetermined randomization table with four strata, including duration of pain and employment status. Outcome assessor blinded to intervention. Patients were recruited from advertising media, radio, newspapers, flyers, and interns in Los Angeles, CA. Period of study: not stated. Follow-up: 3 weeks. No intention-to-treat analysis. Quality score: 4/8 (Hsieh) and 5/8 (Pope)	85 patients were randomly assigned (Hsieh 1992) and 164 (Pope 1994). 74% were seen in the four visits. Age: average 33.9 years (Hsieh) and 32 years (Pope). Gender: 62% male (Pope). Diagnosis: nonspecific low back pain, no radiation below knees. Length of pain: 3 weeks to 6 months. No previous surgery.
Melzack 1983	Method of randomization: sealed envelopes. Outcome assessors blinded to intervention. Patients were referred to the physiotherapy department of Montreal General Hospital, Canada. No withdrawals. Follow-up: until end of sessions. Included an intention-to-treat analysis. Quality score: 6/8	41 patients were randomly assigned, 100% were interviewed after the end of treatment. Age: average 46.3 years. Gender: 46% male. Previous surgery: ? Length of pain: average 36.2 weeks.
Preyde 2000	Method of randomization: random numbers table. 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, Canada. Period of study: 1998–1999. Follow-up: 1 month after end of treatment. Intention-to-treat analysis. Quality score: 8/8	165 patients were recruited, 107 met the inclusion criteria and 104 were randomly assigned. 92% were followed. Average age: 46 years. 51% female. Average duration of pain: 3 months (1 week to 8 months). Previous treatments not described.

(Table continues)

