

SYSTEMATIC REVIEW

Integrative Therapies for Low Back Pain That Include Complementary and Alternative Medicine Care: A Systematic Review

包括补充与替代医疗护理的腰痛综合疗法：系统性审查

Terapias integradas para la lumbalgia que incluyen cuidados de medicina alternativa y complementaria: una revisión sistemática

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ABSTRACT

Study Design: Systematic review of the literature.

Objective: To evaluate whether an integrated approach that includes different Complementary and Alternative Medicine (CAM) therapies combined or CAM therapies combined with conventional medical care is more effective for the management of low back pain (LBP) than single modalities alone.

Summary of Background Data: LBP is one of the leading causes of disability worldwide, yet its optimal management is still unresolved.

Methods: The PRISMA Statement guidelines were followed. The Cochrane Back Review Group scale was used to rate the quality of the studies found.

Results: Twenty-one studies were found that met the inclusion criteria. The CAM modalities used in the studies included spinal manipulative therapy, acupuncture, exercise therapy, physiotherapy, massage therapy, and a topical ointment. Twenty studies included acupuncture and/or spinal manipulative therapy. Nine high quality studies showed that integrative care was clinically effective for the management of LBP. Spinal manipulative therapy combined with exercise therapy and acupuncture combined with conventional medical care or with exercise therapy appears to be promising approaches to the management of chronic cases of LBP.

Conclusions: There is support in

the literature for integrated CAM and conventional medical therapy for the management of chronic LBP. Further research into the integrated management of LBP is clearly needed to provide better guidance for patients and clinicians.

摘要

研究设计：系统性文献检查。

目的：评估包括不同的辅助和替代医学（Complementary and Alternative Medicine, CAM）疗法或CAM疗法结合常规医疗护理的一种综合方法，是否比单一疗法更有效的管理腰痛（Low back pain, LBP）。

背景资料概述：在世界范围内，LBP是残疾的主要原因之一，但其最佳管理方法仍然没有得到解决。

方法：遵照PRISMA声明的指南内容。采用柯克兰背部检查组量表，对研究质量进行评级。

结果：发现21项研究符合纳入标准。研究中使用的CAM方法包括脊椎手法治疗、针灸、运动疗法、物理疗法、按摩疗法和外用药膏。20项研究包括针灸和/或脊椎手法治疗。9项高质量的研究表明，综合护理是临床上有效的LBP处理方法。结合传统的医疗或运动疗法的脊椎手法治疗、以及结合常规医疗或运动疗法的针灸方法看来对于处理慢性LBP病例是有前途的。

结论：文献支持综合性CAM与传统医学可用于治疗慢性LBP。但是，显然需要进一步研究LBP综合处理方法，以便为患者和临床医生提供更好的指导。

SINOPSIS

Diseño del estudio: Revisión sistemática de la bibliografía.

Objetivo: Evaluar si un enfoque integrado que incluya diferentes terapias de medicina alternativa y complementaria combinadas o las terapias de medicina alternativa y complementaria combinadas con cuidados médicos convencionales resulta más efectivo a la hora de controlar la lumbalgia que las modalidades individuales por sí solas.

Resumen de los antecedentes: La lumbalgia es una de las principales causas de discapacidad en el mundo; sin embargo, aún se desconoce cómo tratarla de manera óptima.

Métodos: Se siguieron las directrices de la Declaración PRISMA. Se empleó la escala del Grupo Cochrane de revisión de la espalda para calificar la calidad de los estudios encontrados.

Resultados: Se encontraron 21 estudios que cumplían con los criterios de inclusión. Las modalidades de medicina alternativa y complementaria empleadas en los estudios incluían terapia de manipulación espinal, acupuntura, terapia basada en ejercicios, fisioterapia, terapia de masaje y pomada tópica. Veintiún estudios incluían acupuntura y terapia de manipulación espinal. Nueve estudios de alta calidad mostraron que la atención integral resultaba clínicamente eficaz para el tratamiento de la lumbalgia. La terapia de manipulación espinal combi-

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Citation
Global Adv Health Med.
2014;3(5):49-64. DOI:
10.7453/gahmj.2014.043

Key Words
Low back pain,
complementary and
alternative medicine,
integrated care,
acupuncture, spinal
manipulation,
systematic review

Disclosures
The authors completed
the ICMJE Form for
Disclosure of Potential
Conflicts of Interest
and had no
conflicts to report.

nada con el cuidado médico convencional o con la terapia de ejercicios y la acupuntura combinada con el cuidado médico convencional o con la terapia de ejercicios parecen constituir enfoques prom-

etedores en el tratamiento de casos de lumbalgia crónica.

Conclusiones: Existen teorías en la literatura médica que apoyan la integración de medicina alternativa y complementaria y la terapia

médica convencional a la hora de tratar la lumbalgia crónica. Es necesaria investigación adicional para el tratamiento integrado de la lumbalgia que sirva de referencia a pacientes y médicos.

