

## Evidence-informed management of chronic low back pain with massage

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### Abstract

**EDITORS' PREFACE:** The management of chronic low back pain (CLBP) has proven to be very challenging in North America, as evidenced by its mounting socioeconomic burden. Choosing amongst available nonsurgical therapies can be overwhelming for many stakeholders, including patients, health providers, policy makers, and third-party payers. Although all parties share a common goal and wish to use limited health-care resources to support interventions most likely to result in clinically meaningful improvements, there is often uncertainty about the most appropriate intervention for a particular patient. To help understand and evaluate the various commonly used nonsurgical approaches to CLBP, the North American Spine Society has sponsored this special focus issue of *The Spine Journal*, titled Evidence-informed management of chronic low back pain without surgery. Articles in this special focus issue were contributed by leading spine practitioners and researchers, who were invited to summarize the best available evidence for a particular intervention and encouraged to make this information accessible to nonexperts. Each of the articles contains five sections (description, theory, evidence of efficacy, harms, and summary) with common subheadings to facilitate comparison across the 24 different interventions profiled in this special focus issue, blending narrative and systematic review methodology as deemed appropriate by the authors. It is hoped that articles in this special focus issue will be informative and aid in decision making for the many stakeholders evaluating nonsurgical interventions for CLBP. © 2008 Elsevier Inc. All rights reserved.

**Keywords:** Chronic low back pain; Massage therapy; Efficacy; Effectiveness

### Description

#### Terminology

The term massage, in this review, is defined as soft-tissue manipulation using the hands or a mechanical device. 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.

### History

Massage may be the earliest and most primitive tool to treat pain [1]. The most ancient references to the use of massage come from Babylonia (around 900 BC), China (around 2700 BC), India (around 1500–120 BC), Greece (Hippocrates 460–377 BC, Asclepiades, Galen), and Rome (Plato 427–347 BC and Socrates 470–399 BC) [2,3].

### Frequency of use

Massage appears to be gaining popularity in recent years as increasing numbers of people with chronic low back pain (CLBP) are seeking alternative care.

FDA device/drug status: not applicable.

Nothing of value received from a commercial entity related to this manuscript.

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### Subtypes

Common types of massage therapy are acupressure (Shiatsu), Rolfing, Swedish massage (SM), reflexology, myofascial release, and craniosacral therapy.

### General description

Massage for CLBP can be applied either to the lumbar region or to the whole body, depending on patient presentation and the desired therapeutic effect. Massage uses a combination of techniques including Cyriax, effleurage, petrissage, friction, kneading, or hacking. Depending on the practitioner or setting, massage may constitute the primary intervention, or may be considered an adjunct to prepare the patient for exercise or other interventions. However, there are practitioners (eg, massage therapists) who use massage as the primary intervention. In 2001, World Health Organization defined acupressure as the application of gentle but firm finger pressure over meridians and acupuncture points at selected sites [4]. This approach has also been termed acupuncture massage and differs from needle acupuncture, which is reviewed elsewhere in this special focus issue [4].

### Practitioner, setting, and availability

Massage therapy may be delivered by licensed massage therapists, physical therapists, or chiropractors, all of whom receive extensive practical training in the application of manual therapies. This intervention is widely available throughout the United States.

### Reimbursement

Current procedural terminology (CPT) codes for massage therapy include 97124 (therapeutic procedure, one or more areas, each 15 minutes; massage, including effleurage, petrissage, and/or tapotement [stroking, compression, percussion]) and 97140 (manual therapy techniques [eg, mobilization/manipulation, manual lymphatic drainage, manual traction], one or more regions, each 15 minutes). In the United States, the average cost of a 1-hour massage is approximately \$75; this estimate is slightly lower in Canada.

Although the initial cost of massage may be high, the massage therapy intervention group in Cherkin et al. [5] showed a decrease in the amount spent on the use of pain medications and additional back-care services. In the study by Preyde [6], the cost of six sessions of massage combined with exercise and education was C\$300, whereas massage alone cost C\$240, and exercise alone or sham laser cost C\$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.

Although most individuals pay for massage therapy themselves, an increasing number of insurance companies and managed-care organizations are covering massage therapy and other complementary and alternative health-care practices fueled by consumer demand [7]. Provincial/territorial medical insurance plans, with the exception of the province of British Columbia, where massage is partially covered by the provincial medical services plan for persons with income of less than \$27,000 per year, do not cover the cost of massage therapy, although many third-party insurance plans (including automobile insurance) cover a portion or all of the costs of treatment. Some plans require medical referral, some do not.

## Theory

### Mechanism of action

Soft-tissue massage is thought to improve physiologic and clinical outcomes with CLBP by offering the symptomatic relief of pain through physical and mental relaxation. Manipulation of affected muscles and fascia may induce local biochemical changes that modulate local blood flow and oxygenation in muscle. These local effects may influence neural activity at the spinal cord segmental level and could modulate the activities of subcortical nuclei that influence mood and pain perception [8]. Massage may also increase the pain threshold through the release of endorphins and serotonin. The gate-control theory predicts that massaging a particular area stimulates large-diameter nerve fibers, which have an inhibitory input onto T-cells (first cells in the spinal cord that project into the central nervous system). This may result in decreased T-cell activity, followed by pain relief [9]. Massage may also increase local blood circulation, improve muscle flexibility, intensify the movement of lymph, and loosen adherent connective tissue [1]. However, the precise mechanisms by which massage exerts multiple therapeutic effects on CLBP are not yet known.