Table 1. Continued

Interventions	Outcomes	Results/Conclusions
<p>(1) 30-minute massage therapy sessions per week over 5 weeks by trained massage therapist.</p> <p>The massage consisted of the following techniques applied to the entire back at a level tolerant to the patient: 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.</p> <p>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, patients 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.</p> <p>(2) Relaxation therapy (to control for potential placebo effects and the effects of increased attention given to the massage patients): 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 patients were asked to conduct these 30-min sessions at home twice a week for 5 weeks and to keep a log.</p>	<p>Measured at the end of all sessions.</p> <p>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-item scale. The STAI scores increase in response to stress and decrease under relaxing conditions. Adequate concurrent validity and internal consistency.</p> <p>Pain measures: Short-form McGill Pain Questionnaire: 11 questions based on sensory dimensions and four questions based on affective dimensions. VITAS: present pain with a VAS ranging from 0 to 10. (ROM): trunk flexion = C7-1 Pain flexion ROM measure (touch toes with pain).</p>	<p>Authors' conclusions: massage therapy is effective in reducing pain, stress hormones, and symptoms associated with chronic low back pain.</p>
<p>(1) Soft tissue massage of the lumbosacral area (<i>n</i> = 39), average of 3.9 sessions.</p> <p>(2) Lumbosacral manipulation, short high-velocity thrusts (<i>n</i> = 56), average 4.8 sessions.</p>	<p>Measured before and after each session.</p> <p>(a) Subjective measures: mini-multi MMPI and other questionnaires not stated.</p> <p>(b) Objective: SLR, distance fingertip-floor.</p>	<p>Based on (a) and (b): Manipulation better than massage only immediately after first treatment. No difference at discharge or 3 weeks after discharge. High loss to follow-up. Massage was not the active intervention. There were more patients in the manipulation group (56) compared to the massage group (39). The massage group had less severe pain at baseline. The length of treatment in the manipulation group was 30 ± 27.7 days compared with 19.6 ± 20.4 days in the massage group ($P < 0.05$).</p>
<p>(1) Massage: two licensed massage therapists applied gentle stroking to the whole back area without any deep tissue manipulation (<i>n</i> = 15 in Hsieh; <i>n</i> = 37 in Pope), for 3 weeks, 3×/wk plus 10-min hot packs.</p> <p>(2) Manipulation of the lumbar and/or sacroiliac joints (<i>n</i> = 26 in Hsieh; <i>n</i> = 70 in Pope) for 3 weeks, 3×/wk plus 10-min hot packs.</p> <p>(3) Freeman lumbosacral corset (<i>n</i> = 12 in Hsieh; <i>n</i> = 29 Pope) for 3 weeks.</p> <p>(4) Transcutaneous muscular stimulation (<i>n</i> = 10 in Hsieh; <i>n</i> = 28 in Pope) for 3 weeks, four electrodes, 8 hr/day.</p>	<p>Measured immediately after first session, at the end of all sessions, and 3 weeks after discharge.</p> <p>(a) Revised Oswestry Low Disability Index (Hsieh). (b) Roland-Morris Disability Questionnaire (Hsieh). (c) VAS (Pope). (d) range of motion (Pope). (e) maximum voluntary extension effort (Pope). (f) Sorensen fatigue test (Pope). (g) median frequency from muscle activity (Pope).</p>	<p>Results: for (a) as outcome measure, the group that received manipulation improved significantly more than the massage group. For (b) manipulation was better than massage and transcutaneous muscular stimulation. For (c,d,e,f,g) there was an overall difference among the treatment groups, but no significant contrast among the four groups.</p>
<p>(1) Gentle massage by placing on the skin four suction cups kept in place by mild negative pressure (<i>n</i> = 21) plus 30-min standard exercise 2×/wk. End of treatment: 10 times, or pain relief, or patient request to stop or symptoms became worse.</p> <p>(2) TENS, active electrodes at the center of the painful area, 4-8 Hz plus standard 30-min exercise (<i>n</i> = 20). 2×/wk. End of treatment: 10 times, or pain relief, or patient request to stop or symptoms became worse.</p>	<p>Measured during the course of sessions.</p> <p>(a) McGill Pain Questionnaire: Pain Rating Index and Present Pain Intensity.</p> <p>(b) ROM: SLR and back flexion.</p>	<p>Thirty-eight percent in the massage group had pain relief greater than 50% compared with 85% of the patients in the TENS group. Author's conclusions: TENS is better than massage in relieving pain and SLR.</p>
<p>(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.</p> <p>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.</p> <p>15 to 20 minutes of education on posture and body mechanics, particularly as they related to work and daily activities.</p> <p>(2) Soft tissue manipulation only. This group received the same soft tissue manipulation as the patients in the CMT group.</p> <p>(3) Remedial exercise only. This group received the same exercise and education sessions as subjects in the CMT group.</p> <p>(4) The control group received 20 minutes of sham low-level laser (infrared) therapy. The laser was set up to look as if it was functioning but was not. The patient was "treated" lying on his or her side with proper support to permit relaxation. The treatment provider held the instrument on the area of complaint.</p>	<p>Measured during the course of all sessions.</p> <ol style="list-style-type: none"> 1. Roland Disability Questionnaire (valid, reliable, sensible) 2. Present Pain Index (valid, reliable) 3. Pain Rating Index (valid, reliable) 4. State Anxiety Index Score (reliable, valid, internal consistent) 5. Modified Schoeber test 	<p>Authors' conclusions: massage is beneficial for patients with subacute low back pain. Measured at the end of all sessions and 1 month after the end of sessions.</p>

HMO = health maintenance organization; TENS = transcutaneous electrical nerve stimulation; VAS = visual analog scale; ANOVA = analysis of variance; SLR = straight leg raising; ROM = range of motion; MMPI = Minnesota Multiphasic Personality Inventory; SF = Short Form.