INTRODUCTION

Low-back pain (LBP) is a complex disorder and one of the most significant healthcare challenges affecting modern society. In the United States, LBP is the fifth most common reason for all physician visits^{1,2} and is the single most common cause for chronic or permanent impairment in adults under the age of 65 years.³ LBP is now considered the leading cause of disability worldwide.⁴ While substantial heterogeneity exists among epidemiological studies of LBP, estimates of the recurrence of activity limiting LBP at 1 year range from 24% to 80%,⁵ leading to a startling economic burden that appears to continue to increase.⁶

The number of interventions available to manage LBP is also extensive.^{7,8} While there are more than 1000 randomized controlled trials (RCTs) published on the topic,⁹ the most effective management approach remains unclear.^{8,10} Conventional treatments such as anti-inflammatory medications have been shown to have limited benefit in improving patient outcomes.¹¹ Opioids appear to offer short-term benefits for chronic LBP, but long-term effects and safety remain unproven.¹² Stabilization exercises have been reported to help decrease pain and disability,¹³ and post-treatment exercise programs have been shown to prevent recurrences of back pain, but Choi et al.¹⁴ found conflicting evidence for exercise as a treatment. An RCT comparing fusion surgery with conservative treatment showed conflicting results as well.¹⁵ These uncertainties in the literature and in conventional medical practice may help explain why LBP is the most common reason for patients to seek out care from a complementary and alternative medicine (CAM) provider.¹⁶ Yet, the literature in support of CAM for management of LBP is also limited. A review published by the Agency for Healthcare Research and Quality found that CAM therapies for back pain (such as acupuncture, massage, and spinal manipulative therapy [SMT]) provide a greater, albeit a modest, benefit as compared to usual medical care.¹⁷

With so many treatment options available and insufficient evidence of efficacy,¹⁵ it is no surprise that there is little consensus among healthcare practitioners across disciplines and even within disciplines with regard to what might be the most appropriate management intervention for LBP. Hirsh et al.¹⁸ reported that there does not seem to be a one-size-fits-all approach to LBP management, that no single treatment approach is the panacea for all patients.

Previous reviews^{2,19-28} have evaluated the use of single CAM therapies for LBP, but in practice it is also

Key Points:

1. Low back pain is a global disorder that causes significant disability.
2. People with low back pain often seek care from a variety of practitioners, both conventional medical practitioners and complementary and alternative medicine (CAM) providers. The optimal management for low back pain is still debated.
3. This systematic review found 21 articles that described the management of low back pain by integrated therapy of conventional medicine and CAM modalities or CAM modalities combined.
4. Spinal manipulative therapy combined with conventional medical care or with exercise therapy and acupuncture combined with conventional medical care or with exercise therapy appear to be promising approaches to the management of chronic cases of low back pain.

common for patients to seek care from multiple practitioners and therefore combine different types of therapies (such as combining conventional medical care, SMT, exercise, and/or acupuncture).⁸ National survey data suggest that more than half of US adults with LBP seek care from medical doctors and one or more types of CAM modalities.¹⁶ The increasing use and acceptance of CAM²⁹ makes this combined approach to care likely to become even more prevalent in the coming years,³⁰ yet very little information has been collected regarding the actual practice of integrative medicine for the treatment of LBP. Studies have proposed the use of multi-modal therapies for LBP management¹⁵ with Guzman et al.³¹ reporting a benefit for multidisciplinary biopsychosocial rehabilitation for LBP and Flor et al.³² finding multidisciplinary treatments for chronic LBP to be superior to single-discipline treatments such as medical treatment or physical therapy. However, Flor's³² review did not include RCTs, and neither Flor et al.³² nor Guzman et al.³¹ considered CAM therapies. Rubinstein et al.²⁷ included a review of SMT used as an adjunct therapy but limited their search to acute LBP and did not investigate any other CAM modalities. In Rubinstein's²⁷ review of SMT for chronic LBP, SMT as an adjunct therapy demonstrated varying quality of evidence, but again, the study did not investigate other CAM modalities.²⁰ No systematic reviews appear to have examined the studies that combine CAM modalities or CAM and conventional medical approaches for LBP. We therefore conducted a systematic review to address this gap in knowledge by summarizing efficacy evidence of an integrated approach to managing LBP.

Our aim was to summarize evidence in relation to the following questions:

1. Is an integrated approach that includes CAM therapies and conventional medical care more effective for the management of LBP than either alone?
2. Is an integrated approach that combines CAM modalities more effective than each applied alone?

MATERIALS AND METHODS

The PRISMA statement for reporting systematic reviews was used as guide during the development of this project.³³

Eligibility Criteria

To be eligible for this systematic review, articles had to meet the following criteria:

1. Reported on an RCT.
2. Included the treatment of LBP.
3. At least one treatment group received integrated therapy that included at least one CAM modality (ie, two or more CAM modalities used together, or one or more CAM modalities used with conventional medical treatment). For this study, a CAM modality was defined as a non-mainstream health-care intervention that is used either together with conventional medical care or in place of it.³⁴ Conventional medicine was defined as care provided by a medical or osteopathic physician or allied healthcare providers (eg, physical therapist). Exercise therapy was defined as conventional medical care as it is most often considered a mainstream therapy provided by physical therapists.
4. Published in English.
5. An original study and published in a peer-reviewed journal.
6. At least one outcome measure for pain or disability used (visual analog scale for pain [VAS], Oswestry Low Back Pain Disability Questionnaire [Oswestry], Roland-Morris Disability Questionnaire [Roland-Morris], Short Form-36 [SF-36], von Korff Scales, Dartmouth-Northern New England Primary Care Cooperative Information Project [CO-OP], Aberdeen Low Back Pain Scale (Aberdeen), McGill Pain Questionnaire [MPQ], Numeric Rating Scale for Pain [NRS], Rating of Perceived Capacity of Spine, self-generated pain or disability questionnaires).

Information Sources

The search engines used for this systematic review were PubMed, Medline, Index to Chiropractic Literature, Academic Search Premier, CINAHL, Cochrane Center Registry of Controlled Trials, and OVID. References of selected articles were searched for any additional studies that were missed by the initial search.

Search restrictions were human subjects, English language, peer-reviewed journal, RCTs and articles published up to February 2013.