### Diagnostic testing required

Patients should receive a thorough history and physical examination to rule out the possibility of serious pathology related to CLBP.

### Indications and contraindications

Massage is indicated for a wide variety of conditions in which relief of pain, reduction of swelling, or mobilization of adhesive tissues are desired [1], including nonspecific mechanical CLBP. Massage is generally recognized as a safe intervention, with minimal risk of adverse events. Contraindications to massage include acute inflammation, skin infection, nonconsolidated fracture, burn area, deep

vein thrombosis, or active cancer tumor [10]. Precautions should be taken in patients using anticoagulant therapy and those diagnosed with hemophilia or myositis ossificans [11].

It is uncertain what patient characteristics are associated with improved outcomes when using massage therapy for CLBP. Profile of patients included in the randomized controlled trials (RCTs) which reported benefit of massage were adults (18 years and older) with nonspecific CLBP and without infection, neoplasm, metastasis, osteoporosis, rheumatoid arthritis, fracture, inflammatory process, or radicular syndrome. Prior studies have reported that gender, race, work status, and family income did not influence the outcomes obtained with massage therapy [5].

**Evidence of efficacy**

*Review methods*

The main objectives of this review were to assess the effectiveness of massage therapy in patients with nonspecific CLBP compared with placebo or other medical treatments, and assess the effectiveness of adding massage to other interventions for CLBP.

Studies were identified using a recent Cochrane systematic review on this topic [12], and an updated search of the electronic databases MEDLINE, EMBASE, and CENTRAL (Cochrane Library) from 2003 to July 2006 using the same search strategy; there was no language restriction in the search strategies.

After the search, results were combined and duplicates were removed. Two authors (ADF and MI) independently screened for study eligibility using the following criteria: 1) RCTs, 2) population including at least 50% with nonspecific CLBP, defined as pain more than 3 months with no identifiable cause, and 3) the intervention included massage.

The same two authors then reviewed full-text articles to perform quality assessment using 11 questions recommended by the Cochrane Back Review Group [13] (Table 1). Each item could be scored “no,” “yes,” or “don’t know.”

Table 1  
Methodological quality questions recommended by the Cochrane Collaboration Back Review Group

1.	Was the method of randomization adequate?
2.	Was the treatment allocation concealed?
3.	Were the groups similar at baseline regarding the most important prognostic indicators?
4.	Was the patient blinded to the intervention?
5.	Was the care provider blinded to the intervention?
6.	Was the outcome assessor blinded to the intervention?
7.	Were co-interventions avoided or similar?
8.	Was the compliance acceptable in all groups?
9.	Was the dropout rate described and acceptable?
10.	Was the timing of the outcome assessment in all groups similar?
11.	Did the analysis include an intention-to-treat analysis?

Disagreements were resolved by consensus. No primary study authors were consulted to obtain additional information. Studies fulfilling greater than or equal to six criteria were considered to be of higher quality. Two authors (ADF and MI) independently extracted data, including patient demographics, descriptions of treatments, and outcomes onto predesigned data extraction forms. A qualitative synthesis of data was conducted using the levels of evidence described by the Cochrane Back Review Group [13], which takes into consideration the number of trials, methodological quality, and outcome (Table 2).

*Systematic reviews*

A systematic review by Furlan et al. in 2002 [12] concluded that massage therapy might be beneficial for patients with nonspecific subacute or chronic low back pain (LBP), especially when combined with exercises and education. Evidence from that review also suggested that acupuncture massage is more effective than classic massage.

*Randomized controlled trials*

Our search resulted in 174 studies. Five were eligible, recently published RCTs (two high-quality and three low-quality studies) [14–18]. When added to studies identified in the recent Cochrane systematic review [12], a total of nine studies (n=1,196) were potentially eligible for this review (Table 3). Five studies (n=475) [19–23] were later excluded from the analysis because they included participants with only acute LBP [19], subacute LBP [21,23], less than 50% CLBP [20], or the number of CLBP patients was poorly described [22].

*Massage versus inert or sham therapy.* One high-quality study (n=104) [6] showed that massage alone is significantly better than sham low-level infrared laser for pain and function in the short term.

*Massage versus conventional physical therapy (PT).* One high-quality study (n=129) [18] and one low-quality study (n=146) [14] compared the effects of acupuncture massage

Table 2  
Levels of evidence

Level	Evidence	Supporting evidence
A	Strong	Generally consistent findings provided by (a systematic review of) multiple high-quality RCTs
B	Moderate	Generally consistent findings provided by (a systematic review of) multiple (at least four) low-quality RCTs, or at least two high-quality RCTs
C	Limited	One RCT (either of low or high quality) or inconsistent findings from (a systematic review of) multiple (at least four) RCTs
D	None	No RCTs

RCT=randomized controlled trial.