Table 2. Quality Assessment Criteria for Included Randomized Controlled Trials

Items for Quality Assessments																				
Study	a	b1	b2	c	d	e	f	g	h	i	j	k	l	m1	m2	n	o	p	q	score
Cherkin 2001	Yes	Yes	DK	Yes	Yes	DK	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8/8
Franke 2001	Yes	Yes	No	No	Yes	No	Yes	Yes	No	No	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	5/8
Godfrey 1984	Yes	Yes	DK	DK	Yes	No	No	DK	No	DK	Yes	No	Yes	Yes	No	DK	Yes	No	No	2/8
Hernandez-Heif 2001	Yes	Yes	DK	Yes	Yes	DK	DK	Yes	No	DK	Yes	No	No	Yes	No	Yes	Yes	DK	Yes	4/8
Hoehler 1981	Yes	Yes	DK	Yes	Yes	No	Yes	No	No	Yes	Yes	No	No	Yes	Yes	DK	Yes	No	Yes	3/8
Hsieh 1992	Yes	Yes	DK	DK	Yes	No	No	Yes	No	Yes	Yes	No	No	Yes	No	Yes	Yes	No	Yes	4/8
Melzack 1983	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	No	Yes	Yes	No	DK	Yes	Yes	Yes	6/8
Pope 1994	Yes	Yes	DK	Yes	Yes	No	Yes	No	No	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	5/8
Preyde 2000	Yes	Yes	DK	Yes	Yes	DK	Yes	Yes	DK	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	8/8

DK = don't know.

Comparison Between Massage and Corset. In the studies by Hsieh et al¹⁶ and Pope et al³¹ (high quality), the authors showed that those who used corsets improved their function scores, but there was no difference from the scores of the massage group. For other outcome measures, such as pain intensity, range of motion, extension effort, or muscle fatigue, there was no significant contrast among the treatment groups.

Comparison Between Massage and Exercise. One high-quality study³² showed that patients who received massage did significantly better than the exercise group only in measurements of function in the short-term. The groups had similar measurements of pain intensity and pain quality on both short and long-term follow-up.

Comparison Between Massage and Relaxation Therapy. One low-quality study¹⁴ reported that the immediate effects, measured with the McGill Pain Questionnaire (pre- and post-treatment), revealed that both groups reported less pain after treatment, but more so on the first day of treatment. For the pain intensity measures, only the massage group experienced less pain immediately after their first and last treatment sessions. Comparisons between the first and last days revealed that both groups perceived pain reduction based on the pretreatment pain measures.

Comparison Between Massage and Acupuncture. One high-quality study⁵ showed that patients in the massage group had significantly better function than patients in the acupuncture group after 10 weeks. No significant difference in symptoms (pain, numbness, and tingling) was observed at 10 weeks. At 52 weeks, massage was superior to acupuncture in its effect on symptoms and function.

Comparison Between Massage and Self-Care Education. One high-quality study⁵ showed that patients in the massage group had fewer symptoms (pain, numbness, and tingling) and better function compared with patients in the self-care education group after 10 weeks ($P = 0.01$ and $P < 0.001$, respectively). These differences were not maintained at 52 weeks ($P = 0.42$ and $P = 0.97$, respectively), because the self-care education group demonstrated substantial improvements during this period.

Massage as a Component of a Combined Therapy

This was assessed when the effects of massage could be extracted separately or the addition of massage was compared with the other treatments without massage.

One high-quality study³² showed that patients who received massage combined with exercises and education were significantly better than those who received only exercises, as assessed by measurements of function and pain intensity on both short- and long-term measurements and by measurements of quality of pain in the short-term. Massage combined with exercise and education was significantly better than sham laser in the three outcome measures on both short- and long-term follow-up. However, massage combined with exercise and education was better than massage alone only on measurements of pain intensity in the short-term.

Different Techniques of Massage and Experience of Therapist

One high-quality study⁹ compared acupuncture massage with classic (Swedish) massage. Each massage therapy group also received one of two types of exercise programs (individual or group). This study showed that acupuncture massage was superior to classic massage (irrespective of the type of exercise received) on measures of both pain and function, but this needs confirmation in other studies.

In six studies,^{5,12,14-16,31,32} massage was done with the hands over the patient's back region, whereas in two studies,^{9,28} massage was done using a mechanical device. There was no clear benefit of one technique over the other.

Regarding the experience and/or certification of the therapist, the most significant benefits were observed in the studies that used a trained massage therapist with many years of experience or a licensed massage therapist.^{5,14,32}

No conclusion could be made regarding the number and duration of sessions because of a lack of information in some studies and heterogeneity of findings in the studies with this information.

Subgroup of Acute, Subacute, and Chronic Low Back Pain

We cannot conclude if massage is beneficial for patients with acute LBP, because we found only one low-quality study in this category that examined massage as a control treatment for the main intervention, which was spinal manipulation. This study did not include a placebo or sham treatment to compare with massage. The effects of massage did not differ from the effects of spinal manipulation or faradic current. Both groups reported equal improvements in their pain, which could also be an effect of the natural history of acute episodes of LBP.