Search

The search string used for this systemic review was: (low back pain OR back pain) AND (integrative care OR multidisciplinary care OR chiropractic OR spinal manipulation OR Chinese medicine OR traditional chinese medicine OR acupuncture OR homeopathy OR Ayurveda OR herbal medicine OR nutrition OR nutritional supplements OR mind-body medicine OR massage therapy OR yoga) AND (randomized controlled trial).

Study Selection

The three authors met together and reviewed each article to determine if each one met the predetermined inclusion criteria. Disagreements between reviewers were resolved through discussion and consensus and by performing a literature review on the meaning of integrated CAM therapies.

Data Collection Process

One author extracted the data from the articles into a spreadsheet. This was reviewed by a second author and disagreements between the authors resolved by consensus.

Data Items

Information that was extracted from the studies included:

1. Type of LBP
2. Sample size
3. Age of participants
4. Adverse events
5. Interventions used
6. Outcome measures
7. Results of interventions

Risk of Bias in Individual Studies

The Cochrane Back Review Group (CBRG) scale³⁵ was used for rating the quality of the studies found (Table 1). All three authors rated each article independently and then met to discuss their ratings. When there was a disagreement the original article was reread until a consensus was formed. Articles that scored six points or more on the 12-point scale were rated as high-quality. Articles that scored less than six points should be rated as low-quality.³⁵

Planned Methods of Analysis

Data were extracted for the pain and disability effect estimates (between-group and/or within group differences) and for measures of variability (eg, confidence intervals) where possible. Clinical significance was determined using very minimal estimates based on existing literature.³⁶⁻⁴¹ A statistician analyzed whether studies achieved clinically significant results. Statistical significance was reported for outcomes that did not have validated clinically significant cutoffs.

For this review, cutoffs were set at³⁶⁻⁴¹:

Table 1 The Cochrane Back Review Group Scale Questions

	Was the method of randomization adequate? Was the treatment allocation concealed?
Was knowledge of the allocated intervention adequately prevented during the study?	Was the patient blinded to the intervention? Was the care provider blinded to the intervention? Was the outcome assessor blinded to the intervention?
Were incomplete outcome data adequately addressed?	Was the dropout rate described and acceptable? Were all randomized participants analyzed in the group to which they were allocated? Are reports of the study free of suggestion of selective outcome reporting?
Other sources of potential bias	Were the groups similar at baseline regarding the most important prognostic indicators? Were co-interventions avoided or similar? Was the compliance acceptable in all groups? Was the timing of the outcome assessment similar in all groups?

1. >10 mm on a 100-mm visual analog scale for pain (VAS)
2. >10 points on Oswestry Low Back Pain Disability Questionnaire (Oswestry)
3. >3 points on Roland-Morris Disability Questionnaire (Roland-Morris)
4. ≥ 5 points on Short Form-36 (SF-36)
5. >10 points on von Korff Scales (Pain and Disability)
6. >5 points on Dartmouth Primary Care Cooperative chart system (COOP)
7. >10 points on Aberdeen Low Back Pain Scale (Aberdeen)
8. >2 points McGill Pain Questionnaire (MPQ)
9. >1 on a 10-point Numeric Rating Scale for Pain (NRS)

No further pooling of study results could be performed because of the heterogeneity of the outcome measures used.

Additional Analyses

The studies were grouped according to the modalities that were used in the treatment arms. Subgroup analysis was performed to determine the efficacy of the different integrative treatments for LBP. SMT was considered to be manual therapy delivered to correct spinal biomechanics. It could be applied by chiropractors, osteopaths, or physical therapists. Acupuncture could be provided alone or in conjunction with electrical stimulation applied directly to the needles. The points chosen could be

traditional acupuncture points or muscle motor points or other points using neurological levels. Physiotherapy was considered any passive modality applied to the patient while exercise therapy was considered any active movement therapy to be performed by the patient.

The strength of the evidence for each group was calculated by looking at the degree of agreement on the effectiveness and the quality of the studies as determined by the CBRG score. The strength of the evidence was rated using a five-level scale to determine their place in the best evidence synthesis (Table 2).⁴²

RESULTS

Study Selections

The search of PubMed, Medline, Index to Chiropractic Literature, Academic Search Premier, CINAHL, Cochrane Center Registry of Controlled Trials, and OVID provided total of 622 citations. Five hundred and ninety one of these articles were excluded for not meeting the inclusion criteria. The full text of the remaining 31 articles was obtained. The references of these articles were examined for any additional relevant studies and none were found. After review, nine of the 31 articles were excluded for not including an integrative CAM treatment arm or not including pain or disability outcome measures. One article was excluded because it was a duplicate. A total of 21 studies were found that met the inclusion criteria (Figure 1).

Table 2 Best Evidence Synthesis Scale

Level	Description	Evidence Required
1	Strong evidence	More than 75% of high-quality RCTs report the same results
2	Moderate evidence	One high-quality RCT and/or multiple low-quality RCTs report the same results
3	Limited evidence	One low-quality RCT or one high-quality RCT and one low-quality RCT with opposite conclusion
4	Conflicting evidence	Contradictory results among multiple RCTs
5	No evidence	No RCTs

Abbreviation: RCT, randomized controlled trial.