Table 3  
Characteristics of included studies

Study	Population	Interventions	Outcomes	Results
[25] Country: Germany Funding: Not reported Blinding: Not blinded Recruited: Not mentioned Randomized: 190 Followed: 179, 11 patients (5.8%) dropped out Analyses: Variance analysis with two factors Intention-to-treat analysis: No Quality score: 6/11	Mean age: 45 y % Female: 39% % White: Not described Work status: Active people, but not specified Pain duration: More than 1 y Previous surgery Diagnoses: Lumbar disc prolapsed without myelopathy, 28% LBP and 23% ischialgia	Massage technique  (1) Acupuncture massage according to Penzel: Treats one unique point with a special vibrating instrument that stimulates the acupuncture point superficially (not needle insertion) (2) Classic massage: Tonify and detonify muscle structures by increasing circulation in the skin and muscle, decrease adhesions  Experience of therapist  Acupuncture massage was carried out by certified therapist  Groups  Group 1: Acupuncture massage +individual exercises (n=46) Group 2: Acupuncture massage +group exercises (n=46) Group 3: Classic massage+individual exercises (n=49) Group 4: Classic massage+group exercises (n=49)  Both types of therapeutic exercises aimed at stretching, strengthening of the back muscles and at coordination training. They were performed in water and on land. In addition, the Brugger's physiotherapeutic concept was applied to correct the posture by tilting the pelvis anteriorly	Measured before and after the end of study. a) Pain: VAS (1 to 10 cm) b) Function: Hanover Function Score Questionnaire for LBP 0%–100%; lumbar flexion and extension (degrees) c) Overall improvement: Not measured d) Patient satisfaction: Not measured f) Adverse events: Not reported g) Costs: Not described h) Work-related: Not described	a) Pain  Group 1: From 5.4 to 3.57 Group 2: From 4.0 to 2.54 Group 3: From 4.2 to 3.20 Group 4: From 4.4 to 3.78b)  Function  Group 1: From 61.3 to 67.4 Group 2: From 65.7 to 73.5 Group 3: From 68.7 to 68.5 Group 4: From 68.0 to 67.7  Author's conclusions  "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 0.8 cm (VAS)"  Reviewer's comments  Important differences in baseline VAS between Groups 1 and 2; Differences between groups are not clinically important to justify implementation of acupuncture technique; no long-term follow-up a1) Pain (PPI)  Group 1: From 2.4 to 0.44 to 0.42 Group 2: From 2.2 to 1.04 to 1.18 Group 3: From 2.2 to 1.64 to 1.33 Group 4: From 2.0 to 1.65 to 1.75a2)  Pain (PRI)  Group 1: From 12.3 to 2.92 to 2.29 Group 2: From 10.6 to 5.24 to 4.55
[6] Country: Canada Funding: College of Massage Therapists of Ontario Blinding: Outcome assessor for ROM measurements Recruited: 165 Randomized: 104 Followed: 91 (85%)	Mean age: 46 y % Female: 51% % White: Not reported Work status: % In CMT group; STM group; RE group; Control group Not working or retired: 32; 28; 27; 15 Student: 4; 16; 9; 15 At desk mainly: 12; 24; 9; 19 At desk and movement: 36; 16; 27; 27	Massage technique  CMT: Various STM techniques such as friction trigger points and neuromuscular therapy to promote circulation and relaxation of spasm or tension. Duration=30 to 35 min. Six treatments within 1 mo STM only: This group received the same STM as the subjects in the CMT group	Measured at the end of all sessions and at 1 mo after the end of sessions a) Pain: PPI score: valid, reliable; PRI score: valid, reliable; McGill Pain Questionnaire b) Function: RDQ score: valid, reliable, sensible; modified Schoeber test c) Overall improvement: % Of patients with no pain at 1 mo follow-up	

Analyses: ANOVA (Scheffé post hoc) for comparisons between groups  
 Intention-to-treat analysis: “Yes” at the end of sessions, but “no” at 1-mo follow-up  
 Quality score: 7/11

Physical labor: 16; 16; 27; 23  
 Pain duration: 3 mo (1 wk to 8 mo)  
 Previous surgery: Not described  
 Diagnoses: Nonspecific LBP caused by bending or lifting injuries, work-related mild strains, sports injuries and unknown

RE only: 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 min of education on posture and body mechanics, particularly as they related to work and daily activities

Control group: Twenty minutes of SLL (infrared) therapy

Experience of therapist

More than 10 y experience massage therapists

Groups

Group 1: CMT, n=25  
 Group 2: STM only, n=25  
 Group 3: RE only, n=22  
 Group 4: Control group, n=26

Massage technique

Thirty-minute massage therapy sessions per week over 5 wk. Massage was applied to the entire back (moving hands, kneading and pressing of muscles, rubbing movements) and to the legs (long gliding strokes, kneading and moving the skin, pressing and releasing, back and forth subbing movements, short rubbing movements, and slow pulling of both legs

d) Patient satisfaction: Not measured  
 e) Adverse events: Not reported  
 f) Costs: CMT had the most benefit but cost \$60 more per subject than STM alone. The cost per subject in CTM was \$300 (six sessions at \$50) and \$240 for the SMT. The estimate cost per subject for RE and control group was \$90  
 g) Work-related: Not measured

Measured after first session and at the end of last session

a) Pain: VAS (0 to 10), Short-form McGill Pain Questionnaire  
 b) Function: Trunk ROM:  
 1) Trunk flexion (touch toes without pain),  
 2) Pain flexion (touch toes with pain)  
 c) Overall improvement: Not measured  
 d) Patient satisfaction: Not measured  
 e) Adverse events: Not described  
 f) Costs: Not measured  
 g) Work-related: Not measured

Group 3: From 10.2 to 7.91 to 5.19  
 Group 4: From 11.1 to 8.31 to 7.71b)

Function (RDQ)

Group 1: From 8.3 to 2.36 to 1.54  
 Group 2: From 8.6 to 3.34 to 2.86  
 Group 3: From 7.2 to 6.82 to 5.71  
 Group 4: From 7.2 to 6.85 to 6.50c)

Modified Schöber test

Group 1: From 5.6 to 6.36 to 6.47  
 Group 2: From 5.2 to 5.87 to 5.93  
 Group 3: From 5.3 to 5.86 to 5.39  
 Group 4: From 5.5 to 5.98 to 5.50d)