For subacute (and early chronic) LBP, there is moderate evidence that massage reduces pain intensity and pain quality compared with sham treatment. These effects were similar to the effects for exercise and manipulation.

For patients with chronic LBP, there is moderate evidence showing that massage is beneficial in reducing pain intensity and improving function. These effects were lower than the effects of TENS but superior to relaxation, acupuncture, and self-care education. The effects of massage in this group of patients lasted for up to 1 year.

Costs

In the study by Preyde,³² the cost of six sessions of massage combined with exercise and education was Can\$300, whereas massage alone cost Can\$240, and exercise alone or sham laser cost Can\$90 each. In this study, massage combined with exercise and education had the most significant effects but cost more. In the study by Cherkin et al,⁵ the cost of massage was US\$377 per patient, acupuncture was US\$352 per patient, and self-care education was US\$50 per patient. However, the costs of provider visits, pain medication, and outpatient Health Maintenance Organization back care services were about 40% lower in the massage group than in the other groups.

Influence of Study Design, Quality, and Other Characteristics on the Results

The studies in which the objectives were to assess the effects of other interventions (and massage was used only to control for the hands-on effect) failed to demonstrate the beneficial effects of massage therapy. When massage was one of the main interventions, studies showed that massage was effective in relieving symptoms and improving function in these patients. With respect to the methodologic quality of the studies, the two best trials demonstrated that massage was beneficial, and the two worst trials showed that massage was equal to or inferior to spinal manipulation. None of the studies reported on possible conflict of interests of the researchers involved in the studies.

■ Discussion

We updated our previous review¹⁰ with four recently published randomized controlled trials. In contrast with the trials included in our previous review, these four new trials considered massage as one of the main interven-

tions under study. The overall quality of the four new trials was better than the old ones. Our conclusions differ from our previous review because of this newly published evidence. Our findings suggest that massage might be beneficial for patients with subacute and chronic nonspecific LBP, especially if combined with exercise and delivered by a licensed therapist. The studies suggest that massage has long-lasting effects (at least 1 year). One study showed that acupuncture massage was better than classic (Swedish) massage, but these findings need confirmation.

Three studies attempted to have an inert treatment group, but only the study by Preyde³² used a sham treatment that controlled for the interpersonal contact and support. Statistical pooling was not possible because the studies were very heterogeneous in relation to the population, massage technique, comparison group, timing, and type of outcome measures. Massage is a global treatment, and its effects are difficult to measure because of various confounding variables, including the size of the massage area, amount of pressure, different types of maneuvers, progression, rhythm, duration of treatment sessions, number of treatment sessions, experience of the therapist, level of stress, type of injury, chronicity, heterogeneity of patients, position of the patient, and type of lubricant used. Other criticisms of these trials are the lack of long-term follow-up, paucity of cost-benefits analysis, lack of return-to-work as an outcome, and lack of discussion of clinical relevance of the results.

Our methodology to conduct this systematic review was improved in relation to our previous version. We invited an experienced librarian to refine and conduct the search strategies. We contacted some authors to obtain more information about the trials, and two independent reviewers under blinded conditions did the methodologic quality assessment. Although the rating system has not been validated, it is recommended for trials of LBP and has been used in many systematic reviews in this field.³⁴ The definition of a high-quality study is somewhat arbitrary, but in the previous version of this review, we conducted a sensitivity analysis that showed that changing the threshold to 40% or 60% did not make any significant difference.

A critique of the methodology of research studies evaluating massage was made by Cawley⁴ in 1997. The indications for massage therapy and study designs were relaxation in healthy females (uncontrolled study), relief of distress in cancer patients (crossover design comparing with the rest), distress in patients with inflammatory bowel disease (uncontrolled study), relaxation in elderly patients (no study design given), back pain related to work (uncontrolled study), anxiety in elderly patients (uncontrolled study), pain in cancer patients (randomized controlled study), and stress in patients in the intensive care unit (randomized controlled study). Cawley⁴ concluded that there were many differences between the studies. When viewed in isolation, each study could be said to indicate that massage was beneficial. However, the limitations within the studies made cross compari-

sons problematic, suggesting it was prudent for the reader to view the results of the studies as tentative.