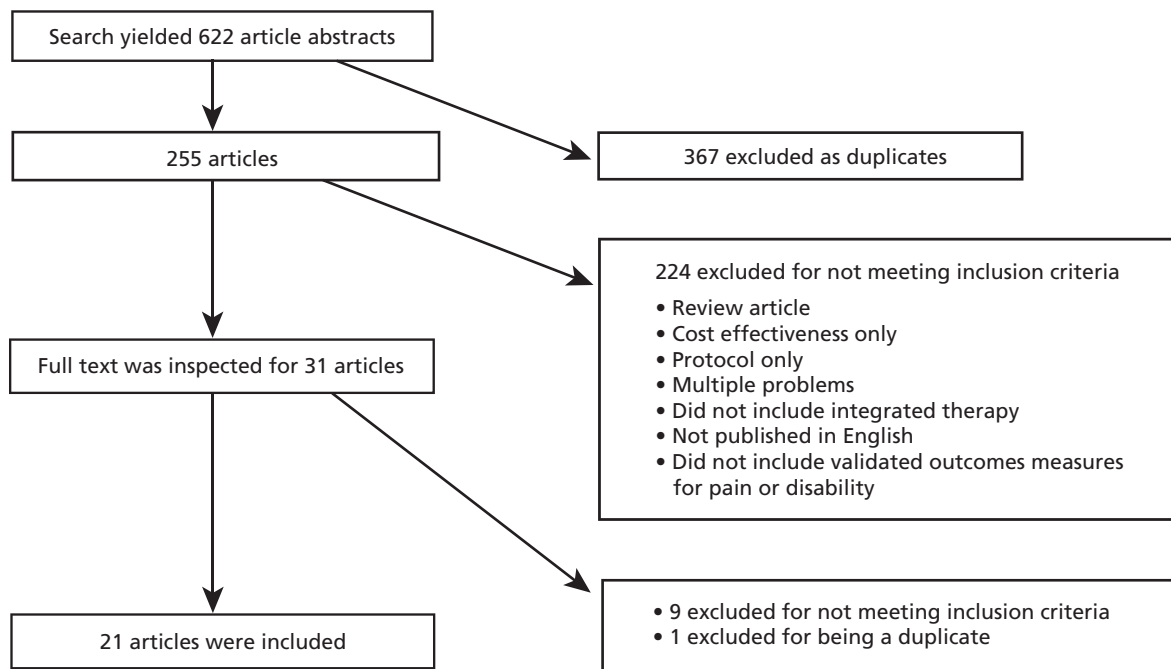


Figure 1 Flow of citations through the retrieval and screening process.

Study Characteristics

A total of 4400 patients were included in the 21 articles. Individual study sample sizes ranged from 32 to 1334. Two studies (10%) had fewer than 50 patients; five (24%) had between 50 and 100 patients, and 14 (67%) had more than 100 patients. Five studies (24%) included only acute LBP, 13 (62%) only subacute or chronic LBP (one of which specified patients with osteoarthritis in the low back), and three (14%) did not specify any chronicity (Table 3).

Eleven studies (52%) were limited to middle-aged participants. Three (14%) of the studies only included seniors, five studies (24%) included middle-aged and senior participants and two studies (10%) did not specify the age of the participants.

The modalities used in the studies included: SMT (13), conventional medical care (8), acupuncture (8), exercise (8), physiotherapy (5), massage therapy (1), topical application (1).

No studies were found that used integrated therapies that included homeopathy, Ayurveda, herbal medicine, nutrition, nutritional supplements, mind-body medicine, or yoga.

Risk of Bias Within Studies

The risk of bias within studies was determined using the CBRG scale (Table 4). Seventeen of the 21 studies (81%) were judged to be of high and four (19%) of low-quality. The most common problems encountered were lack of blinding of the participants, providers, and outcome assessors. Only eight of the studies reported on the use of any co-interventions by the participants and six on the participant's compliance with the treatment protocol.

Results of Individual Studies

A wide range of outcome measures were used in the studies included in this systematic review (Table 5). All of the outcome measures included were validated except Gunn et al,⁶⁰ who used a self-generated questionnaire. Some studies reported only the within-group changes over time while others only reported between-group differences. Seventeen studies (81%) used primary outcome measures for pain or disability due to LBP. Even this consistency was confounded by the use of many different instruments that purport to measure the same outcome. Other primary outcome measures used included lumbar range of motion, satisfaction with care, prescription medication use, surface electromyography (EMG), lumbar muscle endurance, quality of life, perceived capacity of spine, adverse events, and heart rate variability.

Some authors used multiple VAS for pain, such as current, average, and most severe pain. To simplify analysis, we used only average pain for this systematic review when multiple VAS scores for pain were reported.

When authors reported outcomes at multiple time points we chose to only include those taken at the conclusion of the intervention period.

Synthesis of Results

Studies were organized by the type of modalities used for treating LBP, the quality of the studies based on the CBRG score and whether the treatment was clinically effective. Levels of best evidence (Table 6) were calculated for each type of treatment using methods described above.