Overall improvement at 1 mo

Group 1: 63  
 Group 2: 27  
 Group 3: 14  
 Group 4: 0

Author’s conclusions

“massage is beneficial for patients with subacute low-back pain”

Reviewer’s comments

Mixed subacute and chronic LBP; outcome assessor was blinded only for physical measures, not for all outcome measures  
 VAS

Group 1: From 5.6 to 3.4 to 1.7  
 Group 2: From 4.5 to 3.7 to 2.9

McGill

Group 1: From 16.5 to 4.8 to 4.1  
 Group 2: From 16.7 to 6.9 to 6.4

ROM—trunk flexion (cm)

Group 1: From 56.0 to 61.2 to 61.4  
 Group 2: From 57.5 to 58.0 to 58.2

ROM—pain flexion (cm)

Group 1: From 57.7 to 59.5 to 61.3  
 Group 2: From 61.1 to 61.3 to 60.6

[24]  
 Country: USA  
 Funding: NIMH Research Scientist Award, NIMH Research Grant and Johnson and Johnson  
 Blinding: Not blinded (self-report for outcome assessment)  
 Recruited: not mentioned. Patients were self-referred.  
 Randomized: 24  
 Followed: 24 (no dropouts)  
 Analyses: MANOVAs and ANOVAs, and significant interactions were followed by Bonferroni

Mean age: 39.6 y  
 % Female: 13 (54.1%)  
 67% Caucasians  
 Work status: Not reported  
 Pain duration: At least 6 mo  
 Previous surgery: Not included in the study  
 Diagnoses: Not detailed

Table 3 (continued)

Study	Population	Interventions	Outcomes	Results
<p><i>t</i> tests for comparisons within groups Intention-to-treat analysis: No Quality score: /11</p> <p>[5] Country: USA Funding: Grants from Group Health Cooperative, The Group Health Foundation, Seattle, WA; and the John E. Fetzer Institute, Kalamazoo, Michigan; and by grant HS09351 from the Agency for Healthcare Research and Quality, Rockville, MD Blinding: Outcome assessor Recruited: 693 Randomized: 262 Followed: 252 received allocated treatment, 250 at 4 wk, 249 (95%) at 10 and 52 wk Analyses: ANCOVA for comparisons among three groups, with adjustment for baseline, using Sidak adjustment for multiple comparisons and confirmed by Kruskal-Wallis analysis Intention-to-treat analysis: Yes Quality score: 9/11</p>	<p>Mean age: 44.9 y % Female: 58% % White: 84% Work status: Employed or self-employed: 84% Pain duration: Continuous pain for the past year most patients. At least 6 wk duration. 61% lasted more than 1 y Previous surgery: 6% Diagnoses: Persistent back pain</p>	<p>Experience of therapist Trained massage therapist Groups Group 1: Massage (n=12) Group 2: Relaxation therapy: (control group): instruction on progressive muscle relaxation exercises for 30-min session at home twice a week for 5 wk (n=12) Massage technique Manipulation of soft tissue (ie, 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 Rolting) Experience of therapist Licensed therapist: At least 3 y of experience for massage and acupuncture groups Groups Group 1: Massage (n=78) Group 2: Acupuncture (n=94) Group 3: Self-care (n=90)</p>	<p>Other measures h) Stress measures: 1) Profile of Mood States Depression Scale, 2) State Anxiety Inventory i) Symptom Checklist-90 Revised j) Sleep scale k) Urine samples for cortisol, catecholamines, and serotonin levels When measured? 4, 10, 52 wk after randomization a) Pain: “Bothersomeness” back pain (0–10); Bothersomeness of numbness or tingling (0–10) b) Function: Modified Roland Morris Disability Scale; National Health Interview Survey c) Overall improvement: SF-12 Physical and Mental Health summary scales d) Patient satisfaction: Satisfaction with overall care for the back problem f) Adverse events: No serious adverse effects were reported. 13% in the massage group and 11% in the acupuncture group reported significant discomfort or pain during or shortly after treatment g) Costs: \$25 For each acupuncture and massage visit. Mean intervention cost per randomized patient: Group 1: \$352 Group 2: \$377 Group 3: \$50 Number of provider visits, pain medications and costs of outpatients Health Maintenance Organization back-</p>	<p>Author’s conclusions “massage therapy is effective in reducing pain, stress hormones and symptoms associated with chronic low back pain” Reviewer’s comments Poor description of patients, pain patterns, causes, and diagnosis. No short-term follow-up. Unknown losses to follow-up or withdrawals, intent-to treat analysis, co-interventions and contamination a) Pain: Symptom bothersomeness Group 1: From 6.2 to 4.5 to 3.6 to 3.2 Group 2: From 6.2 to 4.3 to 4.0 to 4.5 Group 3: From 6.1 to 4.9 to 4.6 to 3.8b) Function: Roland Morris Disability Group 1: From 11.8 to 7.9 to 6.3 to 6.8 Group 2: From 12.8 to 9.1 to 7.9 to 8.0 Group 3: From 12.0 to 9.3 to 8.8 to 6.4 Author’s conclusions “Therapeutic massage was effective for persistent low back pain, apparently providing long-lasting benefits. Massage might be an effective alternative to conventional medical care for persistent back pain” Reviewer’s comments Patients retained access to their usual medical care. Poor description of population, pain patterns, duration, and definition of CLBP</p>