■ Conclusions

Implications for Practice

Massage is beneficial for patients with subacute and chronic nonspecific LBP in terms of improving symptoms and function. Massage therapy is costly, but it may save money by reducing health care provider visits, the use of pain medications, and costs of back care services. The effects of massage are improved if combined with exercise and education. The beneficial effects of massage in patients with chronic LBP are long lasting (at least 1 year after the end of sessions). It seems that acupuncture massage is better than classic massage, but this needs confirmation.

Implications for Research

There is a need for more trials that compare massage with an inert treatment, especially for chronic LBP. The conclusions of this review are classified as “limited” or, at best, “moderate” because of the paucity of trials in each category. Therefore, these findings need to be confirmed.

There is a need to confirm if acupuncture massage is better than classic massage. 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/chronic pain, presence of other aggravating factors, different countries with different cultures) that need to be assessed separately. Future trials may also want to consider whether the benefits of massage can be increased if the therapist has many years of experience or is a licensed therapist.

Future trials should discuss the clinical relevance of the results and include return-to-work as an outcome and long-term follow-up. Researchers are encouraged to follow the CONSORT statement for reporting their trials³⁰ and use the standard outcomes for trials of LBP, as described by Deyo et al,⁶ in order to provide homogeneous information for future systematic reviews and meta-analysis. When presenting the results, researchers are encouraged to show the baseline characteristics using point estimates (mean, median) with standard deviations (for continuous variables) for the number of patients in each category (for categorical variables) and for every follow-up measure. When researchers present only the difference between the baseline and the follow-up, these data cannot be used in a meta-analysis.

■ Appendix 1. Search Strategy for MEDLINE, CINAHL, and HealthSTAR

001 randomized controlled trial.pt.
002 controlled clinical trial.pt.
003 randomized controlled trials/
004 random allocation/
005 double-blind method/
006 single-blind method/

007 clinical trial.pt.
008 exp clinical trials/
009 (clin\$ adj25 trial\$).ti,ab.
010 ((singl\$ or doubl\$ or trebl\$ or tripl\$) adj25
(blind\$ or mask\$)).ti,ab.
011 placebos/
012 placebo\$.ti,ab.
013 random\$.ti,ab.
014 research design.sh.
015 volunteer\$.ti,ab.
016 animal/
017 human/
018 16 not 17
019 or/1-15
020 19 not 18
021 exp massage/
022 therapeutic touch/
023 reflexotherapy/
024 rolfing.ti,ab.
025 shiatsu.ti,ab.
026 reflexology.ti,ab.
027 myotherapy.ti,ab.
028 (polarity adj therapy).ti,ab.
029 (myofascial adj release).ti,ab.
030 (craniosacral adj therapy).ti,ab.
031 reiki.ti,ab.
032 (trager adj psychophysical).ti,ab.
033 (hakomi adj method).ti,ab.
034 (jin adj shin).ti,ab.
035 (neuromuscular adj therapy).ti,ab.
036 (pfrimmer adj25 therapy).ti,ab.
037 (alexander adj technique).ti,ab.
038 (feldenkrais adj method).ti,ab.
039 or/21-38
040 exp back pain/
041 exp back/
042 backache.ti,ab.
043 exp lumbar vertebrae/
044 lumbar.ti,ab.
045 lumbago.ti,ab.
046 (low adj back).ti,ab.
047 exp spine/
048 spine.ti,ab.
049 spinal.ti,ab.
050 (disc adj degeneration).ti,ab.
051 (disc adj prolapse).ti,ab.
052 (disc adj herniation).ti,ab.
053 vertebrae.ti,ab.
054 vertebral.ti,ab.
055 intervertebral.ti,ab.
056 scoliosis.ti,ab.
057 kyphosis.ti,ab.
058 lordosis.ti,ab.
059 oswestry.ti,ab.
060 roland-morris.ti,ab.
061 or/40-60
062 20 and 39 and 61
063 62