Table 3 Study Characteristics

Authors	Type of LBP	Sample size	Age	Interventions	Outcome Measures
Beyerman et al, 2006 ⁴⁷	Secondary to osteoarthritis (chronic)	252	Not reported	TG: SMT + Moist heat CG: Moist heat	Lumbar spine range of motion Oswestry VAS
Bronfort et al, 2008 ⁴⁵	Chronic (≥6 weeks)	174	20-60 y	TG: SMT + Strengthening exercise CG: Conventional medical care + Strengthening exercise CG: SMT + stretching exercise	VAS Roland-Morris COOP
Childs et al, 2004 ⁴³	Not reported	131	18-60 y	TG: SMT + Exercise CG: Exercise	Oswestry
Eisenberg et al, 2007 ⁶²	Acute	444	18 y and over	TG: Conventional medical care + Choice of acupuncture, chiropractic or massage therapy CG: conventional medical care	NRS Roland-Morris Self-generated satisfaction scale Cost
Gunn et al, 1980 ⁶⁰	Chronic	56	25-56 y	TG: Acupuncture (dry needling) + Conventional medical care CG: Conventional medical care	Self-generated pain and work status questionnaire
Hancock et al, 2007 ⁵¹	Acute	240	Not reported	TG: SMT + Conventional medical care CG: Conventional medical care + Placebo SMT CG: SMT + Placebo conventional medical care CG: Placebo SMT + Placebo conventional medical care	VAS for number of days to recovery
Hurley et al, 2004 ⁴⁸	Sub-acute	240	18-65 y	TG: SMT + Electric muscle stimulation CG: SMT CG: Electric muscle stimulation	Roland-Morris VAS MPQ EQ-5D SF-36 Self-generated questionnaire for LBP recurrence, work absenteeism, exercise participation, analgesic medication consumption, and additional healthcare use
Hurwitz et al, 2002 ⁴⁹	Not reported	341	18 years and over	TG: SMT with physiotherapy modalities CG: SMT	NRS for pain Roland-Morris
Itoh et al, 2009 ⁵⁷	Chronic	32	61-81 y	TG: Acupuncture + TENS CG: Waiting list control CG: Acupuncture CG: TENS	VAS Roland-Morris
Jüni et al, 2009 ⁵⁰	Acute	104	20-55 y	TG: Conventional medical care + SMT CG: Conventional medical care	NRS Analgesic use

Table 3 Study Characteristics (*cont*)

Authors	Type of LBP	Sample size	Age	Interventions	Outcome Measures
Leibing et al, 2002 ⁵⁶	Chronic	131	18-65 y	TG: Acupuncture + Active physiotherapy CG: Active physiotherapy CG: Sham acupuncture + Active physiotherapy	VAS Pain Disability Index
Mayer et al, 2005 ⁶¹	Acute	122	18-55 y	TG: Heat-wrap therapy + Exercise CG : Heat-wrap therapy CG: Exercise CG: Control (booklet)	Rating of perceived capacity-spine
Meng et al, 2003 ⁵⁸	Chronic	55	60 y and over	TG: Acupuncture + Conventional medical care CG: Conventional medical care	Roland-Morris
Mohseni-Bandpei et al, 2006 ⁴⁴	Chronic	120	18-55 y	TG: SMT + Exercise CG: Ultrasound + Exercise	VAS Oswestry Lumbar spine range of motion Surface electromyography Lumbar extension muscle endurance
Molsberger et al, 2002 ⁵⁹	Chronic	186	20-60 y	TG: Acupuncture + Conventional orthopedic therapy CG: Conventional orthopedic therapy CG: Sham acupuncture + Conventional orthopedic therapy	VAS Self-generated effectiveness of treatment Lumbar spine range of motion
Niemistö et al, 2003 ⁵³	Chronic	204	24-46 y	TG: SMT + Stabilizing exercise + Conventional medical care CG: Conventional medical care	VAS Oswestry Frequency of LBP
Ongley et al, 1987 ⁵²	Chronic	81	21-70 y	TG: Forceful SMT + Injection of dextrose-glycerine-phenol into soft tissues + High dose of anesthesia CG: Low dose of anesthesia + Less forceful SMT + Placebo injection	VAS Analgesic use Roland-Morris Adverse events
UK BEAM Trial 2004 ⁴⁶	Not reported	1,334	18-65 y	TG: SMT + exercise CG: Conventional medical care CG: Exercise CG: SMT	Roland-Morris Von Korff scales Back beliefs questionnaire Fear avoidance belief questionnaire SF -36 EQ-5D
Weiner et al, 2008 ⁶³	Chronic	65	65 y and over	TG: Acupuncture (percutaneous electrical nerve stimulation [PENS]) + General conditioning and aerobic exercise (GCAE) CG: PENS CG: Sham PENS CG: Sham PENS + GCAE	MPQ Roland-Morris

Table 3 Study Characteristics (*cont*)

Authors	Type of LBP	Sample size	Age	Interventions	Outcome Measures
Yeung et al, 2003 ⁵⁵	Chronic	52	18-75 y	TG: Exercise + Electro-acupuncture CG: Exercise	NRS Aberdeen
Zhang et al, 2008 ⁵⁴	Acute	36	Not reported	TG: SMT + Biofreeze topical application CG: SMT	VAS Roland-Morris Low back muscle surface electromyography Heart rate variability

Abbreviations: CG, control group; COOP, Dartmouth Primary Care Cooperative chart system; EQ-5D, European Quality of Life; LBP, low back pain; MPQ, McGill Pain Questionnaire; NRS, numeric rating scale; SF-12 & 36: Short Form 12 & 36; SMT, spinal manipulative therapy; TENS, transcutaneous electric nerve stimulation; TG, treatment group.