<p>[14] Country: Taipei, Taiwan, China Funding: Not reported Blinding: Outcome assessor, however, pain is subjective and patient was not blinded Recruited: 250 Randomized: 146 Followed: Posttreatment=146; at 6 mo=121 Analyses: Independent <i>t</i> test for continuous variables; chi-square 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 Intention-to-treat analysis: Yes immediately after treatment, no at 6-mo follow-up Quality score: 5/11</p>	<p>Mean age: Acupressure group: 47.6 y; PT (control) group: 47.6 y Gender Acupressure group: 30 males, 39 females PT (control) group: 40 males, 37 females Ethnicity: Not reported (possible that all were Chinese patients) Work status (n) acupressure versus PT Labor 15 versus 10 Office 21 versus 31 Householder 21 versus 19 Other 12 versus 17 Pain duration: 67% Of patients over 6 mo (range 1 mo to over 10 y) Previous surgery: Not reported Diagnoses: Not detailed</p>	<p>Massage technique Six acupressure sessions over a 4- wk period, lasting approximately 15 min (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 PT (n=77) included thermotherapy, infrared light therapy, electrical stimulation, exercise therapy, and pelvic manual traction (no more details were reported)</p>	<p>care services were about 40% lower in the massage group than in the other groups h) Work-related Measured at baseline, then immediately after six sessions of treatment, and at the 6-mo follow-up a) Pain - Pain visual scale (0–5) - Pain score based on the validated Chinese version of SF-PQ, 15-item: each descriptor was ranked on a intensity from 0 (none) to 3 (severe). Summation of these 15 intensity scale numbers yielded a pain score for each patient (range 0–45) b) Function: Not measured c) Overall improvement: Not measured d) Patient satisfaction: Not measured f) Adverse events: Not reported in the acupressure group g) Costs: Not reported h) Work-related outcomes: Not reported</p>	<p>a) Pain score Group 1: From 9.29 to 2.28 to 1.08 Group 2: From 7.68 to 5.13 to 3.15a) SF-PQ Pain descriptors: Significant difference between groups Posttreatment: throbbing, shooting, stabbing, sharp, cramping, aching, sickening, punishing-cruel At 6-mo follow-up: cramping, aching, tiring, exhausting Author's conclusions “Our results suggest that acupressure is another effective alternative medicine in reducing LBP, although the standard operating procedures involved with acupressure treatment should be carefully assessed in the future” Reviewer's comments Co-interventions during treatment and follow-up not reported; patients and care providers not blinded to interventions; interventions and clinical settings not well described; clinically effective benefits not defined; no functional or disability outcome measures, results of pain visual scale not reported a) Pain (VAS) Group 1: From 58.8 to 30.6 to 16.1 Group 2: From 57.0 to 48.0 to 41.4b1) Function (Roland and Morris) Group 1: From 10.9 to 5.4 to 2.2 Group 2: From 10.0 to 9.2 to 6.7b2) Function (Oswestry) Group 1: From 24.4 to 17.0 to 12.2</p>
<p>[18] Country: Taiwan, China Funding: None Blinding: Outcome assessor Recruited: 188 Randomized: 129 Followed: 122 at 1 mo; 109 at 6 mo Analyses: For comparisons between groups: 1) Wilcoxon rank sum test (Roland and Morris), jack-knife method to calculate 95% confidence intervals. 2) ANCOVA</p>	<p>Mean age: 50.2 y in the acupressure group; 52.6 y in the PT 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)</p>	<p>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</p>	<p>Measured at baseline, after six sessions of treatment and at 6 mo follow-up a) Pain: VAS (01–100) b) Function: 1) Roland and Morris disability questionnaire (primary outcome) (range: 0–24); 2) modified ODQ c) Overall improvement: Chinese version of the standard core outcome measures (degree of how bothersome)</p>	

(Continued)

Table 3 (continued)