■ **Appendix 2. Search Strategy for EMBASE**

* #30 #23 and #29 (200 records)
 #29 #24 or #25 or #26 or #27 or #28 (86,534 records)
 #28 (BACK in *F) or (BACK- in *F) or (BACK-ACHE in *F) or (BACK-DISABILITY in *F) or (BACK-DISABLED in *F) or (BACK-INJURIES in *F) or (BACK-INJURY in *F) or (BACK-INJURY-REHABILITATION in *F) or (BACK-INJURY-THERAPY in *F) or (BACK-LUMBAR in *F) or (BACK-MOBILIZING in *F) or (BACK-MOVEMENT in *F) or (BACK-MUSCLE in *F) or (BACK-MUSCLE-THERAPY in *F) or (BACK-PAIN in *F) or (BACK-PRESSURE in *F) or (BACK-PRESSURES in *F) or (BACK-PROBLEM-RELATED in *F) or (BACK-REHABILITATION in *F) or (BACK-THERAPY in *F) or (BACKACHE in *F) or (BACKACHE- in *F) or (BACK-ACHE-REHABILITATION in *F) or (BACKACHE-THERAPY in *F) or (BACKACHES in *F) (36,361 records)
 #27 (LUMBAR in *F) or (LUMBAR- in *F) or (LUMBAR-BACK in *F) or (LUMBAR-DISC in *F) or (LUMBAR-DISK in *F) or (LUMBAR-DISK-COMPLICATION in *F) or (LUMBAR-DISK-DEGENERATION in *F) or (LUMBAR-DISK-HERNIA in *F) or (LUMBAR-DISK-HERNIA-COMPLICATION in *F) or (LUMBAR-DISK-HERNIA-CONGENITAL-DISORDER in *F) or (LUMBAR-DISK-HERNIA-DISEASE-MANAGEMENT in *F) or (LUMBAR-DISK-HERNIA-DRUG-THERAPY in *F) or (LUMBAR-DISK-HERNIA-PREVENTION in *F) or (LUMBAR-DISK-HERNIA-REHABILITATION in *F) or (LUMBAR-DISK-HERNIA-SURGERY in *F) or (LUMBAR-DISK-HERNIA-THERAPY in *F) or (LUMBAR-DISK-PRESSURE in *F) or (LUMBAR-DISK-THERAPY in *F) or (LUMBAR-DISKECTOMY in *F) or (LUMBAR-DORSAL in *F) or (LUMBAR-FACET-JOINT-SYNDROME-SURGERY in *F) or (LUMBAR-HERNIA in *F) or (LUMBAR-HERNIA-SURGERY in *F) or (LUMBAR-LUMBOSACRAL in *F) or (LUMBAR-MUSCLE in *F) or (LUMBAR-NERVE-ROOT-COMPRESSION in *F) or (LUMBAR-REGION in *F) or (LUMBAR-SCIATIC in *F) or (LUMBAR-SPINAL in *F) or (LUMBAR-SPINE in *F) or (LUMBAR-SPINE-DISEASE in *F) or (LUMBAR-SPINE-INJURY in *F) or (LUMBAR-SPINE-THERAPY in *F) or (LUMBAR-SPONDYLOSIS in *F) or (LUMBAR-STENOSIS in *F) (25,886 records)
 #26 explode 'back'/all subheadings (24,146 records)
 #25 explode 'spine disease'/all subheadings (27,908 records)
 #24 explode 'backache'/all subheadings (10,338 records)
 #23 #11 and #22 (641 records)
 #22 #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 (5871 records)
 #21 (ALEXANDER-TECHNIK in *F) or (ALEXANDER-TECHNIQUE in *F) (one record)
 #20 REIKI in *F (four records)