Table 4 The Cochrane Back Review Group Scores

	Random- ization Adequate	Treatment Allocation Concealed	Patient Blinded	Care Provider Blinded	Outcome Assessor Blinded	Drop- Out Rate	Intention to Treat	Selective Outcome Reporting	Groups Similar at Baseline	Co- interventions	Compliance	Timing of the Outcomes	Score
Beyerman, 2006 ⁴⁷	?	–	–	–	–	+	–	+	+	?	?	+	4
Bronfort, 2008 ⁴⁵	+	+	–	–	–	+	+	+	+	+	+	+	9
Childs, 2004 ⁴³	+	+	–	–	–	–	+	+	+	?	+	+	7
Eisenberg, 2007 ⁶²	+	+	–	–	–	+	+	+	+	+	?	+	8
Gunn, 1980 ⁶⁰	+	+	–	–	?	+	+	+	?	?	?	+	6
Hancock, 2007 ⁵¹	+	+	+	?	+	+	+	+	+	+	+	+	11
Hurley, 2004 ⁴⁸	+	+	–	–	–	–	+	+	+	?	+	+	8
Hurwitz, 2002 ⁴⁹	+	+	–	–	–	+	+	+	+	+	?	+	7
Itoh, 2009 ⁵⁷	+	+	–	–	–	+	?	+	+	?	?	+	6
Jüni, 2009 ⁵⁰	+	+	–	–	–	+	+	+	?	+	+	+	8
Leibing, 2002 ⁵⁶	–	–	?	–	?	–	+	+	+	?	?	+	4
Mayer, 2005 ⁶¹	+	+	–	–	–	+	–	+	+	?	?	+	6
Meng, 2003 ⁵⁸	+	+	–	–	–	–	+	+	+	+	?	+	7
Mohseni-Bandpei, 2006 ⁴⁴	+	+	–	–	+	–	+	?	+	+	?	+	7
Molsberger, 2002 ⁵⁹	+	+	?	–	?	+	+	+	+	?	?	+	7
Niemistö, 2003 ⁵³	+	+	–	–	–	+	+	+	+	+	?	+	8
Ongley, 1987 ⁵²	+	+	+	–	+	?	–	+	+	?	?	+	7
UK Beam, 2004 ⁴⁶	+	+	–	–	–	–	–	+	–	?	–	+	4
Weiner, 2008 ⁶³	+	+	?	?	?	+	+	+	+	?	+	+	8
Yeung, 2003 ⁵⁵	+	+	–	–	–	+	+	+	+	?	?	+	7
Zhang, 2008 ⁵⁴	+	+	–	–	–	?	?	+	+	?	?	+	5

+, yes (1 point); –, no (0 points); ?, unclear (0 points).

Spinal Manipulative Therapy and Exercise

A total of four studies were identified in this category. All of these studies were pragmatic trials, and all or most participants received SMT that included high-velocity thrusts. Childs et al⁴³ and Mohseni-Bandpei et al⁴⁴ had physiotherapists performing the SMT, Bronfort et al⁴⁵ used chiropractors, and the UK BEAM trials⁴⁶ used chiropractors, osteopaths, and physiotherapists. The UK BEAM⁴⁶ study reported no adverse effects while

Bronfort et al⁴⁵ reported adverse effects mainly from NSAIDs. Childs et al⁴³ and Mohseni-Bandpei et al⁴⁴ did not report if there were any adverse effects. All trials except for Bronfort et al⁴⁵ reported clinically effective results from the integrated therapy. Of the three high-quality studies,⁴³⁻⁴⁵ Childs et al⁴³ and Mohseni-Bandpei et al⁴⁴ reported that integrative treatments were more effective than the comparison therapy, leading to a level 2 best evidence score for using the integrated therapy.

Table 5 Study Outcomes

Study Name		Group 1	Group 2	Group 3	Group 4
Beyerman, 2006 ⁴⁷	Intervention	SMT + Moist Heat	Moist Heat		
	N	143	109		
	Oswestry mean \pm SD ^b	8.56 \pm 7.10 ^a	12.82 \pm 7.66 ^a		
	VAS mean \pm SD ^b	2.55 \pm 2.01 ^a	3.99 \pm 2.23 ^a		
Bronfort, 2008 ⁴⁵	Intervention	SMT + Strengthening Exercise	Conventional Medical Care + Strengthening Exercise	SMT + Stretching Exercise	
	N	71	52	51	
	VAS mean \pm SD	Mean not reported ^a	Mean not reported ^a	Mean not reported ^a	
	Roland-Morris	Mean not reported ^a	Mean not reported ^a	Mean not reported ^a	
	COOP	Mean not reported ^a	Mean not reported ^a	Mean not reported ^a	
Childs, 2004 ⁴³	Intervention	SMT + Exercise	Exercise		
	N	70	61		
	Oswestry mean differences (95% CI)	8.3 (2.4, 14.2) ^{b,c}			
Eisenberg, 2007 ⁶²	Intervention	Conventional Medical Care + Choice of Acupuncture, Chiropractic or Massage Therapy	Conventional Medical Care		
	N	300	150		
	NRS mean change after treatment (IQ) ^b	-5 (-7,-3)	-4 (-7,-2)		
	Roland-Morris change	-9 (-15,-4)	-8 (-13,-2)		
Gunn, 1980 ⁶⁰	Intervention	Acupuncture (Dry Needling) + Conventional Medical Care	Conventional Medical Care		
	N	29	27		
	Self-generated pain and work status ^b	Not reported	Not reported		
Hancock, 2007 ⁵¹	Intervention	Conventional Medical Care + SMT + Diclofenac	Conventional Medical Care + Placebo SMT + Diclofenac	Conventional Medical Care + SMT + Placebo Diclofenac	Conventional Medical Care + Placebo SMT + Placebo Diclofenac
	N	60	60	59	60
	Treatment Modality	Diclofenac	Placebo Diclofenac	SMT	Placebo SMT
	Days	13 (10-16)	16 (14-18)	15 (13-18)	15 (12-19)
	Number of days to a full day of zero on the VAS (95% CI)				
Hurley, 2004 ⁴⁸	Intervention	SMT	Electric Muscle Stimulation	SMT + Electric Muscle Stimulation	
	N	80	80	80	
	Change in Roland-Morris mean (95% CI)	-4.53 (-5.7,-3.3) ^a	-3.56 (-4.8,-2.4) ^a	-4.65 (-5.8,-3.5) ^a	
	Change in VAS (mm) mean (95% CI)	-19.88 (-26.1,-13.7) ^a	-21.38 (-27.5,-15.2) ^a	-24.69 (-30.8,-18.6) ^a	
Hurwitz, 2002 ⁴⁹	Intervention	SMT	SMT + Physiotherapy		
	N	169	172		
	Clinically significant Improvement on NRS (2 points/10)	34.5%	45%		
	Change in NRS (95% CI)	1.04 (0.74, 1.35)	1.35 (1.05, 1.66)		
			-0.31 (-0.13, 0.75)		
	Clinically significant Improvement on Roland-Morris	43.8%	51.5%		
	Change in Roland-Morris (95% CI)	3.18 (2.48, 3.88)	3.16 (2.46, 3.86)		
			0.02 (-1.02, 0.97)		

