

Nonpharmacologic Therapies for Acute and Chronic Low Back Pain: A Review of the Evidence for an American Pain Society/American College of Physicians Clinical Practice Guideline

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Background: Many nonpharmacologic therapies are available for treatment of low back pain.

Purpose: To assess benefits and harms of acupuncture, back schools, psychological therapies, exercise therapy, functional restoration, interdisciplinary therapy, massage, physical therapies (interferential therapy, low-level laser therapy, lumbar supports, short-wave diathermy, superficial heat, traction, transcutaneous electrical nerve stimulation, and ultrasonography), spinal manipulation, and yoga for acute or chronic low back pain (with or without leg pain).

Data Sources: English-language studies were identified through searches of MEDLINE (through November 2006) and the Cochrane Database of Systematic Reviews (2006, Issue 4). These electronic searches were supplemented by hand searching of reference lists and additional citations suggested by experts.

Study Selection: Systematic reviews and randomized trials of 1 or more of the preceding therapies for acute or chronic low back pain (with or without leg pain) that reported pain outcomes, back-specific function, general health status, work disability, or patient satisfaction.

Data Extraction: We abstracted information about study design, population characteristics, interventions, outcomes, and adverse events. To grade methodological quality, we used the Oxman criteria for systematic reviews and the Cochrane Back Review Group criteria for individual trials.

Data Synthesis: We found good evidence that cognitive-behavioral therapy, exercise, spinal manipulation, and interdisciplinary rehabil-

itation are all moderately effective for chronic or subacute (>4 weeks' duration) low back pain. Benefits over placebo, sham therapy, or no treatment averaged 10 to 20 points on a 100-point visual analogue pain scale, 2 to 4 points on the Roland-Morris Disability Questionnaire, or a standardized mean difference of 0.5 to 0.8. We found fair evidence that acupuncture, massage, yoga (Viniyoga), and functional restoration are also effective for chronic low back pain. For acute low back pain (<4 weeks' duration), the only nonpharmacologic therapies with evidence of efficacy are superficial heat (good evidence for moderate benefits) and spinal manipulation (fair evidence for small to moderate benefits). Although serious harms seemed to be rare, data on harms were poorly reported. No trials addressed optimal sequencing of therapies, and methods for tailoring therapy to individual patients are still in early stages of development. Evidence is insufficient to evaluate the efficacy of therapies for sciatica.

Limitations: Our primary source of data was systematic reviews. We included non-English-language trials only if they were included in English-language systematic reviews.

Conclusions: Therapies with good evidence of moderate efficacy for chronic or subacute low back pain are cognitive-behavioral therapy, exercise, spinal manipulation, and interdisciplinary rehabilitation. For acute low back pain, the only therapy with good evidence of efficacy is superficial heat.

Ann Intern Med. 2007;147:492-504.

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Many nonpharmacologic therapies are available for treatment of low back pain. In 1 study of primary care clinicians, 65% reported recommending massage therapy; 55% recommended therapeutic ultrasonography; and 22% recommended, prescribed, or performed spinal manipulation (1). In another study, 38% of patients with spine disorders were referred to a physical therapist for exercise therapy, physical therapies, or other interventions (2). Other noninvasive interventions are also available, including psychological therapies, back schools, yoga, and interdisciplinary therapy.

Clinicians managing low back pain vary substantially in the noninvasive therapies they recommend (3). Although earlier reviews found little evidence demonstrating efficacy of most noninvasive therapies for low back pain (4–6), many more randomized trials are now available. This article summarizes current evidence on noninvasive therapies for low back pain in adults. It is part of a larger evidence review commissioned by the American Pain Society and the American College of Physicians to guide rec-

ommendations for management of low back pain (7). Pharmacologic therapies are reviewed in a separate article in this issue (8).

METHODS

Data Sources and Searches

An expert panel convened by the American Pain Society and American College of Physicians determined which

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nonpharmacologic therapies would be included in this review. **Appendix Table 1** (available at www.annals.org) shows the 17 therapies chosen by the panel and how we defined and grouped them. Several therapies that have not been studied in the United States or are not widely available (such as acupressure, neuroreflexotherapy, spa therapy, and percutaneous electrical nerve stimulation) are reviewed in the complete evidence review (7). Therapies solely involving advice or back education are also reviewed separately, as are surgical and interventional pain procedures.

We searched MEDLINE (1966 through November 2006) and the Cochrane Database of Systematic Reviews (2006, Issue 4) for relevant systematic reviews, combining terms for low back pain with a search strategy for identifying systematic reviews. When higher-quality systematic reviews were not available for a particular intervention, we conducted additional searches for primary studies (combining terms for low back pain with the therapy of interest) on MEDLINE, the Cochrane Central Register of Controlled Trials, and PEDro. Full details of the search strategies are available in the complete evidence report (7). Electronic searches were supplemented by reference lists and additional citations suggested by experts. We did not include trials published only as conference abstracts.

Evidence Selection

We included all randomized, controlled trials meeting all of the following criteria: 1) reported in English, or in a non-English language but included in an English-language systematic review; 2) evaluated nonpregnant adults (>18 years of age) with low back pain (alone or with leg pain) of any duration; 3) evaluated a target therapy; and 4) reported at least 1 of the following outcomes: back-specific function, generic health status, pain, work disability, or patient satisfaction (9, 10).

We excluded trials of low back pain associated with acute major trauma, cancer, infection, the cauda equina syndrome, fibromyalgia, and osteoporosis or vertebral compression fracture.

Because of the large number of studies on therapies for low back pain, our primary source for trials was systematic reviews. When multiple systematic reviews were available for a target therapy, we excluded outdated systematic reviews, which we defined as systematic reviews with a published update or those published before 2000. When a higher-quality systematic review was not available for a particular therapy, we included all relevant randomized, controlled trials. We also supplemented systematic reviews with data from recent, large (>250 patients) trials.

Data Extraction and Quality Assessment

For each included systematic review, we abstracted information on search methods; inclusion criteria; methods for rating study quality; characteristics of included studies; methods for synthesizing data; and results, including the number and quality of trials for each comparison and outcome in patients with acute (<4 weeks' duration) low back

pain, chronic/subacute (>4 weeks' duration) low back pain, and back pain with sciatica. If specific data on duration of trials were not provided, we relied on the categorization (acute or chronic/subacute) assigned by the systematic review. For each trial not included in a systematic review, we abstracted information on study design, participant characteristics, interventions, and results.

We considered mean improvements of 5 to 10 points on a 100-point visual analogue pain scale (or equivalent) to be small or slight; 10 to 20 points, moderate; and more than 20 points, large or substantial. For back-specific functional status, we classified mean improvements of 2 to 5 points on the Roland-Morris Disability Questionnaire (RDQ; scale, 0 to 24) and 10 to 20 points on the Oswestry Disability Index (ODI; scale, 0 to 100) as moderate (11). We considered standardized mean differences of 0.2 to 0.5 to be small or slight; 0.5 to 0.8, moderate; and greater than 0.8, large (12). Some evidence suggests that our classification of mean improvements and standardized mean differences for pain and functional status are roughly concordant in patients with low back pain (13–18). Because few trials reported the proportion of patients meeting specific thresholds (such as >30% reduction in pain score) for target outcomes, it was usually not possible to report numbers needed to treat for benefit. When those were reported, we considered a relative risk of 1.25 to 2.00 for the proportion of patients reporting greater than 30% pain relief to indicate a moderate benefit.

Two reviewers independently rated the quality of each included trial. Discrepancies were resolved through joint review and a consensus process. We assessed internal validity (quality) of systematic reviews by using the Oxman criteria (**Appendix Table 2**, available at www.annals.org) (19, 20). According to this system, systematic reviews receiving a score of 4 or less (on a scale of 1 to 7) have potential major flaws and are more likely to produce positive conclusions about effectiveness of interventions (20, 21). We classified such systematic reviews as “lower quality”; those receiving scores of 5 or more were graded as “higher quality.”

We did not abstract results of individual trials if they were included in a higher-quality systematic review. Instead, we relied on results and quality ratings for the trials as reported by the systematic reviews. We considered trials receiving more than half of the maximum possible quality score to be “higher quality” for any quality rating system used (22, 23).

We assessed internal validity of randomized clinical trials not included in a higher-quality systematic review by using the criteria of the Cochrane Back Review Group (**Appendix Table 3**, available at www.annals.org) (24). When blinding was not feasible, we removed blinding of providers (for studies of acupuncture, spinal manipulation, and massage) or blinding of patients and providers (for studies of back schools, exercise, psychological interventions, interdisciplinary rehabilitation, and functional resto-

ration) as a quality criterion; thus, the maximum score was 10 or 9, respectively. We considered trials receiving more than half of the total possible score to be “higher quality” and those receiving less than or equal to half to be “lower quality” (22, 23).

Data Synthesis

We assessed overall strength of evidence for a body of evidence by using methods adapted from the U.S. Preventive Services Task Force (25). To assign an overall strength of evidence (good, fair, or poor), we considered the number, quality and size of studies; consistency of results among studies; and directness of evidence. Minimum criteria for fair and good quality ratings are shown in **Appendix Table 4** (available at www.annals.org).

Consistent results from many higher-quality studies across a broad range of populations support a high degree of certainty that the results of the studies are true (the entire body of evidence would be considered good quality). For a fair-quality body of evidence, results could be due to true effects or to biases operating across some or all of the studies. For a poor-quality body of evidence, any conclusion is uncertain.

To evaluate consistency, we classified conclusions of trials and systematic reviews as positive (the therapy is beneficial), negative (the therapy is harmful or not beneficial), or uncertain (the estimates are imprecise, the evidence unclear, or the results inconsistent) (20). We defined “inconsistency” as greater than 25% of trials reaching discordant conclusions (positive vs. negative), 2 or more higher-quality systematic reviews reaching discordant conclusions, or unexplained heterogeneity (for pooled data).

Role of the Funding Source

The funding source had no role in the design, conduct, or reporting of this review or in the decision to publish the manuscript.

RESULTS

Size of Literature Reviewed

We reviewed 1292 abstracts identified by searches for systematic reviews of low back pain. Of these, 96 seemed potentially relevant and were retrieved. A total of 40 systematic reviews (26–70) met inclusion criteria (see **Appendix Table 5** for quality ratings and **Appendix Table 6** for characteristics and results of the systematic reviews that evaluated efficacy; both are available at www.annals.org). We excluded 59 systematic reviews (71–129), most frequently because they met our criteria for outdated reviews or did not report results for patients with low back pain (**Appendix Table 7**, available at www.annals.org). Five recent, large (>200 patients) trials of acupuncture (130–132) and spinal manipulation or exercise (133, 134) supplemented the systematic reviews.

We found no systematic reviews of interferential therapy, low-level laser therapy, shortwave diathermy, ultra-

sonography, or yoga for low back pain. We identified 532 citations from 5 searches for randomized trials of these interventions. Three trials of interferential therapy (135–137), 7 trials of low-level laser therapy (138–144), 3 trials of shortwave diathermy (145–147), 3 trials of ultrasonography (148–150), and 3 trials of yoga (151–153) met inclusion criteria.

Spinal Manipulation, Massage, and Acupuncture

Spinal Manipulation

Sixty-nine unique trials on efficacy of spinal manipulation were included in 12 systematic reviews (15, 55–63, 68–71). Four other systematic reviews focused on harms associated with spinal manipulation (21, 64–67).

For acute low back pain, a higher-quality Cochrane review found spinal manipulation to be slightly to moderately superior to sham manipulation for short-term pain relief in a meta-regression analysis (weighted mean difference, –10 points on a 100-point visual analogue scale [95% CI, –17 to –2 points]) (15, 55). However, this estimate is mainly based on a lower-quality trial of patients with acute or subacute sacroiliac pain (154). Short-term effects on the RDQ (2 trials, 1 higher-quality) were moderate but did not reach statistical significance (weighted mean difference, –2.8 points [CI, –5.6 to 0.1 points]). Differences between spinal manipulation and therapies judged ineffective or harmful (traction, bed rest, home care, topical gel, no treatment, diathermy, and minimal massage) did not reach clinical significance for pain (weighted mean difference, –4 points [CI, –8 to –1 points]) and reached clinical but not statistical significance on the RDQ (weighted mean difference, –2.1 points [CI, –4.4 to 0.2 points]). There were no clear differences between spinal manipulation and usual care or analgesics (3 trials), physical therapy or exercises (5 trials), and back schools (2 trials).

For chronic low back pain, the Cochrane review found spinal manipulation moderately superior to sham manipulation (3 trials) and therapies thought to be ineffective or harmful (5 trials). Against sham manipulation, differences in short- and long-term pain averaged 10 and 19 points on a 100-point visual analogue scale, and differences for short-term function averaged 3.3 points on the RDQ. There were no differences between manipulation and general practitioner care or analgesics (6 trials), physical therapy or exercises (4 trials), and back school (3 trials). Evidence was insufficient to conclude that effectiveness of spinal manipulation varies depending on the presence or absence of radiating pain or the profession or training of the manipulator.