#19 (MYOTHERAPY in *F) or (MYOTHERAPY- in *F) (two records)
 #18 (REFLEXO-THERAPEUTIC in *F) or (REFLEXO-THERAPY in *F) (two records)
 #17 (SHIATSU in *F) or (SHIATSU- in *F) (13 records)
 #16 ROLFING in *F (eight records)
 #15 (MASSAGE in *F) or (MASSAGE- in *F) or (MASSAGE-AND-PRESSURE in *F) or (MASSAGE-CONTINUED in *F) or (MASSAGE-CONTROL in *F) or (MASSAGE-ENHANCED in *F) or (MASSAGE-INDUCED in *F) or (MASSAGE-LIKE in *F) or (MASSAGE-TUINA-THERAPIE in *F) or (MASSAGE-TYPE in *F) or (MASSAGE-WERE in *F) or (MASSAGEBEHANDLUNG in *F) or (MASSAGED in *F) or (MASSAGEE in *F) or (MASSAGEINST in *F) or (MASSAGEMETHODEN in *F) (2032 records)
 #14 explode 'manipulative medicine'/all subheadings (2388 records)
 #13 explode 'alternative medicine'/all subheadings (1704 records)
 #12 explode 'massage'/all subheadings (711 records)
 #11 #9 not #10 (320,588 records)
 #10 (TG = 701) not ((TG = 888) and (TG = 701)) (22,918 records)
 #9 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 (320,858 records)
 #8 follow-up studies (2875 records)
 #7 placebo* (76,309 records)
 #6 explode clinical-trials [searched clinical trial]/all subheadings (156,029 records)
 #5 random* (162,511 records)
 #4 (DOUBLE-BLIND in *F) or (DOUBLE-BLIND-CLINICAL in *F) or (DOUBLE-BLIND-CONTROLLED in *F) or (DOUBLE-BLIND-CROSS-CO5ER in *F) or (DOUBLE-BLIND-CROSSOVER in *F) or (DOUBLE-BLIND-CROSSOVER-TRIAL in *F) or (DOUBLE-BLIND-FASHION in *F) or (DOUBLE-BLIND-INTERACTION in *F) or (DOUBLE-BLIND-PLACEBO in *F) or (DOUBLE-BLIND-PLACEBO-CONTROLLED in *F) or (DOUBLE-BLIND-PROCEDURE in *F) or (DOUBLE-BLIND-PROCEDURE-DRUG-THERAPY in *F) or (DOUBLE-BLIND-PROCEDURE-SIDE-EFFECT in *F) or (DOUBLE-BLIND-STUDIES in *F) or (DOUBLE-BLIND-STUDY in *F) or (DOUBLE-BLIND-TEST in *F) or (DOUBLE-BLINDCROSSOVER in *F) or (DOUBLE-BLINDED in *F) or (DOUBLE-BLINDED-STUDY in *F) (52,009 records)
 #3 randomized-controlled-trial* (36,371 records)
 #2 (CONTROLLED-BLINDED in *F) or (CONTROLLED-CLINICAL in *F) or (CONTROLLED-DESIGN in *F) (3 records)
 #1 (RANDOMIZED in *F) or (RANDOMIZED- in *F) or (RANDOMIZED-BLINDED in *F) or (RANDOMIZED-BLOCK in *F) or (RANDOMIZED-CONSENT in *F) or (RANDOMIZED-CONTROL in *F) or (RANDOMIZED-CONTROLLED in *F) or (RANDOMIZED-CONTROLLED-TRIAL in *F) or (RANDOMIZED-

CROSSOVER in *F) or (RANDOMIZED-DOSING-SEQUENCE in *F) or (RANDOMIZED-DOUBLE-BLIND in *F) or (RANDOMIZED-GROUP in *F) or (RANDOMIZED-INTERVENTION in *F) or (RANDOMIZED-MULTI-CROSSOVER in *F) or (RANDOMIZED-ORDER in *F) or (RANDOMIZED-SAMPLE in *F) or (RANDOMIZED-SEQUENCE in *F) or (RANDOMIZED-STRATIFIED in *F) or (RANDOMIZED-SURGEON in *F) or (RANDOMIZED-TREATMENT in *F) (83,589 records)

■ Appendix 3. Van Tulder et al Criteria for Assessing Methodologic Quality

Patient Selection

- a. Were the eligibility criteria specified?
- b. Treatment allocation
 - b1. Was a method of randomization used?
 - b2. Was the treatment allocation concealed?
- c. Were the groups similar at baseline regarding the most important prognostic indicators?