Study	Population	Interventions	Outcomes	Results
<p>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</p> <p>Intention-to-treat analysis: Yes, for participants lost to follow-up, baseline values were assumed at posttreatment and 6 mo follow-up. All 129 randomized patients were analyzed</p> <p>Quality score: 7/11</p>	<p>Heaver labor 9 (14) versus 8 (12)</p> <p>Other 20 (31) versus 33 (51)</p> <p>Pain duration: Median (range) time since onset of pain (y): acupressure group: 3.3 (0.2–33.3) versus PT group: 1.6 (0.2–34.3)</p> <p>Median (range) length of latest pain period (mo): acupressure group: 14.5 (0.02–360) versus PT group: 12 (0.25–432)</p> <p>Previous surgery: None (inclusion criteria)</p> <p>Diagnoses: CLBP over 4 mo by orthopedic surgeon</p>	<p>Groups</p> <p>Group 1: Acupressure (n=64 randomized to this group)</p> <p>Group 2: Conventional PT received in routine PT offered by the orthopedic 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)</p>	<p>d) Patient satisfaction: As part of the core outcome measures: satisfaction of life with symptoms; satisfaction with previous treatment</p> <p>e) Adverse events: Not reported</p> <p>f) Costs: Not reported</p> <p>g) Work-related: As part of the core outcome measures: pain interferes with normal work, days cut down on doing things, days off from work/school</p>	<p>Group 2: From 21.1 to 20.6 to 17.9c)</p> <p>Satisfaction of life with symptom</p> <p>Group 1: From 1.39 to 2.38 to 3.63</p> <p>Group 2: From 1.57 to 1.97 to 2.95d)</p> <p>Days off work</p> <p>Group 1: From 4.2 to 1.5 to 0.6</p> <p>Group 2: From 3.3 to 3.5 to 2.5</p> <p>Author's conclusions</p> <p>“This study shows that acupressure is more efficacious in alleviating low back pain than is PT, as measured by pain visual analogue scale, core outcome measures, Roland and Morris disability questionnaire and Oswestry disability questionnaire”</p> <p>Reviewer's comments</p> <p>Acupressure intervention and clinical setting not described in detail; patients not blinded to intervention and outcome evaluations; care providers not blinded, adjuvant therapy not described; clinically important change not defined. Twenty (15.5%) patients lost to follow-up at 6 mo</p> <p>a) Pain (VAS)</p> <p>Group 1: From 6.38 to 3.95</p> <p>Group 2: From 5.70 to 5.62</p> <p>Mean ratio change:</p> <p>Group 1: 39% Reduction in VAS</p> <p>Group 2: Unchanged pain intensityb)</p> <p>Function</p> <p>ROM (p=.01)</p> <p>Group 1: 4% Improvement</p> <p>Group 2: 1% Decline</p> <p>Walking time (p=.05):</p> <p>Group 1: 9% Improvement</p> <p>Group 2: 3% Decline</p> <p>Insignificant interference with daily activities</p>
<p>[15]</p> <p>Country: Hong Kong, China</p> <p>Funding: Partial support of the School of Nursing, Departmental Research Committee for this study</p> <p>Blinding: Not blinded</p> <p>Recruited: 61</p> <p>Randomized: 61</p> <p>Followed: 51 (84%)</p> <p>Analyses: Mean ratio change=X2/X1, where X2 was the mean score after 1-wk follow-up, X1 was the mean score at baseline, comparison between groups by Mann-Whitney <i>U</i> test</p> <p>Intention-to-treat analysis: No</p> <p>Quality score: 4/11</p>	<p>Mean age: 45.81 y</p> <p>% Female: 97%</p> <p>Ethnicity: Not reported, but assume all Chinese</p> <p>Work status: Not reported</p> <p>Pain duration: Of current episode:</p> <p>Group 1: 39.16 h</p> <p>Group 2: 51.45 h</p> <p>Previous surgery: Not reported</p> <p>Diagnoses: Nonspecific subacute LBP</p> <p>defined as pain on most days in the past 4 wk, in the area between the lower coastal margins and the gluteal folds without known specific cause, such as a spinal deformity</p>	<p>Massage technique</p> <p>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 (four bilateral) fixed acupoints for 2 min each: San-Jiao-Shu (UB22), Shen-Shu (UB23), Da-Chang-Shu (UB25), and Wei-Zhong (UB40); for 35–40 min, eight times over a 3-wk period</p> <p>Before massage</p> <p>Ten-minute ‘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</p>	<p>Measured at baseline and 1 wk after the end of treatment</p> <p>a) Pain: VAS: primary outcome</p> <p>b) Function: ROM of lateral spine flexion (lateral fingertip-to-ground distance in cm), walking time for 15 m (50 ft); interference in daily activities (modified Aberdeen LBP scale—effect of LBP on sleeping, walking distance, housework/work, and leisure-time activities).</p> <p>Higher scores mean greater interference</p> <p>c) Overall improvement: Not measured</p> <p>d) Patient satisfaction: Not measured</p>	



[16]  
 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 posttreatment; 172 at 1-mo follow-up  
 Analyses: Paired *t* tests for comparisons immediately before and after treatment and follow-ups. ANCOVA for comparisons between groups  
 Intention-to-treat analysis: “Yes” as stated by authors, but “no” because not all randomized patients were analyzed  
 Quality score: 8/11

Mean age: 36.4 y  
 % Female: 114 (63%)  
 % White: Not reported  
 Work status: heavy work: n=9 (5%); lighter work: n=171 (95%)  
 Pain duration: 35.7 mo  
 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

bilateral acupoints [Shou-San-Li (LI10), Qu-Chi (LI11), Nao-Shu (SI10), Tian-Liao (TW15), and Tian-Zhu (BL10)]

Experience of therapist

Nurse trained in Chinese Medicinal Nursing. The precision of the acupressure was confirmed by deqi

Groups

Group 1: Acupressure massage (n=32 randomized to this group)  
 Group 2: Usual care only (not described in detail) (n=29)

Massage technique

TTM 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; used 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 5–10 s at a time, for 30 min, 10 min passive stretching for six sessions over a period of 3–4 wk

Experience of therapist

4, 8, and 20 y of experience

Groups

Group 1: TTM: 90 randomized to this group

e) Adverse events: No adverse effects were reported  
 f) Costs: Not reported  
 g) Work-related: Part of Aberdeen scale

Measured

at 1) baseline, 2) Immediately after first treatment; 3) during intervention period=3 wk; and 4) 1 mo after last treatment  
 a) Pain: VAS  
 b) Function: Thai version of the ODQ; PPT algometry; Thoracolumbar ROM, body flexibility (sit-and-reach box) at baseline, immediately after first treatment, 3-wk, and 1-mo follow-up  
 c) Overall improvement: Not measured  
 d) Patient satisfaction: Four-point scale (1 completely dissatisfied; to 4 very satisfied); % of very satisfied  
 e) Adverse events: Soreness, allergic reaction (rashes and pimples) to the massage oil  
 f) Costs: Not reported  
 g) Work-related: Not measured

Author’s conclusions

“Our results show that 8-sessions of acupoint 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 subacute 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”