Five higher-quality systematic reviews reached conclusions generally consistent with those of the Cochrane review (58, 60, 61, 69, 70). Two recent, large trials (133, 134) not included in the systematic reviews also reported consistent results (**Appendix Table 8**, available at www.annals.org [130, 132–134, 155]). For low back pain of

unspecified duration, 1 higher-quality trial (681 patients) found no differences in pain, functional status, or other outcomes between patients randomly assigned to chiropractic versus medical management (133). The other trial (1334 patients) found spinal manipulation to be slightly superior to usual care for pain and disability (about 5 points on 100-point scales) after 3 months in patients with subacute or chronic low back pain, although effects were not as pronounced after 12 months, and differences on the RDQ did not reach clinical significance (about 1 point) (134). Manipulation and exercise did not significantly differ, and the addition of manipulation to exercise therapy was no better than exercise alone.

Two lower-quality systematic reviews found spinal manipulation superior to some other effective interventions (57, 68). However, these conclusions were based on sparse data (1 to 3 trials, often lower-quality and often with small sample sizes).

Five systematic reviews consistently found that serious adverse events after spinal manipulation (such as worsening lumbar disc herniation or the cauda equina syndrome) were very rare (64–67, 69). One systematic review found no serious complications reported in more than 70 controlled clinical trials (65). Including data from observational studies, the risk for a serious adverse event was estimated as less than 1 per 1 million patient visits (66, 67).

One higher-quality randomized trial evaluated a decision tool for identifying patients more likely to benefit from spinal manipulation (156). It found that patients who met at least 4 of 5 predefined criteria had a higher likelihood of greater than 50% improvement in ODI scores when randomly assigned to spinal manipulation (odds ratio [OR], 60.8 [CI, 5.2 to 704.7]) compared with those who had negative findings according to the rule who were randomly assigned to manipulation (OR, 2.4 [CI, 0.83 to 6.9]) and those with positive findings according to the rule who were randomly assigned to exercise (OR, 1.0 [CI, 0.28 to 3.6]). However, no studies have examined how applying the decision tool versus not using the tool affects clinical outcomes, and the decision tool may not be practical for many primary care settings because it requires the clinician to perform and interpret potentially unfamiliar physical examination maneuvers and administer a specific questionnaire. A more pragmatic version of the decision tool has not been prospectively validated (157).

Massage

Eight unique trials of massage were included in 2 systematic reviews (26, 27, 69). For acute low back pain, evidence is insufficient to determine efficacy of massage (1 lower-quality trial evaluating a minimal massage intervention [158]). One higher-quality trial found combined treatment with massage, exercise, and education to be superior to exercise and education alone for subacute or chronic low back pain 1 month after treatment (159).

For chronic low back pain, a higher-quality Cochrane review found no clear differences between massage and manipulation at the end of a course of treatment (3 lower-quality trials) (26, 27). Superficial massage was inferior to transcutaneous electrical nerve stimulation (TENS) for relieving pain in 1 higher-quality trial (160). Single trials found massage similar in effectiveness to corsets and exercise and moderately superior to relaxation therapy, acupuncture, sham laser, and self-care education (26, 27). Nearly all trials assessed outcomes only during or shortly after (within 1 month) a course of treatment. However, 1 higher-quality trial found that beneficial effects of massage compared with acupuncture and self-care education persisted for 1 year (161). Results of a second systematic review are consistent with the Cochrane review (69).

Only 1 trial (rated higher-quality) directly compared different massage techniques. It found acupuncture massage superior to classical (Swedish) massage (162). Massage seemed more effective in trials that used a trained massage therapist with many years of experience or a licensed massage therapist (26, 27). Evidence was insufficient to determine effects of the number or duration of massage sessions on efficacy. Several trials with negative results evaluated superficial massage techniques, brief treatment sessions (10 to 15 minutes), or few sessions (<5).

Acupuncture

Fifty-one unique trials on efficacy of acupuncture were included in 3 systematic reviews (16–18, 69). All of the systematic reviews identified substantial methodological shortcomings in most trials. About one third of the trials were conducted in Asia. A fourth systematic review focused on adverse events associated with acupuncture and included observational studies (163).

For acute low back pain, 2 higher-quality systematic reviews found sparse, inconclusive evidence from 4 small trials on efficacy of acupuncture versus sham acupuncture or other interventions (16–18).

For chronic low back pain, both systematic reviews found acupuncture moderately more effective than no treatment or sham treatments for short-term (<6 weeks' [16] or <3 months' [17, 18] duration) pain relief. Acupuncture was also associated with moderate short-term improvements in functional status compared with no treatment (standardized mean differences, 0.62 [CI, 0.30 to 0.95] [16], and 0.63 [CI, 0.19 to 1.08] [17, 18]), but not compared with sham therapies. A recent, higher-quality trial not included in the systematic reviews found no differences between acupuncture and sham acupuncture for pain or function (**Appendix Table 8**, available at www.annals.org) (130).

Evidence of longer-term benefits from acupuncture is mixed. Acupuncture was moderately superior for long-term (>6 weeks' duration) pain relief compared with sham TENS in 2 trials and compared with no additional treat-

ment in 5 trials, although there were no significant differences compared with sham acupuncture (16). One higher-quality trial found no differences in pain 1 year after acupuncture therapy compared with provision of a self-care education book (161). A higher-quality trial not included in the systematic reviews found clinically insignificant differences (<5 points on 100-point scales) between acupuncture and no acupuncture for pain and function after 6 months (**Appendix Table 8**, available at www.annals.org) (132). Another recent, higher-quality trial found acupuncture slightly superior to usual care on Short Form-36 pain scores after 24 months (weighted mean difference, 8 points [CI, 0.7 to 15.3 points]) and for recent use of medications for low back pain (60% vs. 41%), although ODI scores and other outcomes did not differ (131).

Efficacy does not clearly differ between acupuncture and massage, analgesic medication, or TENS (each evaluated in 1 to 4 trials) (16–18). Although 2 trials found acupuncture inferior to spinal manipulation for short-term pain relief, both were rated lower-quality (16). The addition of acupuncture to a variety of noninvasive interventions significantly improved pain and function through 3 to 12 months in 4 higher-quality trials (17, 18).

Few higher-quality trials directly compared different acupuncture techniques. One trial found deep-stimulation acupuncture to be superior to superficial stimulation for immediate outcomes (164). Another found no difference between manual acupuncture and electroacupuncture (165).

Only 14 of 35 trials of acupuncture reported any complications or side effects (17, 18). Minor complications occurred in 5% (13 of 245) of patients receiving acupuncture. A systematic review of acupuncture for various conditions (data from >250 000 treatments) found wide variation in rates of adverse events, ranging from 1% to 45% for needle pain and 0.03% to 38% for bleeding (163). Feelings of faintness and syncope occurred after 0% to 0.3% of treatments. Serious adverse events were rare. Pneumothorax was reported in 2 patients, and there were no cases of infections.

Exercise Therapy, Yoga, and Back Schools

Exercise Therapy

Seventy-nine unique trials of exercise therapy were included in 6 systematic reviews (34–40).

For acute low back pain, a higher-quality Cochrane review found exercise therapy superior to usual care or no treatment in 2 of 9 trials (35, 36). Among trials that could be pooled, exercise therapy and no exercise did not differ for pain relief or functional outcomes. There were also no differences between exercise therapy and other noninvasive treatments for acute low back pain or between exercise therapy and placebo or usual care for subacute low back pain.

For chronic low back pain (43 trials), the Cochrane review found exercise slightly to moderately superior to no

treatment for pain relief at earliest follow-up (weighted mean difference, 10 points on a 100-point scale [CI, 1.31 to 19.09 points]), although not for functional outcomes (35, 36). Results were similar at later follow-up. Exercise therapy was associated with statistically significant but small effects on pain (weighted mean difference, 5.93 points [CI, 2.21 to 9.65 points]) and function (weighted mean difference, 2.37 points [CI, 0.74 to 4.0 points]) compared with other noninvasive interventions.

Three systematic reviews were less comprehensive than the Cochrane review but reached consistent conclusions (34, 38, 40). A fourth, higher-quality systematic review focusing on work outcomes (14 trials) found that exercise slightly reduced sick leave during the first year (standardized mean difference, -0.24 [CI, -0.36 to -0.11]) and improved the proportion of patients who had returned to work at 1 year (relative risk, 1.37 [CI, 1.05 to 1.79]), although no benefit was observed in the severely disabled subgroup (>90 days of sick leave) or in patients receiving disability payments (37).

Results of a large (1334 patients), recently published trial are consistent with those of the systematic reviews (**Appendix Table 8**, available at www.annals.org) (134). It found exercise therapy to be marginally superior to usual care for pain and disability in patients with low back pain for more than 28 days, but no differences were seen between exercise therapy and manipulation.

The authors of the Cochrane review also conducted a meta-regression analysis and found that exercise therapy using individualized regimens, supervision, stretching, and strengthening was associated with the best outcomes (36). They estimated that exercise therapy incorporating all of these features would improve pain scores by 18.1 points (95% credible interval, 11.1 to 25.0 points) compared with no treatment and would improve function by 5.5 points (95% credible interval, 0.5 to 10.5 points). However, no trials of such an intervention have been conducted. The Cochrane review also found addition of exercise to other noninvasive therapies to be associated with small improvements in pain (about 5 points on a 100-point scale) and function (about 2 points on a 100-point scale). One recent, higher-quality systematic review found no clear differences between the McKenzie method and other exercise regimens (39).

Yoga

We identified no systematic reviews of yoga for low back pain. From 27 citations, 3 trials (all in patients with chronic low back pain) met inclusion criteria (**Appendix Table 9**, available at www.annals.org) (151–153). One higher-quality trial (101 patients) found 6 weeks of Viniyoga (a therapeutically oriented style) to be slightly superior to conventional exercise (mean difference in RDQ scores, -1.8 [CI, -3.5 to -0.1]) and moderately superior to a self-care education book (mean difference in RDQ

scores, -3.4 [CI, -5.1 to -1.6]) in terms of RDQ scores at 12 weeks, but only superior to the self-care book at 26 weeks (mean difference in RDQ scores, -3.6 [CI, -5.4 to -1.8]) (152). Effects on symptom bothersomeness scores were similar at 12 weeks for all 3 interventions, although yoga was substantially superior to the self-care book at 26 weeks (mean difference, -2.2 on a 0 to 10 scale [CI, -3.2 to -1.2]). Yoga was also associated with decreased medication use at week 26 (21% of patients) compared with exercise (50%) and the self-care book (59%), although the rate of back pain–related health care provider visits did not differ.

Two lower-quality, smaller trials (60 and 22 patients) evaluated Iyengar yoga, a commonly practiced style of Hatha yoga that frequently uses physical props (151, 153). Results were inconclusive. Although 1 trial found Iyengar yoga more effective than exercise instruction for reducing disability through 3 months after treatment, effects on pain were small and were statistically significant only when adjusted for baseline differences (153). The other, smaller trial found no significant differences between Iyengar yoga and standard exercise (151).

Back Schools

Thirty-one unique trials of back schools were included in 3 systematic reviews (28–31). For acute or subacute low back pain, a higher-quality Cochrane review (19 trials) included 1 lower-quality trial (166) that found back schools superior to sham diathermy for short-term recovery and return to work, but not for pain or long-term recurrences (29, 30).

For chronic low back pain, the Cochrane review found inconsistent evidence on efficacy of back schools versus placebo or wait-list controls (8 trials), although most studies found no benefits (29, 30). Results were generally better in trials of back schools conducted in an occupational setting and for more intensive programs based on the original Swedish back school, although benefits were small. Conclusions of 2 other systematic reviews of back schools are consistent with those of the Cochrane review (28, 31).

Psychological Therapies, Interdisciplinary Rehabilitation, and Functional Restoration

Psychological Therapies

Thirty-five unique trials of psychological therapies for chronic low back pain were included in 2 systematic reviews (32, 33). One of the systematic reviews included trials of psychological therapies as part of interdisciplinary therapy (32).

A higher-quality Cochrane review (33) included 4 trials (1 higher-quality [167]) that found cognitive-behavioral therapy to be moderately superior to a wait-list control for short-term pain intensity (standardized mean difference, 0.59 [CI, 0.10 to 1.09]), but not for functional status (standardized mean difference, 0.31 [CI, -0.20 to 0.82]). It also included 2 lower-quality trials that found progres-

sive relaxation to be associated with large effects on short-term pain (standardized mean difference, 1.16 [CI, 0.47 to 1.85]) and behavioral outcomes (standardized mean difference, 1.31 [CI, 0.61 to 2.01]). Results in the electromyography biofeedback group compared with those in the wait-list control group were mixed. Although 3 trials found biofeedback superior for pain intensity (standardized mean difference, 0.84 [CI, 0.32 to 1.35]), a fourth trial found no differences. There were no differences between patients receiving operant treatment and wait-list control participants. Conclusions of another higher-quality systematic review (22 trials) are consistent with those of the Cochrane review (32).

No differences were seen between psychological therapies and other active therapies (such as exercise or usual care) for most outcomes, although 1 systematic review found small to moderate effects on short-term (standardized mean difference, 0.36 [CI, 0.06 to 0.65]; 3 trials) and long-term (standardized mean difference, 0.53 [CI, 0.19 to 0.86]; 4 trials) disability (32).

Psychological therapies did not improve outcomes when added to a variety of other noninvasive therapies (6 lower-quality trials), although diversity in both psychological and nonpsychological therapies limits interpretability of this finding (33).