Interventions

- d. Were the index and control interventions explicitly described?
- e. Was the care provider blinded to the intervention?
- f. Were co-interventions avoided or comparable?
- g. Was the compliance acceptable in all groups?
- h. Was the patient blinded to the intervention?

Outcome Measurement

- i. Was the outcome assessor blinded to the intervention?
- j. Were the outcome measures relevant?
- k. Were adverse effects described?
- l. Was the withdrawal/dropout rate described and acceptable?
 - m. Timing of follow-up measurements
 - m1. Was a short-term follow-up measurement performed?
 - m2. Was a long-term follow-up measurement performed?
 - n. Was the timing of the outcome assessment in both groups comparable?

Statistics

- o. Was the sample size for each group described?
- p. Did the analysis include an intention-to-treat analysis?
- q. Were point estimates and measures of variability presented for the primary outcome measures?
 - Internal validity criteria: b, e, f, g, h, i, j, l, n, p
 - Descriptive criteria: a, c, d, k, m
 - Statistical criteria: o, q

Operationalization of Criteria

- a) To score a “yes,” the location and the duration of the pain syndrome must be described appropriately.
 - b1) A random (unpredictable) assignment sequence. Methods of allocation using date of birth, date of admis-

sion, hospital numbers, or alternation should not be regarded as appropriate.

b2) Assignment generated by an independent person (recruiter) not responsible for determining the eligibility of the patients. This person has no information about the persons (subjects) included in the trial and has no influence on the assignment sequence or on the decision about eligibility of the patient.

c) To receive a “yes,” groups must be similar at baseline regarding age, duration of complaints, and value of main outcome measure(s). Statistical significance is only one parameter which to judge this question.

d) Description of type, modality, application technique, intensity, duration, number, and frequency of session for both the index intervention(s) and control intervention(s) must be adequate, so that others could replicate the treatment.

e) The reviewer determines when enough information about the blinding is given in order to score a “yes.” Was blinding of the care provided feasible?

f) Co-interventions should either be avoided in the trial design or be comparable between the index and control groups.

g) The reviewer determines when the compliance to the intervention is acceptable, based on the reported intensity, duration, number, and frequency of sessions for both the index intervention(s) and control intervention(s).

h) The reviewer determines when enough information about the blinding is given in order to score a “yes.” Was blinding of the patient feasible?

i) The reviewer determines (per outcome parameter) when enough information about blinding is given in order to score a “yes.”

j) The reviewer determines whether the outcome measures were relevant. For back pain, we recommend considering pain, a global measure of improvement, back-specific functional status, generic functional status, and return-to-work to be relevant.

k) Each event should be described and correctly attributed to the allocated treatment. If it is explicitly reported that “no adverse effects” have occurred, a “yes” should be scored.

l) Participants included in the study but who did not complete the observation period or were not included in the analysis must be described. If the percentage of withdrawals and dropouts does not exceed 20% for short-term follow-up and 30% for long-term follow-up and does not lead to substantial bias, a “yes” is scored. (*N.B.*, these percentages are arbitrary, not supported by literature).

m1) Outcome assessment at the end of the intervention period

m2) Outcome assessment more than 3 months after randomization

n) Timing of outcome assessment should be identical for all intervention groups and for all important outcome assessments.

o) To be presented for each group at randomization and for most important outcome assessments (*N.B.*, this means

that, in contrast to previous lists, there is no preset cutoff point to determine whether sample size is sufficient)

p) All randomized patients are reported/analyzed for the most important moments of effect measurement (minus missing values), irrespective of noncompliance and co-interventions.

q) Both point estimates and measure of variability should be presented (to be scored for each important outcome parameter separately). Point estimates are means, medians, modes, *etc.* Measurements of variability are standard deviations, 95% confidence intervals, *etc.*

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Key Points

- This systematic review identified eight randomized controlled trials of massage therapy for non-specific low back pain.
- The four trials in which massage was a control group for other interventions were of lower quality and tended not to conclude in favor of massage. The four most recent trials in which massage was the main intervention under study were of higher quality and tended to conclude in favor of massage.
- Massage is beneficial for patients with nonspecific low back pain, especially if given with exercise and education.

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