Reviewer’s comment

No report on allocation concealment; patients and care providers not blinded to intervention and assessment; co-interventions not described; 16% lost to follow-up  
 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 2.5b)

Function

ODQ (baseline, 3-wk and 1 mo follow-up):  
 Group 1: From 20.7 to 13.8 to 13.4  
 Group 2: From 20.7 to 15.4 to 13.9

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 3.6c)

Patient satisfaction

Group 1: 83% Day 1; 88% Week 3  
 Group 2: 86% Day 1; 82% Week 3

Author’s 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

Table 3 (continued)

Study	Population	Interventions	Outcomes	Results
		Group 2: SM: 90 randomized to this group		alternative primary health-care treatments for this disorder”  Reviewer’s comments  Comparison between two massage techniques (no inactive control group); patients could be blinded to which technique they were receiving 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 4.29b)  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 42.50c)  Satisfaction with overall therapy Group 1: 6.3 Group 2: 6.0 Group 3: 5.1 Group 4: 5.9
[17]	Mean age: 40.7 y 41% Female 85% White 34% Not working because of pain Pain duration: Mean 76.9 mo 18% Had previous surgery Diagnoses: Not reported	Massage  Muscle energy technique weekly for 5 wk  Experience of therapists  Physical therapist with 12 y postgraduate training in manual medicine  Groups Group 1: Massage + specific exercises (n=26 randomized to this group) Group 2: Massage + nonspecific exercises (n=24) Group 3: Sham massage + specific exercises (n=25) Group 4: Sham massage + nonspecific exercises (n=25)	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) VAS b) Function: b1) Quebec Back Pain Disability Scale and b2) Interference subscale of the Multidimensional Pain Inventory c) Overall improvement: Not measured d) Patient satisfaction: Four questions with seven-point Likert scale f) Adverse events: Not measured g) Costs: Not measured h) Work-related: Not measured	Author’s 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”  Reviewer’s comments  Patients not described in details, 28% dropouts, small improvement (clinically relevant), no big difference among groups (does it justify the costs?)

LBP=low back pain; SM=Swedish massage; VAS=visual analogue scale; ROM=range of motion; ANOVA=analysis of variance; CMT=comprehensive massage therapy; STM=Soft-tissue manipulation; RE=Remedial exercise; PPI=present pain index; PRI=pain rating index; RDQ=Roland Disability Questionnaire; CLBP=chronic low back pain; PT=physical therapy; SF-PQ=Short-Form Pain Questionnaires; TTM=traditional Thai massage; ODQ=Oswestry disability questionnaire; PPT=pressure pain threshold; NIMH=National Institute of Mental Health; MANOVA=multivariate analyses of variance; ANCOVA=Analysis of covariance; MANCOVA=Multivariate analysis of covariance.

with conventional care as decided by the physical therapist (eg, pelvic manual traction, spinal manipulation, thermo-therapy, infrared light therapy, electrical stimulation, and exercise therapy). There is moderate evidence that acupressure is significantly better than standard PT for pain as measured by visual analogue scale, core outcome measures, Roland and Morris disability questionnaire, and Oswestry disability index questionnaire.

*Massage versus exercise.* One high-quality study (n=104) [6] showed that massage was significantly better than exercise for 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.

*Massage versus relaxation therapy.* One low-quality study (n=24) [24] showed that pain improved with either massage or relaxation therapy, but more so on the first day of treatment. Only the massage group experienced less pain immediately after their first and last treatment sessions.

*Massage versus acupuncture.* One high-quality trial (n=262) [5] showed that patients in the massage group had significantly better function than patients in the acupuncture group after 10 weeks, with no significant differences in pain, numbness, or tingling. At 52 weeks, massage was superior to acupuncture for both symptoms and function.

*Massage versus self-care education.* One high-quality study (n=262) [5] showed that patients in the massage group had fewer symptoms (pain, numbness, and tingling) and better function compared with the self-care education group after 10 weeks. These differences were not maintained at 52 weeks.

*Massage versus usual care.* One low-quality study (n=61) [15] showed that eight sessions of acupressure stimulation followed by acupressure with aromatic lavender oil is an effective method for short-term pain relief compared with usual care.

*Massage+other interventions.* Two high-quality studies (n=294) [6,25] and one low-quality study (n=100) [17] assessed the effects of massage added to specific versus non-specific exercises [17], individual versus group exercises [25], or exercise and education [6]. One study [25] observed a marked improvement in the group that received both acupressure and group exercise. Acupressure improved pain and function in both individual and group exercises. Most decrease in pain occurred in the acupressure plus individual exercise group and the mean difference between acupressure and classic massage groups was 7.0% for function and 8.0% for visual analogue scale. Classic massage did not change function. One study [17] showed that massage therapy combined with specific adjuvant

exercise appears to be beneficial but despite changes in pain, perceived function did not improve. One study [6] showed that patients who received massage combined with exercises and education were significantly better than those who received only exercises for both function and pain on short- and long-term follow-up. Massage combined with exercise and education was significantly better than sham laser for pain and function on both short- and long-term follow-up. However, massage combined with exercise and education was better than massage alone only for pain in the short term.

#### *Different techniques of massage*

Two higher quality studies (n=370) [16,25] compared two different massage techniques. Franke et al. [25] compared acupressure versus classic (SM) massage, combined with individual or group exercise. This study showed that acupressure was superior to classic massage (irrespective of exercise group) for pain and function. Chatchawan et al. [16] compared Traditional Thai massage with SM. Both groups had equal expected effectiveness. In eight studies [5,6,14–18,24], massage was done by hands, whereas in one study [25] massage was performed using a mechanical device. There was no clear benefit of one technique over the other.