Interdisciplinary Rehabilitation and Functional Restoration

Twenty-eight unique trials were included in 4 systematic reviews of interdisciplinary rehabilitation (43–47) or functional restoration (41, 42). For subacute low back pain, a higher-quality Cochrane review found interdisciplinary rehabilitation with a workplace visit more effective than usual care for subacute low back pain, but only 2 lower-quality trials were included (45, 46).

For chronic low back pain, a second higher-quality Cochrane review included 3 trials (1 higher-quality) that found intensive (>100 hours), daily interdisciplinary rehabilitation to be moderately superior to noninterdisciplinary rehabilitation or usual care for short- and long-term functional status (standardized mean differences, -0.40 to -0.90 at 3 to 4 months and -0.56 to -1.07 at 60 months) (43, 44). Interdisciplinary rehabilitation was also moderately superior for pain outcomes at 3 to 4 months in 2 trials (standardized mean differences, -0.56 and -0.74 , respectively), although long-term (60 months) results were inconsistent (standardized mean differences, -0.51 and 0.00 , respectively) (168, 169). Evidence was also inconsistent regarding effects on return to work and sick leave. In contrast to more intensive interventions, less intensive interdisciplinary rehabilitation was no better than noninterdisciplinary rehabilitation or usual care (5 trials, 2 higher-quality) (43, 44). A smaller (5 trials) systematic review reported results consistent with those of the Cochrane review (47).

Functional restoration often involves a multidisci-

plinary component (41, 42). For acute low back pain, a higher-quality Cochrane review found functional restoration no better than usual care, normal activities, or standard exercise therapy in 3 trials (2 higher-quality) (41, 42). For chronic low back pain, the Cochrane review found functional restoration with a cognitive-behavioral component more effective than usual care, normal activities, or standard exercise therapy for reducing time lost from work, but little evidence that functional restoration without a cognitive-behavioral component is effective.

Physical Therapies

Interferential Therapy

We identified no systematic reviews of interferential therapy for low back pain. From 8 citations, 3 trials met inclusion criteria (**Appendix Table 9**, available at www.annals.org) (135–137). In 2 trials (1 higher-quality [136]), there were no clear differences between interferential therapy and either spinal manipulation or traction for subacute or chronic back pain (137). A third, lower-quality trial found interferential therapy superior to a self-care book for improvements in RDQ scores in patients with subacute low back pain, but it reported large baseline differences (135). Median RDQ scores after 3 months were identical in the 2 groups.

Low-Level Laser Therapy

We identified no systematic reviews of low-level laser therapy for low back pain. From 218 citations, 7 trials met inclusion criteria (**Appendix Table 9**) (138–144). The trials were generally small (20 to 120 patients) and evaluated heterogeneous outcome measures and different types of lasers at varying doses. In addition, language or publication bias is possible because low-level laser therapy is more commonly used in Russia and Asia.

For chronic low back pain or back pain of unspecified duration, 4 trials (138, 141, 143, 144) (3 higher-quality) found laser therapy superior to sham for pain or functional status up to 1 year after treatment, but another higher-quality trial (140) found no differences between laser and sham in patients also receiving exercise. One lower-quality trial found laser, exercise, and the combination of laser plus exercise similar for pain and back-specific functional status (139).

One trial reported 1 transient adverse event in both the laser and sham laser groups (138). In a systematic review of low-level laser therapy for various musculoskeletal conditions, 6 of 11 trials evaluating higher doses reported no adverse events (95).

Lumbar Supports

Six trials of lumbar supports for treatment of low back pain were included in a higher-quality Cochrane review (48, 49). For low back pain of unspecified duration, the Cochrane review found insufficient evidence from 1 small (30 patients), lower-quality trial (170) to assess efficacy of a

lumbar support compared with no lumbar support. For chronic or subacute low back pain, 1 higher-quality trial found lumbar support to be superior to superficial massage for RDQ scores, but not for ODI scores or pain relief (171, 172). There were no differences between lumbar support and spinal manipulation or transcutaneous muscular stimulation. Evidence from 3 lower-quality trials was insufficient to determine efficacy of lumbar supports compared with other interventions (48, 49).

Shortwave Diathermy

We identified no systematic reviews of shortwave diathermy for low back pain. From 14 citations, 3 lower-quality trials met inclusion criteria (**Appendix Table 9**, available at www.annals.org) (145–147). For acute low back pain, 1 small (24 patients) trial found shortwave diathermy to be inferior to spinal manipulation for pain relief after 2 weeks, but no details about the diathermy intervention were provided (146). For chronic low back pain (145) or low back pain lasting more than 1 week (147), 2 trials found no differences between shortwave diathermy versus sham diathermy or spinal manipulation (145) or shortwave diathermy versus sham diathermy, extension exercises, or traction (147).

Superficial Heat

Nine trials of superficial heat or cold were included in a higher-quality Cochrane review (50). For acute low back pain, the Cochrane review found consistent evidence from 3 higher-quality trials that heat wrap therapy or a heated blanket is moderately superior to placebo or a nonheated blanket for short-term pain relief and back-specific functional status. A higher-quality trial (173) also found heat wrap therapy to be moderately superior to oral acetaminophen or ibuprofen for short-term (3 to 4 days' duration) pain relief (differences of 0.66 and 0.93 on a 6-point scale, respectively) and RDQ scores (differences of about 2 points). For acute low back pain, another higher-quality trial (174) found heat wrap therapy superior to an educational booklet, but not exercise, for early pain relief, although benefits were no longer present after 1 week. Adverse events in trials of superficial heat were minor and mainly consisted of mild skin irritation (50).

Traction

Twenty-four unique trials of traction were included in 3 systematic reviews (51–53, 70). For low back pain of varying duration (with or without sciatica) a higher-quality Cochrane review included 2 higher-quality trials (175–177) that found traction no more effective than placebo, sham, or no treatment for any reported outcome (51, 52). For sciatica of mixed duration, autotraction was more effective than placebo, sham, or no treatment in 2 lower-quality trials (178, 179), but continuous or intermittent traction was not effective (8 trials, 1 higher-quality [180]). There was no clear evidence that various types of traction are

more effective than other interventions (51, 52). Two other systematic reviews found no evidence traction is effective (70) or insufficient evidence to draw reliable conclusions (53).

Adverse events associated with traction include aggravation of neurologic signs and symptoms and subsequent surgery, but these were inconsistently and poorly reported (harms were not mentioned in 16 of 24 trials) (51, 52).

TENS

Eleven unique trials of TENS were included in a higher-quality Cochrane review of TENS (54) and 5 systematic reviews of other interventions (15, 16, 26, 27, 50–52, 55). For chronic low back pain, the Cochrane review included 1 lower-quality trial that found TENS superior to placebo, but a larger, higher-quality trial (181) found no differences between TENS and sham TENS for any measured outcome (54). A systematic review of acupuncture for low back pain also found no difference in short- or long-term pain relief between TENS and acupuncture in 4 trials (16). One higher-quality trial found TENS superior to superficial massage (160). Evidence from single, lower-quality trials is insufficient to accurately judge efficacy of TENS versus other interventions for chronic low back pain or for acute low back pain. For subacute low back pain, 1 higher-quality trial found TENS moderately inferior to spinal manipulation for subacute low back pain (171, 172).

The Cochrane review found that one third of patients randomly assigned to either active or sham TENS had minor skin irritation, with 1 patient (in the sham group) discontinuing therapy because of severe dermatitis (54).

Ultrasonography

We identified no systematic reviews of ultrasonography for low back pain. From 265 potentially relevant citations, 3 lower-quality trials met inclusion criteria (**Appendix Table 9**, available at www.annals.org) (148–150). For chronic low back pain (148) or low back pain of unspecified duration (150), 2 small (10 and 36 patients, respectively) trials reported inconsistent results for ultrasonography versus sham ultrasonography, with the larger trial reporting no differences. For acute sciatica, a nonrandomized trial (73 patients) found ultrasonography superior to sham ultrasonography or analgesics for pain relief, with patients in all groups also prescribed bed rest (149).

DISCUSSION

This review synthesizes evidence from systematic reviews and randomized, controlled trials of 17 nonpharmacologic therapies for low back pain. Nearly all therapies were evaluated in patients with nonspecific low back pain or in mixed populations of patients with and without sciatica. Main results are summarized in **Appendix Table 10** (acute low back pain), **Appendix Table 11** (chronic or subacute low back pain), and **Appendix Table 12** (back

pain with sciatica) (all appendix tables are available at www.annals.org).

We found good evidence that psychological interventions (cognitive-behavioral therapy and progressive relaxation), exercise, interdisciplinary rehabilitation, functional restoration, and spinal manipulation are effective for chronic or subacute (>4 weeks' duration) low back pain. Compared with placebo or sham therapies, these interventions were associated with moderate effects, with differences for pain relief in the range of 10 to 20 points on a 100-point visual analogue pain scale, 2 to 4 points on the RDQ, or a standardized mean difference of 0.5 to 0.8. The exception was exercise therapy, which was associated with small to moderate (10 points on a 100-point visual analogue pain scale) effects on pain. We found fair evidence that acupuncture is more effective than sham acupuncture, and fair evidence that massage is similar in efficacy to other noninvasive interventions for chronic low back pain. We found little evidence of clinically meaningful, consistent differences between most interventions found effective. One exception was intensive interdisciplinary rehabilitation, which was moderately more effective than noninterdisciplinary rehabilitation for improving pain and function. We also found fair evidence that Vinyoga is slightly superior to traditional exercises for functional status and use of analgesic medications.

For acute low back pain (<4 weeks' duration), the only nonpharmacologic therapies with evidence of efficacy are superficial heat (good evidence for moderate benefits) and spinal manipulation (fair evidence for small to moderate benefits). Other noninvasive therapies (back schools, interferential therapy, low-level laser therapy, lumbar supports, TENS, traction, and ultrasonography) have not been shown to be effective for either chronic or subacute or acute low back pain.

We found only rare reports of serious adverse events for all of the noninvasive therapies evaluated in this review. However, assessment and reporting of harms were generally suboptimal. For example, less than half of the trials of acupuncture reported adverse events (17). Better reporting of harms is needed for more balanced assessments of interventions (182).

Our evidence synthesis has several potential limitations. First, because of the large number of published trials, our primary source of data was systematic reviews. The reliability of systematic reviews depends on how well they are conducted. We therefore focused on findings from higher-quality systematic reviews, which are less likely than lower-quality systematic reviews to report positive findings (20, 21). In addition, when multiple recent systematic reviews were available for an intervention, we found overall conclusions to be generally consistent. Second, we only included randomized, controlled trials for assessments of efficacy. Although well-conducted randomized, controlled trials are less susceptible to bias than other study designs, nearly all trials were conducted in ideal settings and se-

lected populations, usually with short-term follow-up. “Effectiveness” trials in less highly selected populations could provide additional information on benefits in real-world practice. Third, language bias could affect our results because we included non-English-language trials only if already included in English-language systematic reviews. However, systematic reviews of acupuncture included Asian-language trials (16, 17), and systematic reviews of other interventions with no language restrictions identified few non-English-language studies (55, 183). Fourth, reliable assessments for potential publication bias were not possible for most of the interventions included in this review because of small numbers of trials (184). For the interventions evaluated in the most trials, assessments of potential publication bias varied. Funnel plot asymmetry was present in trials of exercise therapy (36), was not present in trials of spinal manipulation (15) or behavioral therapy (32), and could not be reliably interpreted for trials of acupuncture (16). Finally, we did not include cost-effectiveness analyses. Although many noninvasive interventions for chronic low back pain appear to have similar effects on clinical outcomes, other factors, such as cost or convenience, may vary widely. However, systematic reviews of economic analyses of low back pain interventions have found few full cost-effectiveness analyses and important methodological deficiencies in the available cost studies (185–188).

We also identified several research gaps that limited our ability to reach more definitive conclusions about optimal use of the interventions included in this review. We found no trials on optimal sequencing of interventions, and only limited evidence on methods to guide selection of therapy for individual patients. Although initial studies are promising, decision tools and other methods for individualizing and selecting optimal therapy are still in fairly early stages of development (156). More research on methods for selecting optimal therapy that are practical for use by primary care clinicians is urgently needed. We also found few trials assessing efficacy of adding one noninvasive intervention to another. Although several trials found acupuncture plus another therapy to be more effective than the other therapy alone, other trials found little or no additional benefit from adding exercise therapy (36), behavioral interventions (33), or spinal manipulation (134) to other therapies. Finally, few trials specifically evaluated patients with sciatica (Appendix Table 12, available at www.annals.org) or spinal stenosis. One systematic review of interventions for sciatica identified only 8 trials of therapies included in this review (70). Most trials included in our review enrolled mixed populations of patients with or without sciatica, or did not enroll patients with sciatica. It remains unclear whether optimal nonpharmacologic treatments for sciatica or spinal stenosis differ from those for nonspecific low back pain, although in the case of spinal manipulation, presence or absence of radiating pain did not appear to affect conclusions (55).

In summary, evidence of effective nonpharmacologic therapies for acute low back pain is quite limited. This is not surprising, as the natural history of acute low back pain is for substantial early improvement in most patients (125). On the other hand, several noninvasive therapies seem to be similarly effective for chronic low back pain. Although evidence on effectiveness of therapies specifically for subacute low back pain is sparse (125), many trials enrolled mixed populations of patients with subacute and chronic low back pain. Factors to consider when choosing among noninvasive therapies are patient preferences, cost, convenience, and availability of skilled providers for specific therapies. Clinicians should avoid interventions not proven effective, as many therapies have at least fair evidence of moderate benefits.