Table 5 Study Outcomes (cont)

Study Name	Group 1	Group 2	Group 3	Group 4
Itoh, 2009 ⁵⁷	Intervention	Acupuncture + TENS	No Specific Treatment	Acupuncture
	N	6	7	7
	VAS mean \pm SD	36.6 \pm 8.0 ^a	53.1 \pm 27.9	37.4 \pm 25.8
	Roland-Morris mean \pm SD	7.3 \pm 4.9 ^a	9.8 \pm 0.8	5.4 \pm 3.4
Jüni, 2009 ⁵⁰	Intervention	Conventional Medical Care + SMT	Conventional Medical Care	TENS
	N	52	52	
	11-point Box scale for pain mean difference (95% CI)	0.6 (−0.1, 1.3)		
	Analgesic dose mean difference (95% CI)	−13 (−42, 15)		
Leibing, 2002 ⁵⁶	Intervention	Acupuncture + Active Physiotherapy (AG)	Active Physiotherapy (CG)	Sham Acupuncture + Active Physiotherapy (SG)
	N	40	46	45
		−2.7 \pm 2.2	−1.0 \pm 1.7	−2.1 \pm 2.2
	Change in VAS mean \pm SD	Contrast AG vs SG AG vs CG ^{b,c}	Difference in Change in VAS Mean (95% CI) −0.6 (−1.65, 0.45) −1.7 (−2.71, −0.62)	
	Change in pain disability index (PDI) mean \pm SD	−13.9 \pm 15.0	−2.6 \pm 7.8	−9.7 \pm 10.5
		Contrast AG vs SG AG vs CG ^{b,c}	Difference in Change in PDI (95% CI) −4.2 (−9.99, 1.71) −11.3 (−17.01, −5.44)	
Mayer, 2005 ⁶¹	Intervention	Heat-Wrap Therapy + Exercise	Heat-Wrap Therapy	Exercise
	N	24	25	25
	Rating of Perceived Capacity-Spine (RPC-S)	Treatment Contrast Heat + Exercise vs Heat ^b Heat + Exercise vs Exercise ^b Heat + Exercise vs Booklet ^b	Relative Increase 84% 95% 175%	
	Control (Booklet)			26
Meng, 2003 ⁵⁸	Intervention	Acupuncture + Conventional Medical Care	Conventional Medical Care	
	N	31	24	
	Change in Rolland Morris questionnaire ^{b,c}	4.1 \pm 3.9 ^a	0.7 \pm 2.8	
Mohseni-Bandpei, 2006 ⁴⁴	Intervention	SMT + Exercise	Ultrasound + Exercise	
	N	60	60	
	Change in VAS (95% CI)	41.6 (4.2, 49.6) ^a 16.4 (6.1, 26.8) ^{b,c}	25.1 (17.7, 32.5) ^a	
	Change in Oswestry (95% CI)	17.9 (14.0, 21.8) ^a 7.8 (2.4, 13.2) ^b	10.1 (6.2, 13.9) ^a	
Molsberger, 2002 ⁵⁹	Intervention	Acupuncture + Conventional Orthopedic Therapy (AC)	Conventional Orthopedic Therapy (C)	Sham Acupuncture + Conventional Orthopedic Therapy (SC)
	N	65	60	61
	VAS mean \pm SD	26 \pm 21	39 \pm 21	36 \pm 19
		77% (62%, 88%)	14% (4%, 30%)	29% (16%, 46%)
	VAS 50% pain relief (95% CI)	Contrast AC vs SC ^{b,c} AC vs C ^c	Difference in means not reported Difference in means not reported	

Table 5 Study Outcomes (cont)