#### *Experience of 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 [5,6,14–18,24]. No conclusion could be made regarding the effects of the number and duration of sessions because of lack of information or study heterogeneity.

#### *Work-related outcomes*

One high-quality study (n=129) [18] and one low-quality study (n=61) [15] evaluated work-related outcome measures. Mean scores for pain interfering with normal work, days cut down on doing things, and days off from work or school were significantly lower for acupressure than PT. Electrical stimulation of acupuncture points followed by acupressure with aromatic lavender oil had no effect on housework/work and leisure time [15].

#### **Harms**

No serious adverse events were reported by any of the patients in the studies reviewed. Some massage techniques such as deep friction, compression, or ischemic compression might produce postmassage soreness [5] and ecchymosis [26]. In one high-quality study (n=180) [16], 19 (11%) participants reported temporary (10–15 minutes) soreness after treatment in Days 1 and 22 (12%) after treatment in

Week 3. In another high-quality study (n=78) [5], 10 (13%) participants reported significant discomfort or pain during or shortly after treatment. When massage oil was applied, allergic reaction such as rashes or pimples occurred in five participants (6%) [16].

## Recommendations

There is strong evidence that massage is effective for non-specific CLBP. There is moderate evidence that massage provides short- and longer-term follow-up relief of symptoms. There is moderate evidence that acupressure may be better than SM, especially if combined with exercise; and SM shows the same effects as Traditional Thai massage.

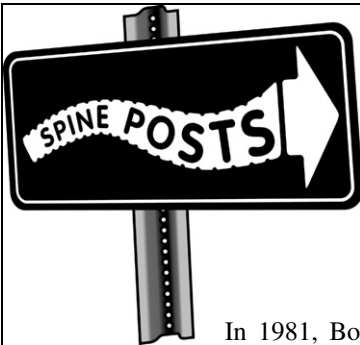
Massage is beneficial for patients with CLBP in terms of improving symptoms and function. Although massage therapy may appear costly, it may save money by reducing health-care provider visits, use of pain medications, and costs of back-care services. The effects of massage are improved if combined with exercise and education and if massage is delivered by a licensed therapist. The beneficial effects of massage in patients with CLBP are long lasting (at least 1 year after the end of sessions). Although it seems that acupressure is better than classic massage, this needs confirmation.

There is still uncertainty about the mechanisms of action of massage therapy, if it is related to endorphin release, to a relaxation effect, or both. More research is needed to determine the type of massage that is indicated for different presentations, such as patients with higher baseline pain scores, muscle spasm, sleep disturbances, stress, and anxiety symptoms. It is important to assess whether patient's beliefs and expectations play a role on the response of massage therapy. Future trials should also investigate the synergic effect of massage and other therapies such as exercise, acupuncture, medications, etc. There is some evidence suggesting that training and experience of the massage therapist might influence outcomes, and this needs to be confirmed in further high-quality trials. There is uncertainty about the most appropriate duration and number of sessions of massage therapy; therefore, future studies are encouraged to assess the effectiveness of different regimens of therapy. There is a paucity of high-quality studies that assess the cost effectiveness of massage therapy. Last, researchers should pay attention to the introduction of bias when measuring subjective outcomes (such as pain) on patients who are unblinded to the intervention they received. Future studies using an inert control group should also control for the possible effects of interpersonal contact and support provided during massage therapy.

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## 25 Years Ago in Spine

In 1981, Bogduk et al. [1] sought to establish and describe the source and pattern of innervation of the lumbar intervertebral discs and their related longitudinal ligaments, particularly those of the anterior longitudinal ligament and the lateral aspects of the discs.

After macroscopic and microscopic studies, then histological verification of neural tissues and vascular structures, the authors traced the innervation patterns of the sinuvertebral nerves, rami communicantes, branches to the anterior longitudinal ligament, and branches innervating the lateral surfaces of the intervertebral discs.

Consistent with the results of previous studies, the authors determined that the lumbar sinuvertebral nerves have a predominately ascending distribution and that multiple rami may occur at any or at all levels. In contrast to the findings of other studies (that specific muscular branches of rami communicantes from the sympathetic trunk end in the substance of psoas), the authors determined that all rami penetrating the substance of psoas were traceable ultimately to a ventral primary ramus.

The nerves to the anterior longitudinal ligament arise independently from rami communicans and the sympathetic

trunk. They are related to the sinuvertebral nerves only in as much as they are connected at opposite ends of a common ramus communicans and it would be erroneous to consider them to be recurrent branches of the sinuvertebral nerves; instead, the sinuvertebral nerves are distributed exclusively within the vertebral canal and no branches pass from them to the external aspects of the vertebral column.

The authors demonstrated that the axis cylinders in nerves passing to discs vary in dimension, and that the possible anatomical pathways for disc pain are diffuse. The branches from ventral primary rami and rami communicantes provide an anatomical substrate for anterior and lateral disc pain, and the dorsally situated sinuvertebral nerves are not the only nerves supplying lumbar intervertebral discs.

Although unable to demonstrate all three types of disc branch at every single level and to recognize other branches to discs and ligaments (which was attributed to a limitation of the technique used rather than to a true absence of such nerves), the authors believed they were able to delineate the general pattern of innervation. In particular, they confirmed a source of innervation from the ventral primary rami of spinal nerves, a source described only once previously in the literature [2] but unconfirmed by histological study.

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