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Disclaimer: No statement in this article should be construed as an official position of the American Pain Society.

Acknowledgments: The authors thank Jayne Schablaske and Michelle Pappas for administrative support.

Grant Support: This article is based on research conducted at the Oregon Evidence-based Practice Center, with funding from the American Pain Society.

Potential Financial Conflicts of Interest: None disclosed.

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Appendix Table 1. Included Interventions

Intervention	Definition
Spinal manipulation	Manual therapy in which loads are applied to the spine using short- or long-lever methods. High-velocity thrusts are applied to a spinal joint beyond its restricted range of movement. Spinal mobilization, or low-velocity, passive movements within or at the limit of joint range, is often used in conjunction with spinal manipulation.
Massage	Soft tissue manipulation using the hands or a mechanical device through a variety of specific methods.
Acupuncture	An intervention consisting of the insertion of needles at specific acupuncture points.
Exercise therapy	A supervised exercise program or formal home exercise regimen, ranging from programs aimed at general physical fitness or aerobic exercise to programs aimed at muscle strengthening, flexibility, or stretching.
Yoga	An intervention distinguished from traditional exercise therapy by the use of specific body positions, breathing techniques, and emphasis on mental focus. Many styles of yoga are practiced, each emphasizing different postures and techniques.
Back schools	An intervention consisting of an education and a skills program, including exercise therapy, in which all lessons are given to groups of patients and supervised by a paramedical therapist or medical specialist. The original Swedish back school was introduced by Zachrisson Forsell in 1969.
Psychological therapies	Includes biofeedback (the use of auditory and visual signals reflecting muscle tension or activity to inhibit or reduce the muscle activity), progressive relaxation (a technique that involves the deliberate tensing and relaxation of muscles to facilitate the recognition and release of muscle tension), and standard cognitive-behavioral and operant therapy.
Interdisciplinary therapy (also called <i>multidisciplinary therapy</i>)	An intervention that combines and coordinates physical, vocational, and behavioral components and is provided by multiple health care professionals with different clinical backgrounds. The intensity and content of interdisciplinary therapy varies widely.
Functional restoration (also called <i>physical conditioning, work hardening, or work conditioning</i>)	An intervention that involves simulated or actual work tests in a supervised environment in order to enhance job performance skills and improve strength, endurance, flexibility, and cardiovascular fitness in injured workers.
Physical therapies	
Interferential therapy	The superficial application of a medium-frequency alternating current modulated to produce low frequencies up to 150 Hz.
Low-level laser therapy	The superficial application of lasers at wavelengths of 632–904 nm. Optimal treatment parameters (wavelength, dosage, dose intensity) are uncertain.
Lumbar supports	A back brace or orthotic device worn to passively support the back.
Shortwave diathermy	Therapeutic elevation of the temperature of deep tissues by application of shortwave electromagnetic radiation with a frequency range of 10–100 MHz.
Superficial heat	The superficial application of heat to the lumbar area.
Traction	An intervention involving drawing or pulling to stretch the lumbar spine. A variety of methods are used and usually involve a harness around the lower rib cage and around the iliac crest, with the pulling action performed by using free weights and a pulley, motorized equipment, inversion techniques, or an overhead harness.
Transcutaneous electrical nerve stimulation	Use of a small battery-operated device to provide continuous electrical impulses via surface electrodes, with the goal of relieving symptoms by modifying pain perception.
Ultrasonography	The therapeutic application of high-frequency sound waves up to 3 MHz.

Appendix Table 2. Quality Rating System for Systematic Reviews

Criteria for Assessing Scientific Quality of Research Reviews*

1. Were the search methods reported?
Were the search methods used to find evidence (original research) on the primary questions stated?
"Yes" if the review states the databases used, date of most recent searches, and some mention of search terms.
2. Was the search comprehensive?
Was the search for evidence reasonably comprehensive?
"Yes" if the review searches at least 2 databases and looks at other sources (e.g., reference lists, hand searches, queries of experts).
3. Were the inclusion criteria reported?
Were the criteria used for deciding which studies to include in the overview reported?
4. Was selection bias avoided?
Was bias in the selection of studies avoided?
"Yes" if the review reports how many studies were identified by searches, numbers excluded, and appropriate reasons for excluding them (usually because of predefined inclusion/exclusion criteria).
5. Were the validity criteria reported?
Were the criteria used for assessing the validity of the included studies reported?
6. Was validity assessed appropriately?
Was the validity of all the studies referred to in the text assessed by using appropriate criteria (either in selecting studies for inclusion or in analyzing the studies that are cited)?
"Yes" if the review reports validity assessment and did some type of analysis with it (e.g., sensitivity analysis of results according to quality ratings, excluded low-quality studies).
7. Were the methods used to combine studies reported?
Were the methods used to combine the findings of the relevant studies (to reach a conclusion) reported?
"Yes" for studies that did qualitative analysis if report mentions that quantitative analysis was not possible and reasons that it could not be done, or if "best evidence" or some other grading of evidence scheme used.
8. Were the findings combined appropriately?
Were the findings of the relevant studies combined appropriately relative to the primary question the overview addresses?
"Yes" if the review performs a test for heterogeneity before pooling or does appropriate subgroup testing, appropriate sensitivity analysis, or other such analysis.
9. Were the conclusions supported by the reported data?
Were the conclusions made by the author(s) supported by the data and/or analysis reported in the overview?
10. What was the overall scientific quality of the overview?
How would you rate the scientific quality of this overview?

Operationalization of Criteria

The purpose of this index is to evaluate the scientific quality (i.e., adherence to scientific principles) of research overviews (review articles) published in the medical literature. It is not intended to measure literary quality, importance, relevance, originality, or other attributes of overviews.

The index is for assessing overviews of primary ("original") research on pragmatic questions regarding causation, diagnosis, prognosis, therapy, or prevention. A research overview is a survey of research. The same principles that apply to epidemiologic surveys apply to overviews: A question must be clearly specified; a target population identified and accessed; appropriate information obtained from that population in an unbiased fashion; and conclusions derived, sometimes with the help of formal statistical analysis, as is done in meta-analyses. The fundamental difference between overviews and epidemiologic studies is the unit of analysis, not the scientific issues that the questions in this index address.

Because most published overviews do not include a methods section, it is difficult to answer some of the questions in the index. Base your answers, as much as possible, on information provided in the overview. If the methods that were used are reported incompletely relative to a specific question, score it as "can't tell," unless there is information in the overview to suggest that the criterion was or was not met.

For question 8, if no attempt has been made to combine findings, and no statement is made regarding the inappropriateness of combining findings, check "No." If a summary (general) estimate is given anywhere in the abstract, the discussion, or the summary section of the paper, and it is not reported how that estimate was derived, mark "No" even if there is a statement regarding the limitations of combining the findings of the studies reviewed. If in doubt, mark "Can't tell."

For an overview to be scored as "Yes" in question 9, data (not just citations) must be reported that support the main conclusions regarding the primary question(s) that the overview addresses.

The score for question 10, the overall scientific quality, should be based on your answers to the first 9 questions. The following guidelines can be used to assist with deriving a summary score: If the "Can't tell" option is used 1 or more times on the preceding questions, a review is likely to have minor flaws at best and it is difficult to rule out major flaws (i.e., a score ≤ 4). If the "No" option is used on question 2, 4, 6, or 8, the review is likely to have major flaws (i.e., a score ≤ 3 , depending on the number and degree of the flaws).

Scoring: Each Question Is Scored as Yes, Partially/Can't Tell, or No

Extensive Flaws		Major Flaws		Minor Flaws		Minimal Flaws	
1	2	3	4	5	6	7	

* Operationalization of the Oxman criteria (19), adapted from reference (20).

Appendix Table 3. Quality Rating System for Randomized, Controlled Trials*

Criteria List for Assessment of Methodologic Quality†	Operationalization of Criteria	Score
A. Was the method of randomization adequate?	A random (unpredictable) assignment sequence. An example of adequate methods is a computer-generated random-number table and use of sealed opaque envelopes. Methods of allocation using date of birth, date of admission, hospital numbers, or alternation should not be regarded as appropriate.	Yes/No/Don't Know
B. Was the treatment allocation concealed?	Assignment generated by an independent person not responsible for determining the eligibility of the patients. This person has no information about the persons included in the trial and has no influence on the assignment sequence or on the decision about eligibility of the patient.	Yes/No/Don't Know
C. Were the groups similar at baseline regarding the most important prognostic factors? "Yes", if similar: Age and sex Description of type of pain Intensity, duration, or severity of pain	To receive a "yes," groups have to be similar at baseline regarding demographic factors, duration or severity of symptoms, percentage of patients with neurologic symptoms, and value of main outcome measure(s).	Yes/No/Don't Know
D. Was the patient blinded to the intervention?	The reviewer determines whether enough information about the blinding is given in order to score a "yes." Use the author's statement on blinding, unless there is a differing statement/reason not to (no need for explicit information on blinding).	Yes/No/Don't Know
E. Was the care provider blinded to the intervention?		Yes/No/Don't Know
F. Was the outcome assessor blinded to the intervention?		Yes/No/Don't Know
G. Were co-interventions avoided or similar?	Co-interventions should be avoided in the trial design or similar between the index and control groups.	Yes/No/Don't Know
H. Was adherence acceptable in all groups?	The reviewer determines whether adherence to the interventions is acceptable, based on the reported intensity, duration, number, and frequency of sessions for both the index intervention and control intervention(s).	Yes/No/Don't Know
I. Was the dropout rate described and acceptable? ≤15% dropout rate is acceptable	The number of participants who are included in the study but did not complete the observation period or were not included in the analysis must be described and reasons given. If the percentage of withdrawals and dropouts does not exceed 15% and does not lead to substantial bias, a "yes" is scored.	Yes/No/Don't Know
J. Was the timing of the outcome assessment in all groups similar?	Timing of outcome assessment should be identical for all intervention groups and for all important outcome assessments.	Yes/No/Don't Know
K. Did the analysis include an intention-to-treat analysis? "Yes," if <5% of randomly assigned patients excluded	All randomly assigned patients are reported/analyzed in the group they were allocated to by randomization for the most important moments of effect measurement (minus missing values), irrespective of nonadherence and co-interventions.	Yes/No/Don't Know

* This list includes only the 11 internal validity criteria that refer to characteristics of the study that might be related to selection bias (criteria A and B), performance bias (criteria D, E, G, and H), attrition bias (criteria I and K), and detection bias (criteria F and J). The internal validity criteria should be used to define methodological quality in the meta-analysis.

† Adapted from methods developed by the Cochrane Back Review Group (24).

Appendix Table 4. Methods for Grading the Overall Strength of Evidence for an Intervention*

Grade	Definition
Good	Evidence includes consistent results from well-designed, well-conducted studies in representative populations that directly assess effects on health outcomes (at least 2 consistent, higher-quality trials).
Fair	Evidence is sufficient to determine effects on health outcomes, but the strength of the evidence is limited by the number, quality, size, or consistency of included studies; generalizability to routine practice; or indirect nature of the evidence on health outcomes (at least 1 higher-quality trial of sufficient sample size; 2 or more higher-quality trials with some inconsistency; or at least 2 consistent, lower-quality trials, or multiple consistent observational studies with no significant methodological flaws).
Poor	Evidence is insufficient to assess effects on health outcomes because of limited number or power of studies, large and unexplained inconsistency between higher-quality trials, important flaws in trial design or conduct, gaps in the chain of evidence, or lack of information on important health outcomes.

* Adapted from methods developed by the U.S. Preventive Services Task Force (25). The overall evidence for an intervention was graded on a 3-point scale (good, fair, poor).

Appendix Table 5. Quality Ratings for Included Systematic Reviews of Nonpharmacologic Therapies for Low Back Pain

Intervention	Study, Year (Reference)	Search Methods?	Comprehensive?	Inclusion Criteria?	Bias Avoided?	Validity Criteria?	Validity Assessed?	Methods for Combining Studies?	Appropriately Combined?	Conclusions Supported?	Overall Quality per Oxman Scale (1-7)
Acupuncture	Ernst, 2001 (64)	Yes	Yes	Yes	Can't tell	No	No	No	Can't tell	Can't tell	3
	Furlan et al., 2002 (26, 27)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7
Back schools	Manheimer et al., 2005 (16)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Partial	Yes	6
	Elders et al., 2000 (28)	Yes	Yes	Yes	Yes	No	Yes	Partial	Can't tell	Can't tell	3
Psychological interventions	Heymans et al., 2005 (29, 30)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7
	Maier-Riehle and Härter, 2001 (31)	Yes	Yes	Yes	Can't tell	No	Partial	Yes	Yes	Yes	4
Exercise	Hoffman et al., 2007 (32)*	Yes	Yes	Yes	Partial	Yes	Yes	Yes	Yes	Yes	6
	Ostelo et al., 2005 (33)	Yes	Yes	Yes	Yes	Yes	Partial	Yes	Yes	Yes	6
Functional restoration	Clare et al., 2004 (34)	Yes	Yes	Yes	Yes	Yes	Partial	Yes	Yes	Yes	6
	Hayden et al., 2005 (35, 36)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7
	Kool et al., 2004 (37)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7
	Liddle et al., 2004 (38)	Yes	Yes	Yes	Can't tell	Yes	Partial	No	Can't tell	Can't tell	3
	Machado et al., 2006 (39)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7
Interdisciplinary therapy	McNeely et al., 2003 (40)	Yes	Yes	Yes	Can't tell	Yes	Partial	No	Yes	Yes	4
	Schonstein et al., 2003 (41, 42)	Yes	Partial	Yes	Can't tell	Yes	Yes	Yes	Yes	Yes	6
Massage	Guzmán et al., 2002 (43, 44)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	6
	Karjalainen et al., 2001, 2003 (45, 46)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7
Lumbar supports	Tveito et al., 2004 (47)	Partial	Yes	Yes	Yes	Yes	Partial	Yes	Yes	Yes	5
	Furlan et al., 2002 (26, 27)	Yes	Yes	Yes	Partial	Yes	Yes	Yes	Yes	Can't tell	6
Superficial heat	Jellema et al., 2001 (48); Van Tulder et al., 2000 (49)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7
	French et al., 2006 (50)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7
Traction	Clarke et al., 2005, 2006 (51, 52)	Yes	Yes	Yes	Can't tell	Yes	Yes	Yes	Yes	Yes	6
	Harte et al., 2003 (53)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7
Transcutaneous nerve stimulation	Khadijkar et al., 2005 (54)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7
Spinal manipulation	Assendelft et al., 2003 (15, 55)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7
	Avery and O'Driscoll, 2004 (56)	Yes	Yes	Yes	Yes	No	Partial	No	Partial	Partial	2
	Bronfort et al., 2004 (57)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Partial	Partial	4
	Brown, 2005 (58)	Yes	Yes	Yes	Can't tell	Yes	Yes	Yes	Yes	Yes	6
	Ernst, 2001 (64)	Yes	Yes	Yes	Yes	No	No	Yes	Can't tell	Can't tell	3
Spinal manipulation	Ernst and Canter, 2003 (59)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Partial	Yes	4

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Appendix Table 5—Continued

Intervention	Study, Year (Reference)	Search Methods?	Comprehensive?	Inclusion Criteria?	Bias Avoided?	Validity Criteria?	Validity Assessed?	Methods for Combining Studies?	Appropriately Combined?	Conclusions Supported?	Overall Quality per Oxman Scale (1–7)
	Ferreira et al., 2002 (60)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Partial	Yes	7
	Ferreira et al., 2003 (61)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Partial	Yes	5
	Gay et al., 2005 (62)	Yes	Yes	No	Can't tell	No	No	No	Can't tell	Can't tell	2
	Licciardone et al., 2005 (63)	Yes	Yes	Yes	Yes	No	No	Yes	Partial	Can't tell	4
	Meeker and Haldeman, 2002 (65)	Partial	Yes	No	No	No	No	No	Partial	Partial	1
	Oliphant, 2004 (66)	Yes	Yes	Yes	Can't tell	Yes	Yes	Yes	No	No	3
	Stevinson and Ernst, 2002 (67)	Yes	Yes	Yes	Can't tell	No	No	No	Can't tell	Can't tell	2
	Woodhead and Clough, 2005 (68)	Yes	Yes	Yes	Can't tell	Yes	Yes	Yes	Partial	Partial	4
Multiple interventions	Cherkin et al., 2003 (69)†	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	4
	Vroomen et al., 2000 (70)‡	Yes	Yes	Yes	Can't tell	Yes	Yes	Yes	Yes	Yes	5

* 22 trials of behavioral therapy alone or as part of interdisciplinary rehabilitation.

† 20 trials of acupuncture, 3 trials of massage, and 26 trials of spinal manipulation.

‡ 6 trials of traction, 1 trial of exercise, and 2 trials of spinal manipulation.

Appendix Table 6. Systematic Reviews of Efficacy of Nonpharmacologic Therapies for Low Back Pain*

Intervention	Study, Year (Reference)	Type of Systematic Review	Included Trials (Trials Rated Higher-Quality), n (n) [†]	Trials not Included in Any Other Relevant Systematic Review	Duration of Treatment in Included Trials	Sample Sizes in Included Trials, n	Interventions Evaluated (Number of Trials)	Main Conclusions	Overall Quality per Oxman Scale (1–7)
Acupuncture (51 unique trials in 3 systematic reviews)	Furlan et al., 2002 (26, 27)	Qualitative and quantitative	35 (14)	11	1–20 sessions	17–492 (median, 54)	Acupuncture (32), dry needling (3)	Acupuncture vs. no treatment for chronic LBP: SMD, -0.73 (95% CI, -1.19 to -0.28) for short-term pain (2 RCTs); SMD, -0.63 (CI, -1.08 to -0.19) for short-term function (2 RCTs) Acupuncture vs. sham acupuncture: WMD, -17.79 points (CI, -25.5 to -10.07 points) for short-term pain (6 RCTs); WMD, -5.74 points (CI, -14.7 to 3.25 points) for long-term pain (3 RCTs); no difference for function	7
	Manheimer et al., 2005 (16)	Quantitative	33 (5)	10	1–20 sessions	17–194 (median, 60)	Chinese acupuncture (29), western acupuncture (4), electroacupuncture (14), acupuncture for antenatal LBP (3)	Acupuncture vs. no additional treatment for chronic LBP: SMD, -0.69 (CI, -0.98 to -0.40) for short-term pain (8 RCTs); SMD, -0.74 (CI, -1.47 to -0.02) for long-term pain (5 RCTs); SMD, -0.62 (CI, -0.95 to -0.30) for short-term function (6 RCTs) Acupuncture vs. sham acupuncture: SMD, -0.58 (CI, -0.36 to -0.80) for short-term pain (4 RCTs); SMD, -0.59 (CI, -1.29 to 0.10) for long-term pain (2 RCTs); no difference for function	6
Back schools (31 unique trials in 3 systematic reviews)	Elders et al., 2000 (28)	Qualitative and quantitative	6 trials of back schools (quality not assessed)	3	NR	51–975 (median, 194)	Not described	Back school vs. control: rate difference for return to work rate ranged from -7% to 29% after 21–42 d (4 RCTs), 30% to 37% after 180–200 d, (3 RCTs), -1% to 42% after 360 d (4 RCTs)	3
	Heymans et al., 2004 (29, 30)	Qualitative	19 (6)	8	One 4-h session to twenty-one 85-min sessions	37–975 (median, 106)	Swedish or modified Swedish back school (6), Maastricht (2), others (11)	Conflicting evidence from 8 RCTs on effectiveness of back schools for chronic LBP vs. wait list control or placebo for short-, intermediate-, or long-term pain, functional status and return to work; back school in occupational setting appeared to be more effective	7
	Maier-Riehle and Härter, 2001 (31)	Quantitative	13 (quality not assessed)	9	1–22 h (median, 5 h)	29–299 (median, 76)	Not described	Back school vs. any control: SMD, 0.14 ($P = 0.026$) for pain intensity at <3 mo (9 RCTs); SMD, 0.44 ($P = 0.001$) for recurring back pain through 6 mo (6 RCTs); no significant differences for functional status (7 RCTs) or recurring back pain after 6 mo	4

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Appendix Table 6—Continued

Intervention	Study, Year (Reference)	Type of Systematic Review	Included Trials (Trials Rated Higher-Quality), <i>n</i> (<i>n</i> †)	Trials not Included in Any Other Relevant Systematic Review	Duration of Treatment in Included Trials	Sample Sizes in Included Trials, <i>n</i>	Interventions Evaluated (Number of Trials)	Main Conclusions	Overall Quality per Oxman Scale (1–7)
Psychological therapies (35 unique trials in 2 systematic reviews)	Hoffman et al., 2007 (32)	Quantitative	22‡ (6)	14	NR	20–239 (median, 76)	Not described	Any psychological intervention or multidisciplinary intervention vs. wait-list controls: SMD, 0.50 (CI, 0.23–0.77) for pain intensity (7 RCTs); SMD, 0.50 (CI, 0.00–0.83) for health-related quality of life (4 RCTs) Cognitive-behavioral treatment vs. wait-list controls: SMD, 0.62 (CI, 0.25–0.98) for pain intensity (7 RCTs) Self-regulatory treatment vs. wait-list controls: SMD, 0.75 (CI, 0.35–1.15) for pain intensity (4 RCTs)	6
	Ostelo et al., 2005 (33)	Quantitative and qualitative	21 (7)	13	3–12 wk	17–161 (median, 66)	Cognitive-behavioral therapy (14), operant (7), relaxation (11), biofeedback (6)	Progressive relaxation vs. wait-list controls: SMD, 1.16 (CI, 0.47 to 1.85) for pain intensity (2 RCTs) Biofeedback vs. wait-list controls: SMD, 0.84 (CI, 0.32 to 1.35) for pain intensity (3 RCTs) Operant therapy vs. wait-list controls: SMD, 0.29 (CI, –0.14 to 0.72) for pain intensity (2 RCTs) Cognitive-behavioral therapy: SMD, 0.59 (CI, 0.10 to 1.09) for pain intensity (4 RCTs)	6
Exercise (79 unique trials in 7 systematic reviews)	Clare et al., 2004 (34)	Quantitative	5 (3)	1	NR	25–321	All trials evaluated the McKenzie method	McKenzie therapy vs. control (booklet, strength training, spinal mobilization, or massage): WMD, –8.6 points (CI, –13.7 to –3.5 points) on 100-point scale for short-term (<3 mo) pain (3 RCTs); WMD, –5.4 points (CI, –8.4 to –2.4 points) for short-term disability (5 RCTs); no differences for intermediate-term disability	6

Appendix Table 6—Continued

Intervention	Study, Year (Reference)	Type of Systematic Review	Included Trials (Trials Rated Higher-Quality), n (n) [†]	Trials not Included in Any Other Relevant Systematic Review	Duration of Treatment in Included Trials	Sample Sizes in Included Trials, n	Interventions Evaluated (Number of Trials)	Main Conclusions	Overall Quality per Oxman Scale (1–7)
	Hayden et al., 2005 (35, 36)	Quantitative and qualitative	61 (28)	41	2–150 h	17–473 (median, 75)	McKenzie method (6), extensor (5), flexion (9), isometric (3), aerobics (8), strengthening (16), stretching (12), graded activity (2), other or multiple (17)	Exercise therapy vs. no treatment for acute LBP: WMD, –0.59 points (CI, –12.69 to 11.51 points) on 100-point scale for short-term pain (3 RCTs); no differences for function Exercise therapy vs. no treatment for chronic LBP: WMD, 10.2 points (CI, 1.31 to 19.09 points) for short-term pain (19 RCTs); WMD, 3.00 points (CI, –0.53 to 6.48 points) for short-term function (17 RCTs); results similar at longer-term follow-up	7
	Kool et al., 2004 (37)	Qualitative and quantitative	14 (9)	7	3 wk–12 mo	80–476 (median, 166)	Outpatient exercise therapy (9), inpatient therapy (3), back school (3), interdisciplinary/functional restoration (5)	Exercise vs. usual care: SMD, –0.24 (CI, –0.36 to –0.11) for number of sick days during first year of follow-up (9 RCTs); RR, 1.37 (CI, 1.05 to 1.78) for proportion of patients at work after 1 y (3 RCTs)	7
	Liddle et al., 2004 (38)	Qualitative	16 (8)	4	NR	28–222 (median, 99)	Strength/flexibility (9), multimodal therapy (3), other (4)	Exercise vs. control: 9 of 16 RCTs reported a “positive result” (on any outcome) vs. control (wait-list, advice, or electrotherapy), 7 other RCTs reported “positive result” but no difference compared with control (usually exercise-based); 5 of 7 RCTs reported “positive result” for back-specific function	3

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Appendix Table 6—Continued

Intervention	Study, Year (Reference)	Type of Systematic Review	Included Trials (Trials Rated Higher-Quality), <i>n</i> (<i>n</i> †)	Trials not Included in Any Other Relevant Systematic Review	Duration of Treatment in Included Trials	Sample Sizes in Included Trials, <i>n</i>	Interventions Evaluated (Number of Trials)	Main Conclusions	Overall Quality per Oxman Scale (1–7)
	Machado et al., 2006 (39)	Quantitative	11 (6)	3	Not clearly reported	24–321 (median, 75)	All trials evaluated McKenzie method	McKenzie method vs. passive therapy (educational booklets, bed rest, ice packs, and massage) for acute LBP: WMD, –4.16 points (CI, –7.12 to –1.20 points) on 100-point scale for pain (4 RCTs); WMD, –5.22 (CI, –8.28 to –2.16) for disability at 1-wk follow-up; no differences at 4 wk (4 RCTs) McKenzie method vs. advice to stay active for acute LBP: WMD, 3.85 (CI, 0.30 to 7.39) for disability at 12-wk follow-up (2 RCTs) No differences between McKenzie method and other exercise therapy	7
	McNeely et al., 2003 (40)	Qualitative (exercise therapy for spondylolysis and spondylolisthesis)	2 (1)	1	NR	44 and 65	Strengthening (1), flexion/extension (1)	Unable to draw firm conclusions regarding exercise therapy for spondylolysis and spondylolisthesis	4
Functional restoration (18 trials in 1 systematic review)	Schonstein et al., 2003 (41, 42)	Qualitative and quantitative	18 (9)	12 trials not included in systematic reviews of interdisciplinary therapy	1 session to weekly sessions for 1.5 y	45–542 (median, 165)	Cognitive-behavioral component (10), no cognitive-behavioral component (8)	Physical conditioning vs. usual care for time lost from work: WMD, –45 (CI, –88 to –3) for number of sick leave days after 1 y (2 RCTs); OR, 0.80 (CI, 0.58 to 1.09) for proportion of patients off work at 12 mo (3 RCTs) Physical conditioning vs. physical conditioning plus psychological treatment: OR, 0.93 (CI, 0.44 to 1.97) for proportion of patients off work at 6 or 12 mo (2 RCTs)	6
Interdisciplinary therapy (16 unique trials in 3 systematic reviews)	Guzmán et al., 2001, 2002 (43, 44)	Quantitative (chronic LBP)	10 (3)	10	Once-weekly to daily sessions	20–476 (median, 170)	Higher-intensity therapy (4), lower-intensity therapy (4), other (3)	Strong evidence that intensive (>100 h) daily interdisciplinary therapy is more effective than usual care or less intensive therapy for function (3 RCTs) Moderate evidence that less intensive (<30 h) interdisciplinary therapy is no more effective than usual care or nonmultidisciplinary therapy (5 RCTs)	6

Appendix Table 6—Continued

Intervention	Study, Year (Reference)	Type of Systematic Review	Included Trials (Trials Rated Higher-Quality), n (n) [†]	Trials not Included in Any Other Relevant Systematic Review	Duration of Treatment in Included Trials	Sample Sizes in Included Trials, n	Interventions Evaluated (Number of Trials)	Main Conclusions	Overall Quality per Oxman Scale (1–7)
	Karjalainen et al., 2001 (45), 2003 (46)	Qualitative (subacute LBP)	2 (0)	1	NR	103 and 130	Interdisciplinary therapy not categorized	Moderate evidence that multidisciplinary rehabilitation with a worksite visit or more comprehensive occupational health care intervention is more effective than usual care for return to work, sick leave, and subjective disability (2 RCTs)	7
	Tveito et al., 2004 (47)	Qualitative	5 (0)	4	NR	128–1645 (median, 234)	Interdisciplinary therapy not categorized	Moderate evidence that interdisciplinary therapy has a positive effect on sick leave (4 RCTs); no evidence of a positive effect on pain (1 RCT)	5
Massage (8 unique trials in 2 systematic reviews)	Furlan et al., 2002 (26, 27)	Qualitative	8 (5)	NA	5–9 sessions	24–262 (median, 106)	Massage with hands (6), massage with mechanical device (2)	Massage superior to sham laser in 1 RCT Relative to other therapies, massage superior to relaxation therapy, acupuncture, and self-care education; massage similar to corset and exercises; light massage inferior to manipulation and TENS	6
Lumbar supports (6 trials in 1 systematic review)	Jellema et al., 2001 (48); Van Tulder et al., 2000 (49)	Qualitative	6 trials of treatment (2)	NA	3–8 wk (median, 3.5 wk)	19–334 (median, 190)	Lumbar support with rigid stay (2), pneumatic lumbar support (1), other or not specified (3)	Insufficient evidence to assess efficacy of lumbar support vs. no treatment (1 RCT); lumbar support superior to other interventions in 1 of 4 RCTs	7
Spinal manipulation (69 unique trials in 12 systematic reviews)	Assendelft et al., 2004 (15), 2003 (55)	Quantitative	39 (10)	1	1–24 sessions over 3 wk	21–741 (median, 103)	Rotational manipulation (6), Maitland method (5), thrust (3), sacroiliac method (2), other or not specified (23)	Spinal manipulation vs. sham for acute LBP: WMD, –10 points (CI, –17 to –22 points) on 100-point VAS for short-term pain; WMD, –2.8 points (CI, –5.6 to 0.1 points) for short-term function (RDQ) Spinal manipulation vs. sham for chronic LBP: WMD, –10 points (CI, –17 to –33 points) on 100-point VAS for short-term pain; WMD, –19 points (CI, –35 to –3 points) for long-term pain; WMD, –3.3 points (CI, –6.0 to –0.6 points) for short-term function (RDQ) No differences between spinal manipulation and other therapies judged effective for acute or chronic LBP	7

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Appendix Table 6—Continued

Intervention	Study, Year (Reference)	Type of Systematic Review	Included Trials (Trials Rated Higher-Quality), n (n) [†]	Trials not Included in Any Other Relevant Systematic Review	Duration of Treatment in Included Trials	Sample Sizes in Included Trials, n	Interventions Evaluated (Number of Trials)	Main Conclusions	Overall Quality per Oxman Scale (1–7)
	Avery and O'Driscoll, 2004 (56)	Qualitative	3 (quality not assessed)	0	NR	155–323	Chiropractic spinal manipulation (2), osteopathic (1)	Insufficient new evidence to assess efficacy of spinal manipulation (updates previous review by Mohseni-Bandpei [114])	2
	Bronfort et al., 2004 (57)	Qualitative	31 (5)	0	1–24 sessions	5202 (mean, 168)	Spinal manipulation (26), mobilization only (5)	Moderate evidence that spinal manipulation is similar to prescriptions of nonsteroidal anti-inflammatory drugs for chronic LBP; limited to moderate evidence that spinal manipulation is superior to some other interventions for acute and chronic LBP	4
	Brown et al., 2005 (58)	Qualitative	14 (6) systematic reviews and 2 (2) RCTs	0	NR	NR	NR	Spinal manipulation is as effective as other noninvasive treatments	6
	Ernst and Canter, 2003 (59)	Qualitative	12 (6)	1	4–12 sessions	12–741 (median, 69)	All trials evaluated chiropractic manipulation	Chiropractic spinal manipulation superior to control treatments in 5 of 12 RCTs; chiropractic manipulation consistently superior to sham manipulation; beneficial effects usually small or moderate; no clear difference between results for acute vs. chronic LBP	4
	Ferreira et al., 2002 (60)	Quantitative	8 (4)	0	4–12 sessions	19–395 (median, 63)	Not specified	Spinal manipulation vs. placebo: WMD, 7 points (CI, 1 to 14 points) on 100-point VAS for short-term pain (2 RCTs) Spinal manipulation vs. NSAIDs: WMD, 14 points (CI, –11 to 40 points) for short-term pain (2 RCTs) and 6 points (CI, 1 to 12 points) on 100-point scale for disability (2 RCTs) No differences between spinal manipulation and other effective therapies	7

Appendix Table 6—Continued

Intervention	Study, Year (Reference)	Type of Systematic Review	Included Trials (Trials Rated Higher-Quality), n (n) [†]	Trials not Included in Any Other Relevant Systematic Review	Duration of Treatment in Included Trials	Sample Sizes in Included Trials, n	Interventions Evaluated (Number of Trials)	Main Conclusions	Overall Quality per Oxman Scale (1–7)
	Ferreira et al., 2003 (61)	Quantitative	27 (11)	2	1–14 sessions (mean, 6.8)	3817 (mean, 146)	High-velocity thrust (11), high-velocity thrust plus other techniques (8), high-velocity thrust plus low-velocity mobilization (7), compared different types of manipulation (1)	High-velocity-thrust spinal manipulation vs. sham manipulation or no treatment for LBP <3 mo in duration: WMD, 18 points (CI, 13–24 points) on 100-point scale for short-term pain (3 RCTs); WMD, 9 points (CI, 1–17 points) on 100-point scale for short-term disability (3 RCTs) No differences between spinal manipulation and other effective therapies	5
	Gay et al., 2005 (62)	Qualitative	1 (quality not assessed)	1	NR	30	Distraction manipulation (1)	Insufficient evidence to assess efficacy of distraction manipulation	2
	Licciardone et al., 2005 (63)	Quantitative	6 (quality not assessed)	1	4–11 sessions	30–178 (median, 93)	All trials evaluated osteopathic spinal manipulation	Osteopathic spinal manipulation vs. control treatment: SMD, –0.30 (CI, –0.47 to –0.13) for pain reduction (8 comparisons from 6 RCTs)	4
	Woodhead and Clough, 2005 (68)	Qualitative	62 (27)	17	1–14 sessions	12–1633 (median, 95)	Rotational method (8), Maitland method (5), sacroiliac method (3), other or not specified (46)	Limited evidence that spinal manipulation is more effective than placebo for acute LBP; moderate evidence that spinal manipulation is more effective than placebo for chronic or subacute LBP Moderate evidence that spinal manipulation is more effective than some other interventions for acute LBP; strong evidence that spinal manipulation is more effective than some other interventions for chronic LBP	4
Superficial heat (9 trials in 1 systematic review)	French et al., 2006 (50)	Quantitative	9 (5)	NA	Single application—7 days	36–371 (median, 90)	Superficial heat (9), superficial cold (2)	Heat wrap vs. oral placebo or nonheated wrap for acute or subacute LBP (4 RCTs): WMD, 1.06 points (CI, 0.68 to 1.45 points) on a 0–5 scale for pain relief up to day 5 (2 RCTs); WMD, –2.10 points (CI, –3.19 to –1.01 points) for score on RDQ (2 RCTs) Insufficient evidence to assess efficacy of superficial heat vs. superficial cold	7

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Appendix Table 6—Continued

Intervention	Study, Year (Reference)	Type of Systematic Review	Included Trials (Trials Rated Higher-Quality), n (n)†	Trials not Included in Any Other Relevant Systematic Review	Duration of Treatment in Included Trials	Sample Sizes in Included Trials, n	Interventions Evaluated (Number of Trials)	Main Conclusions	Overall Quality per Oxman Scale (1–7)
Traction (24 unique trials in 3 systematic reviews)	Clarke et al., 2005, 2006 (51, 52)	Qualitative	23 (5)	11	1–8 wk	25–400 (median, 52)	Mechanical or manual traction (13), autotraction (6), Tru-Trac (3), underwater traction (1), other (3)	Strong evidence that continuous traction is not superior to placebo, sham, or no treatment for any outcome at 3 mo or 6 wk in patients with or without sciatica (2 RCTs) Moderate evidence that autotraction is more effective than placebo, sham, or no treatment for pain, global improvement, or work absenteeism in patients with sciatica (2 RCTs); moderate evidence that other forms of traction not more effective than control (8 RCTs)	6
	Harte et al., 2003 (53)	Qualitative	13 (1)	1	1–8 wk	16–334 (median, 62)	Mechanical or manual traction (7), autotraction (2), Tru-Trac (2), other (3)	Traction vs. sham traction: 6 RCTs (1 higher-quality) reported negative results (1 RCT inconclusive)	7
TENS (11 trials in 6 systematic reviews§)	Khadilkar et al., 2005 (54)	Qualitative	2 (1)	2	Single session and 4 wk	30 and 145	TENS given at clinic (1), TENS self-administered at home (1)	TENS vs. placebo (2 RCTs, 1 good-quality): TENS not superior to placebo for any outcomes measured (pain, functional status, range of motion, use of medical services) (1 good-quality RCT); in the other RCT, TENS superior for subjective pain intensity for 60 min after treatment; no longer-term follow-up	7
Multiple interventions	Cherkin et al., 2003 (69)	Qualitative	8 systematic reviews, 9 RCTs (quality not assessed)	0	2–12 wk (RCTs)	24–262 (RCTs)	Acupuncture (20), massage (3), spinal manipulation (26)	Effectiveness of acupuncture unclear; massage effective for subacute and chronic LBP in 3 RCTs; spinal manipulation equivalent to other commonly used therapies	4
	Vroomen et al., 2000 (70)	Quantitative	8 (3) trials of traction, exercise, or spinal manipulation	0	NR	44–322 (median, 77)	Traction (7), exercise (2), spinal manipulation (2)	Traction vs. sham, infrared heat, or corset for sciatica: OR, 1.2 (CI, 0.7 to 2.0) for “treatment success” (4 RCTs) Insufficient evidence to evaluate efficacy of exercise or spinal manipulation for sciatica	5

* LBP = low back pain; NA = not applicable; NR = not reported; NSAID = nonsteroidal anti-inflammatory drug; ODI = Oswestry Disability Index; OR = odds ratio; RCT = randomized, controlled trial; RDQ = Roland-Morris Disability Questionnaire; RR = relative risk; SMD = standardized mean difference; TENS = transcutaneous electrical nerve stimulation; VAS = visual analogue scale; WMD = weighted mean difference.

† Higher-quality trials defined as those receiving >50% of maximum possible quality rating score used by each systematic review.

‡ 22 trials of behavioral therapy alone or as part of interdisciplinary rehabilitation.

§ Including trials of TENS included in systematic reviews of acupuncture (16), massage (26, 27), spinal manipulation (15, 55), superficial heat (50), and traction (52).

Appendix Table 7. Excluded Systematic Reviews*

Intervention	Study, Year (Reference)	Reason for Exclusion
Acupuncture	Ernst and White, 1997 (71)	Outdated
	Ernst and White, 1998 (72)	Outdated
	Ezzo et al., 2000 (73)	Not specific for LBP
	Patel et al., 1989 (74)	Outdated
	Smith et al., 2000 (75)	Not specific for LBP
Back schools	Strauss, 1999 (76)	Outdated
	ter Riet et al., 1990 (77)	Outdated
	van Tulder, 1999 (78)	Not specific for LBP
	Cohen et al., 1994 (79)	Updated Cochrane review available
	Keijsers et al., 1991 (80)	Outdated
Psychological interventions	Koes et al., 1994 (81)	Outdated
	Nentwig, 1999 (82)	Outdated
	van Tulder et al., 2000 (83)	German language
	Morley et al., 1999 (84)	Updated Cochrane review available
Exercise	van Tulder et al., 2001 (85)	Outdated
	Cleland et al., 2002 (86)	Not specific for LBP
	Colle et al., 2002 (87)	Updated Cochrane review available
	Faas, 1996 (88)	Systematic methods not used for synthesizing results
	Hilde and Bo, 1998 (89)	Only evaluated trials identified by an earlier (outdated) systematic review by van Tulder et al. (2000)
	Koes et al., 1991 (90)	Outdated
	Maher et al., 1999 (91)	Outdated
	van Tulder et al., 2000 (92, 93)	Outdated
Low-level laser therapy	Beckerman et al., 1992 (94)	Updated Cochrane review available
	Bjordal et al., 2003 (95)	Not specific for LBP
	de Bie, 1998 (96)	Not specific for LBP
	Gam et al., 1993 (97)	Not specific for LBP
Lumbar supports	Koes, 1994 (98)	Not specific for LBP
	van Poppel, 2000 (99)	Outdated
Massage Spinal manipulation	Ernst, 1999 (100)	Does not evaluate clinical outcomes from use of lumbar supports
	Abenhaim and Bergeron, 1992 (101)	Outdated
	Anderson et al., 1992 (102)	Outdated
	Assendelft et al., 1992 (103)	Outdated
	Assendelft et al., 1995 (104)	Outdated
	Assendelft et al., 1996 (105)	Outdated
	Assendelft et al., 1996 (106)	Outdated
	Brox et al., 1999 (107)	Outdated
	Di Fabio, 1992 (108)	Norwegian language
	Ernst, 2000 (109)	Outdated
	Ernst and Harkness, 2001 (110)	Not specific for LBP
	Ernst et al., 2004 (111)	Not specific for LBP
	Koes et al., 1991 (112)	Cervical manipulation only
	Koes et al., 1996 (113)	Outdated
	Mohseni-Bandpei, 1998 (114)	Outdated
Ottenbacher and DiFabio, 1985 (115)	Outdated	
Shekelle et al., 1992 (116)	Outdated	
TENS	Brosseau et al., 2002 (117)	Updated Cochrane review available
	Flowerdew and Gadsby, 1997 (118)	Outdated
	Gadsby and Flowerdew, 2000 (119)	Updated Cochrane review available
Traction	Milne et al., 2001 (120)	Updated Cochrane review available
	van der Heijden et al., 1995 (121)	Outdated
Ultrasonography Multiple interventions	van der Windt et al., 1999 (122)	No included studies of LBP
	Beckerman et al., 1993 (123) (exercise, low-level laser therapy, spinal manipulation, traction, ultrasonography)	Outdated
	Di Fabio, 1995 (124) (back schools, interdisciplinary rehabilitation)	Not specific for LBP
	Pengel et al., 2002 (125) (exercise, lumbar supports, spinal manipulation, TENS)	Outdated
	Scheer et al., 1995 (126) (back schools, exercise, spinal manipulation)	Limited to trials of subacute (7 wk–6 mo) LBP, all trials included in other systematic reviews
	Scheer et al., 1997 (127) (back schools, behavioral interventions, exercise, lumbar supports)	Outdated
	Turner, 1996 (128) (back schools, behavioral interventions)	Outdated
	van der Weide et al., 1997 (129) (back schools, behavioral interventions, exercise, spinal manipulation)	Outdated
	van Tulder et al., 1997 (5) (back schools, behavioral interventions, exercise, spinal manipulation, TENS, traction)	Outdated

* LBP = low back pain; TENS = transcutaneous electrical nerve stimulation.

Appendix Table 8. Additional, Large Trials of Acupuncture, Exercise, and Spinal Manipulation for Low Back Pain Not Included in Systematic Reviews*

Intervention	Study, Year (Reference)	Patients, <i>n</i> (Duration of Follow-up)	Main Results	Quality
Acupuncture	Brinkhaus et al., 2006 (130)	298 (8 wk [vs. wait-list control] to 52 wk [vs. sham acupuncture])	Acupuncture vs. sham acupuncture vs. wait-list control (8-wk results) Pain intensity (difference from baseline on 0–100 scale): 28.7 vs. 23.6 vs. 6.9 points ($P = 0.26$ for acupuncture vs. sham; $P < 0.001$ for acupuncture vs. wait-list control) Back function (mean score on 0–100 scale): 66.8 vs. 62.9 vs. 57.7 points Pain Disability Index (mean score on 0–100 scale): 18.8 vs. 21.5 vs. 27.1 points SF-36 physical health scale (mean score): 40.5 vs. 36.2 vs. 33.9 points ($P = 0.004$ for acupuncture vs. sham and $P < 0.001$ for acupuncture vs. wait-list control) SF-36 mental health scale: No differences SF-36 pain scale (mean score): 58.8 vs. 50.7 vs. 39.9 points ($P = 0.01$ for acupuncture vs. sham) Depression: No significant differences	8/10†
	Thomas et al., 2005 (155)	241 (24 mo)	Routinely offering acupuncture vs. usual care SF-36 pain score, mean adjusted difference between interventions: 5.6 points at 12 mo ($P = 0.11$), 8.0 points at 24 mo ($P = 0.03$) (favors acupuncture) McGill Present Pain Intensity: No difference at 12 or 24 mo ODI score: No difference at 12 or 24 mo Pain-free in past 12 mo: 18% vs. 8% ($P = 0.06$) Use of low back pain medication in past 4 wk: 60% vs. 41% ($P = 0.03$)	7/10†
	Witt, 2006 (132)	2841 (6 mo)	Acupuncture vs. no acupuncture (difference in change from baseline, positive values favor acupuncture): Back function loss (Hannover Functional Assessment Questionnaire, 0–100 scale): 22.0 points (95% CI, 19.3 to 24.7 points) at 3 mo, 3.7 (CI, 0.7 to 6.7 points) at 6 mo Low Back Pain Rating Scale (0–100): 27.2 points (CI, 20.9 to 24.5 points) at 3 mo, 2.7 points (CI, –0.3 to 5.7 points) at 6 mo SF-36 physical component score: 4.7 points (CI, 4.0 to 5.4 points) at 3 mo, 0.6 point (CI, –0.2 to 1.3 points) at 6 mo SF-36 mental component score: 2.1 points (CI, 1.4 to 2.8 points) at 3 mo, 0.2 point (CI, –0.6 to 1.0 points) at 6 mo	8/10†
Spinal manipulation or exercise therapy	Hurwitz et al., 2002 (133)—UCLA Low Back Pain Study	681 (6 mo)	Chiropractic care vs. medical care (adjusted between-group difference in improvement from baseline) Most severe pain (0–10 scale): –0.25 point (CI, –0.96 to 0.45 point) at 6 mo, –0.64 point (CI, –1.38 to –0.21 points) at 18 mo Average pain (0–10 scale): –0.26 point (CI, –0.81 to 0.29 point) at 6 mo, –0.50 point (CI, –1.09 to 0.08 point) at 18 mo RDQ (0–24 scale): –0.37 point (CI, –1.63 to 0.90 point) at 6 mo, –0.69 point (–2.02 to 0.65 point) at 18 mo	7/9‡
	UK BEAM Trial, 2004 (134)	1334 (12 mo)	Manipulation + exercise vs. manipulation vs. exercise (all results are absolute net benefit relative to usual care at 12 mo) RDQ (0–24 scale): 1.30 points (CI, 0.54 to 2.07 points) vs. 1.01 points (CI, 0.22 to 1.81 points) vs. 0.39 points (CI, –0.41 to 1.19 points) Modified Von Korff pain score (0–100 scale): 6.71 points (CI, 2.47 to 10.95 points) vs. 5.87 points (CI, 1.58 to 10.17 points) vs. 4.90 points (CI, 0.30 to 9.50 points) Modified Von Korff disability score (0–100 scale): 6.71 points (CI, 2.62 to 10.80 points) vs. 5.65 points (CI, 1.57 to 9.72 points) vs. 4.56 points (CI, 0.34 to 8.78 points)	2/9‡

* ODI = Oswestry Disability Index; RDQ = Roland–Morris Disability Questionnaire; SF-36 = Short Form-36; UCLA = University of California, Los Angeles; UK BEAM = United Kingdom Back Pain Exercise and Manipulation.

† Using Cochrane Back Review Group methods, excluding criterion on blinding of care provider, leaving a maximum possible score of 10.

‡ Using Cochrane Back Review Group methods, excluding criteria on blinding of patients and care provider, leaving a maximum possible score of 9.

Appendix Table 9. Trials of Interferential Therapy, Low-Level Laser Therapy, Shortwave Diathermy, Ultrasonography, and Yoga for Low Back Pain*

Intervention	Study, Year (Reference)	Patients, <i>n</i> (Duration of Follow-up)	Main Results	Quality†
Interferential therapy	Hurley et al., 2001 (135)	60 (3 mo)	Interferential therapy applied to painful area + self-care book vs. interferential therapy applied to area of spinal nerve + self-care book vs. self-care book alone (difference in median scores from baseline to 3 mo) McGill Pain Questionnaire Pain Rating Index (0–78): 2.2 vs. –2.5 vs. –9.7 points RDQ score (0–24): –3.5 vs. –8.0 vs. –4.0 points EQ-5D score: no difference RDQ, median score at 3 mo: 2.0 vs. 1.0 vs. 1.0 points	5/11
	Hurley et al., 2004 (136)	240 (12 mo)	Interferential therapy vs. manipulative therapy vs. combination (mean improvement at 12 mo) Pain (0–100 VAS): –26.5 vs. –18.2 vs. –25.7 points (<i>P</i> > 0.05) McGill Pain Questionnaire Pain Rating Index (0–78): –8.3 vs. –6.4 vs. –9.2 points (<i>P</i> > 0.05) RDQ score (0–24): –4.9 vs. –4.7 vs. –6.5 points (<i>P</i> > 0.05) SF-36 score: no differences Recurrent low back pain: 69% vs. 77% vs. 64% (<i>P</i> > 0.05) Absent from work >30 d: 8% vs. 12% vs. 12%	7/11
	Werners et al., 1999 (137)	152 (3 mo)	Interferential therapy vs. traction (mean difference from baseline to 3 mo) Pain score (0–100): –9.8 vs. –14.6 points (<i>P</i> > 0.05) ODI score (0–100): –7.7 vs. –7.4 points	4/11
Low-level laser therapy	Basford et al., 1999 (138)	61 (1 mo after end of treatment)	Nd:YAG laser vs. sham (mean change from baseline) ODI score: –6.3 vs. –2.1 points Maximal pain in the past 24 h (0–100 VAS): –16.1 vs. –2.3 points	8/11
	Gur et al., 2003 (139)	75 (1 mo after treatment)	Laser vs. exercise vs. laser + exercise (mean change from baseline) Pain (0–10 VAS): –4.2 vs. –3.6 vs. –4.4 points (<i>P</i> > 0.05) RDQ score: –9.7 vs. –9.6 vs. –11.5 points (<i>P</i> > 0.05) Modified ODI score: –16.4 vs. –16.9 vs. –17.6 points (<i>P</i> > 0.05)	3/11
	Klein and Eek, 1990 (140)	20 (1 mo after treatment)	GaAs laser + exercise vs. sham + exercise (mean change from baseline) Pain (0–7.5 VAS): –1.3 vs. –1.2 points RDQ score: –1.8 vs. –3.0 points	6/11
	Longo et al., 1988 (141)	120 (1 y after treatment)	904-nm laser vs. 10 600-nm laser vs. sham Complete disappearance of pain 1 mo after treatment: 95% vs. 82.5% vs. 2.5% Relapse 1 y after treatment: 65% vs. 70% vs. 95%	5/11
	Monticone et al., 2004 (142)	22 (up to 12 mo after treatment)	Laser vs. stabilization (exercise, lumbar therapy, and mesotherapy) (mean change from baseline to end of treatment and after 12 mo) Pain at rest (VAS 0–10): 0 vs. –5 points; –1 vs. –6 points Pain with movement (VAS 0–10): –4 vs. –7 points; –2 vs. –8 points	1/11
	Soriano and Rios, 1998 (143)	85 (6 mo after end of treatment)	GaAs laser vs. sham Proportion with >60% pain relief at end of treatment: 71% (27/38) vs. 36% (12/33) (<i>P</i> < 0.007)	6/11
	Toya et al., 1994 (144)	41 (1 d after treatment)	GaAs laser vs. sham Treatment “effective”: 94% (15/16) vs. 48% (12/25)	10/11
Shortwave diathermy	Sweetman et al., 1993 (147)	400 (2 wk)	Shortwave diathermy vs. extension exercises vs. traction vs. sham diathermy Global effect “better” at 2 wk: 39% (39/100) vs. 45% (45/100) vs. 49% (49/100) vs. 37% (37/100) (<i>P</i> > 0.05)	5/11

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Appendix Table 9—Continued

Intervention	Study, Year (Reference)	Patients, <i>n</i> (Duration of Follow-up)	Main Results	Quality
	Gibson et al., 1985 (145)	109 (12 wk)	Shortwave diathermy vs. osteopathic manipulation vs. detuned (sham) diathermy Median daytime pain score (0–100) at 2 wk: 35 vs. 25 vs. 28 points Median daytime pain score (0–100) at 12 wk: 25 vs. 13 vs. 6 points Proportion free of pain at 2 wk: 35% vs. 25% vs. 28% Proportion free of pain at 12 wk: 37% vs. 42% vs. 44% Proportion needing analgesics at 2 wk: 22% vs. 18% vs. 32% Proportion needing analgesics at 12 wk: 7% vs. 18% vs. 22% Proportion unable to work or with modified activities at 2 wk: 31% vs. 13% vs. 38% Proportion unable to work or with modified activities at 12 wk: 7% vs. 5% vs. 19%	4/11
	Rasmussen, 1979 (146)	24 (2 wk)	Shortwave diathermy vs. spinal manipulation Proportion “fully restored” by 14 d: 25% (3/12) vs. 92% (11/12)	3/11
Ultrasonography	Ansari et al., 2006 (148)	15 (3 wk)	Ultrasonography vs. sham ultrasonography for chronic low back pain Functional Rating Index (mean change from baseline, 0–100 scale): –22 vs. –7 (<i>P</i> < 0.05)	2/11
	Nwuga, 1983 (149)	73 (4 wk)	Ultrasonography vs. sham ultrasonography vs. no ultrasonography for acute sciatica (bed rest in all groups) Proportion pain free: 41% (11/27) vs. 12% (3/25) vs. 7% (2/29) (<i>P</i> < 0.001 for ultrasonography vs. sham or no ultrasonography)	3/11
	Roman, 1960 (150)	36 (duration unclear [10 sessions])	Ultrasonography vs. sham ultrasonography for back pain with or without sciatica Proportion “normal”: 22% (4/18) vs. 11% (2/18) Proportion “normal” or “good”: 67% (12/18) vs. 72% (13/18)	1/11
Yoga	Galantino et al., 2004 (151)	22 (6 wk)	Iyengar yoga vs. usual activities ODI score (change from baseline): 3.83 vs. 2.18 Proportion with lower scores on ODI: 46% vs. 40%	3/9
	Sherman et al., 2005 (152)	101 (26 wk)	Viniyoga vs. exercise (mean difference between groups compared to baseline) RDQ score (0–24 scale): –1.8 points (CI, –3.5 to –0.1 points) at 12 wk (<i>P</i> = 0.034) and –1.5 points (CI, –3.2 to 0.2 points) at 26 wk (<i>P</i> = 0.092) Symptom bothersomeness score (0–10 scale): –0.6 points (CI, –1.6 to –0.4 points) at 6 wk (<i>P</i> = 0.22), –1.4 points (CI, –2.5 to –0.2 points) at 26 wk (<i>P</i> = 0.018) Viniyoga vs. self-care book RDQ score: –3.4 points (CI, –5.1 to –1.6 points) at 12 wk (<i>P</i> = 0.0002) and –3.6 points (CI, –5.4 to –1.8 points) at 26 wk (<i>P</i> < 0.001) Symptom bothersomeness score: –1.6 points (CI, –2.6 to –0.5 points) at 6 wk (<i>P</i> = 0.0025) and –2.2 points (CI, –3.2 to –1.2 points) at 26 wk (<i>P</i> < 0.001)	7/9
	Williams et al., 2005 (153)	60 (7 mo)	Iyengar yoga vs. exercise education Present Pain Index, mean change at 7 mo (0–5 scale): –0.5 vs. –0.9 points (<i>P</i> = 0.140) Pain Disability Index, mean change at 7 mo (7–70 scale): –8.5 vs. –10.4 points (<i>P</i> = 0.009) Pain on VAS, mean change at 7 mo (0–10 scale): 1.2 vs. –1.6 points (<i>P</i> = 0.398)	3/9

* EQ-5D = EuroQol-5D; GaAs = gallium arsenide; Nd:YAG = neodymium:yttrium aluminum-garnet; ODI = Oswestry Disability Index; RDQ = Roland–Morris Disability Questionnaire; SF-36 = Short Form-36; VAS = visual analogue scale.

† Using Cochrane Back Review Group methods; maximum score, 11 (for trials of yoga, maximum score, 9, because of exclusion of criteria on blinding of patients and care provider).

Appendix Table 10. Summary of Evidence on Nonpharmacologic Therapies for Acute Low Back Pain

Intervention	Trials (Trials Rated Higher-Quality by ≥ 1 Systematic Review), n (n)	Net Benefit*	Effective vs. Placebo, Sham, Wait List, or No Treatment?	Inconsistency?†	Directness of Evidence?	Overall Quality of Evidence	Comments
Acupuncture	4 (3)	Unable to estimate	Unclear (2 trials)	Some inconsistency	Direct	Poor	
Back schools	1 (0)	Unable to estimate	Unclear (1 trial)	Not applicable	Direct	Poor	
Psychological interventions	0	No evidence	No evidence	No evidence	No evidence	No evidence	
Exercise	13 (7)	Not effective	No (9 trials)	Some inconsistency	Direct	Good	Most trials found no effect
Functional restoration	4 (3)	Not effective	Yes (3 trials)	Some inconsistency	Direct	Fair	Most trials found no effect, but studies were heterogeneous
Interdisciplinary rehabilitation	0	No evidence	No evidence	No evidence	No evidence	No evidence	
Interferential therapy	0	No evidence	No evidence	No evidence	No evidence	No evidence	
Low-level laser therapy	0	No evidence	No evidence	No evidence	No evidence	No evidence	
Lumbar supports	1 (0)	Unable to estimate	No evidence	Not applicable	Direct	Poor	
Massage therapy	1 (0)	Unable to estimate	No evidence	Not applicable	Direct	Poor	
Shortwave diathermy	1 (0)	Unable to estimate	No evidence	Not applicable	Direct	Poor	
Spinal manipulation	11 (2)	Small to moderate	Yes (2 trials)	No	Direct	Fair	
Superficial heat	5 (5)	Moderate	Yes (2 trials)	No	Direct	Good	
Traction	0	No evidence	No evidence	No evidence	No evidence	No evidence	Most trials included patients with back pain of varying duration, with or without sciatica
Transcutaneous electrical nerve stimulation	1 (0)	Unable to estimate	No evidence	Not applicable	Direct	Poor	
Ultrasonography	0	No evidence	No evidence	No evidence	No evidence	No evidence	
Yoga	0	No evidence	No evidence	No evidence	No evidence	No evidence	

* Based on evidence showing medication is more effective than placebo, or evidence showing medication is at least as effective as other medications or interventions thought to be effective, for 1 or more of the following outcomes: pain, functional status, or work status. Compared with placebo, small benefit was defined as 5–10 points on a 100-point visual analogue scale (VAS) for pain (or equivalent), 1–2 points on the Roland–Morris Disability Questionnaire (RDQ), 10–20 points on the Oswestry Disability Index (ODI), or a standardized mean difference (SMD) of 0.2–0.5. Moderate benefit was defined as 10–20 points on a 100-point VAS for pain, 2–5 points on the RDQ, 10–20 points on the ODI, or an SMD of 0.5–0.8. Large benefit was defined as >20 points on a 100-point VAS for pain; >5 points on the RDQ, >20 points on the ODI, or an SMD >0.8.

† Inconsistency was defined as <75% of trials reaching consistent conclusions on efficacy (no effect vs. positive effect was considered inconsistent).

Appendix Table 11. Summary of Evidence on Nonpharmacologic Therapies for Chronic or Subacute Low Back Pain

Intervention	Trials (Trials Rated Higher-Quality by ≥ 1 Systematic Review), <i>n</i> (<i>n</i>)	Net Benefit*	Effective vs. Placebo, Sham, Wait List, or No Treatment?	Inconsistency?†	Directness of Evidence?	Overall Quality of Evidence	Comments
Acupuncture	24 (8)	Moderate	Yes (12 trials)	Some inconsistency (vs. sham acupuncture)	Direct	Fair	Efficacy of acupuncture vs. sham acupuncture inconsistent
Back schools	26 (3)	Small	Yes (13 trials)	Some inconsistency	Direct	Fair	Back schools based on Swedish model seemed most effective
Psychological interventions	35 (11)	Moderate (cognitive-behavioral treatment), substantial (progressive relaxation), unable to estimate (biofeedback), no effect (operant therapy)	Yes (11 trials)	Some inconsistency (for biofeedback)	Direct	Good (cognitive-behavioral and operant therapy), fair (progressive relaxation), poor (biofeedback)	
Exercise	62 (29)	Small to moderate	Yes (24 trials)	No	Direct	Good	
Functional restoration	12 (9)	Moderate	Yes (7 trials)	No	Direct	Fair	
Interdisciplinary rehabilitation	11 (2)	Moderate	Yes (4 trials)	No	Direct	Good	More intense interdisciplinary rehabilitation more effective than less intense interdisciplinary rehabilitation
Interferential therapy	3 (1)	Unable to estimate	No evidence	No	Direct	Poor	
Low-level laser therapy	6 (4)	Unable to estimate	Unclear (5 trials)	Some inconsistency	Direct	Poor	Trials evaluated different types and intensity of laser, with inconsistent findings
Lumbar supports	2 (1)	Unable to estimate	Unclear (1 trial)	Some inconsistency	Direct	Poor	
Massage therapy	4 (3)	Moderate	No evidence	Some inconsistency (vs. spinal manipulation)	Direct	Fair	Some trials evaluated minimal or light massage techniques
Shortwave diathermy	1 (0)	Not effective	No evidence	Not applicable	Direct	Poor	
Spinal manipulation	29 (15)	Moderate	Yes (13 trials)	No	Direct	Good	
Superficial heat	3 (0)	Unable to estimate	Unclear (3 trials)	No	Direct	Poor	3 lower-quality trials
Traction	6 (3)	Not effective (for continuous traction)	No (2 trials)	No	Direct	Fair	
Transcutaneous electrical nerve stimulation	9 (2)	Unable to estimate	Yes (2 trials)	Yes (vs. sham or no treatment)	Direct	Poor	
Ultrasonography	1 (0)	Unable to estimate	Unclear (1 trial)	Not applicable	Direct	Poor	
Yoga	3 (1)	Moderate (for Viniyoga)	No evidence	No	Direct	Fair (for Viniyoga)	Insufficient evidence to judge non-Viniyoga techniques

* Based on evidence showing medication is more effective than placebo, or evidence showing medication is at least as effective as other medications or interventions thought to be effective, for 1 or more of the following outcomes: pain, functional status, or work status. Compared with placebo, small benefit was defined as 5–10 points on a 100-point visual analogue scale (VAS) for pain (or equivalent), 1–2 points on the Roland–Morris Disability Questionnaire (RDQ), 10–20 points on the Oswestry Disability Index (ODI), or a standardized mean difference (SMD) of 0.2–0.5. Moderate benefit was defined as 10–20 points on a 100-point VAS for pain, 2–5 points on the RDQ, 10–20 points on the ODI, or an SMD of 0.5–0.8. Large benefit was defined as >20 points on a 100-point VAS for pain; >5 points on the RDQ, >20 points on the ODI, or an SMD >0.8.

† Inconsistency was defined as <75% of trials reaching consistent conclusions on efficacy (no effect vs. positive effect was considered inconsistent).

Appendix Table 12. Summary of Evidence on Nonpharmacologic Therapies for Radiculopathy or Sciatica

Intervention	Trials (Trials Rated Higher-Quality by ≥ 1 Systematic Review), <i>n</i> (<i>n</i>)	Net Benefit*	Effective vs. Placebo, Sham, Wait List, or No Treatment?	Inconsistency?†	Directness of Evidence?	Overall Quality of Evidence	Comments
Spinal manipulation	3 (0)	Moderate	No evidence	No	Direct	Fair	No clear differences vs. other interventions
Traction	16 (4)	Not effective (continuous or intermittent traction); small to moderate (autotraction)	No for continuous or intermittent traction (8 trials), yes for autotraction (2 trials)	Some inconsistency (for autotraction vs. continuous or intermittent traction)	Direct	Fair	Other trials of traction included patients with back pain of varying duration
Ultrasonography	1 (0)	Unable to estimate	Unclear (1 trial)	Not applicable	Direct	Poor	

* Based on evidence showing medication is more effective than placebo, or evidence showing medication is at least as effective as other medications or interventions thought to be effective, for 1 or more of the following outcomes: pain, functional status, or work status. Compared with placebo, small benefit was defined as 5–10 points on a 100-point visual analogue scale (VAS) for pain (or equivalent), 1–2 points on the Roland–Morris Disability Questionnaire (RDQ), 10–20 points on the Oswestry Disability Index (ODI), or a standardized mean difference (SMD) of 0.2–0.5. Moderate benefit was defined as 10–20 points on a 100-point VAS for pain, 2–5 points on the RDQ, 10–20 points on the ODI, or an SMD of 0.5–0.8. Large benefit was defined as >20 points on a 100-point VAS for pain; >5 points on the RDQ, >20 points on the ODI, or an SMD >0.8.

† Inconsistency was defined as <75% of trials reaching consistent conclusions on efficacy (no effect vs. positive effect was considered inconsistent).