Study Name		Group 1	Group 2	Group 3	Group 4
Niemistö, 2003 ⁵³	Intervention	SMT + Stabilizing Exercise + Conventional Medical Care	Conventional Medical Care		
	N	102	102		
	VAS mean ± SD ^{b,c}	25.2 ± 23.3 ^a	36.1 ± 23.3 ^a		
	Oswestry mean ± SD ^b	14.7 ± 11.6 ^a	18.6 ± 11.6 ^a		
	% with daily LBP	37% ^a	39% ^a		
Ongley, 1987 ⁵²	Intervention	Forceful SMT + Injection of Dextrose-Glycerine-Phenol into Soft Tissues + High-dose Anesthesia	Low Dose Anesthesia + Less Forceful SMT + Placebo Injection		
	N	40	40		
	VAS mean ± SD ^{b,c}	1.77 ± 0.22	2.93 ± 0.25		
	Roland-Morris ^{b,c}	4.70 ± 0.73	8.49 ± 1.04		
UK BEAM Trial, 2004 ⁴⁶	Intervention	General Practice (GP)	Exercise (E)	SMT (S)	SMT + Exercise (SE)
	N	338	310	353	333
	Roland-Morris mean difference	Contrast GP vs E ^b	Mean Difference (95% CI)		
		GP vs S ^b	1.36 (0.63, 2.10)		
		GP vs SE ^b	1.57 (0.82,2.32)		
			1.87 (1.15,2.60)		
	Von Korff scales mean difference	Contrast GP vs E ^b	Mean difference (95% CI)		
		GP vs S	5.03 (1.02,9.05)		
GP vs SE ^b		.97 (-0.050,7.98)			
		5.51 (1.75,9.28)			
Von Korff scales mean difference for pain	Contrast GP vs E ^b	Mean difference (95% CI)			
	GP vs S ^b	4.59 (0.43,8.75)			
	GP vs SE ^b	8.90 (4.84,12.95)			
		8.21 (4.20,12.21)			
Weiner, 2008 ⁶³	Intervention	Acupuncture with PENS (A)	Acupuncture with PENS + Exercise (AE)	Acupuncture with sham PENS (S)	Acupuncture with Sham PENS + Exercise (SE)
	N	47	45	48	44
	MPQ mean ± SD	-2.9 ± 9.2 ^a	-4.1 ± 8.2 ^a	-2.3 ± 6.3 ^a	-3.1 ± 7.9 ^a
		Contrast A vs S	Mean ± SD		
		AE vs SE	0.5 ± 1.4		
		AE vs A	-0.6 ± 1.5		
	Roland-Morris mean ± SD	SE vs S	-1.4 ± 1.4		
			-0.3 ± 1.4		
-2.6 ± 4.5 ^a		-2.6 ± 4.6 ^a	-2.7 ± 3.8 ^a	-3.0 ± 4.7 ^a	
Contrast A vs S		Mean ± SD			
Yeung, 2003 ⁵⁵	Intervention	Exercise	Exercise + Electro Acupuncture		
	N	26	26		
	NRS mean ± SD ^{b,c}	5.12 ± 2.18	3.81 ± 2.10		
	Aberdeen mean ± SD ^{b,c}	30.82 ± 13.03	20.02 ± 10.47		
Zhang, 2008 ⁵⁴	Intervention	SMT	SMT + Topical Application		
	N	18	18		
	Roland- Morris questionnaire mean ± SD	3.600 ± 5.412	8.000 ± 3.807		
	VAS mean ± SD	5.2 ± 2.167	1.333 ± 1.732 ^a		

Spinal Manipulative Therapy and Physiotherapy

A total of three studies were identified in this category. The Beyerman et al⁴⁷ participants all had chronic LBP due to osteoarthritis. The Hurley et al⁴⁸ participants had subacute LBP and the Hurwitz et al⁴⁹ study did not specify the chronicity of the participants' LBP. The Hurley et al⁴⁸ and Hurwitz et al⁴⁹ studies were pragmatic, while the Beyerman et al⁴⁷ participants all received a prescribed treatment regime. All three studies included a mix of high-velocity, low-amplitude thrusts and mobilization. Beyerman et al⁴⁷ and Hurwitz et al⁴⁹ used chiropractors to deliver the SMT, while Hurley et al⁴⁸ used physiotherapists. Beyerman et al⁴⁷ used moist heat as the physiotherapy, Hurley et al⁴⁸ used electric muscle stimulation, and Hurwitz et al⁴⁹ used the above plus cold and ultrasound. No adverse events were reported by any of these studies. The Beyerman et al⁴⁷ study found that the integrated therapy was clinically effective; however, the two high-quality studies in this group, Hurley et al⁴⁸ and Hurwitz et al⁴⁹ did not find a clinically significant effect for the integrative therapies, leading to a level 2 best evidence score against using the integrated therapy.

Spinal Manipulative Therapy and Conventional Medical Care

A total of three studies were identified in this category. The Jüni et al⁵⁰ and Hancock et al⁵¹ participants had chronic LBP, while Ongley's⁵² had acute LBP. Ongley et al⁵² reported using only forceful SMT. The practitioner type was not reported. Jüni et al⁵⁰ and Hancock et al⁵¹ reported using a mix of high-velocity, low-amplitude thrusts, and mobilization. The Hancock et al⁵¹ study used SMT performed by physiotherapists, while Jüni et al⁵⁰ used a mix of different practitioner types. Hancock et al⁵¹ and Jüni et al⁵⁰ reported adverse events. All three studies were high-quality. Ongley et al⁵² reported clinically significant effectiveness from the integrative therapy while the other two did not, leading to a level 4 best evidence score (conflicting evidence).

Spinal Manipulative Therapy, Exercise, and Conventional Medical Care

Only the Niemesto et al⁵³ study was identified in this category. Participants all had chronic LBP. The SMT used was mobilization using a muscle energy technique. They did not report which profession performed the SMT. No adverse effects were reported by any of the participants. This high-quality study found that the integrated treatment was effective, leading to a level 2 best evidence score for using the integrated therapy.

Spinal Manipulative Therapy and Ointment

Only the Zhang et al⁵⁴ study was identified in this category. The participants had acute LBP. The type of SMT performed was a diversified high-velocity, low-amplitude thrust performed by a chiropractor. A topical menthol ointment (Biofreeze, The Hygenic Corporation, Akron, Ohio) was applied by the participants. The occur-

rence of adverse events was not reported. There were no clinically significant effects observed from the treatments. This was a low-quality study and led to a level 3 best evidence score against using the integrated therapy.

Acupuncture and Exercise

Three articles were identified in this category. Participants all had chronic LBP. Yeung et al⁵⁵ and Leibing et al⁵⁶ used standardized acupuncture points, while Weiner et al⁶³ used motor and other points according to a standardized program using neurological levels. All three studies applied electric stimulation to the needles. Yeung et al⁵⁵ prescribed back-strengthening and stretching exercise, Leibing et al⁵⁶ prescribed standardized active physiotherapy, and Weiner⁶³ prescribed general conditioning and aerobic exercises. Yeung et al⁵⁵ and Weiner et al⁶³ reported no adverse events from the therapy, while Leibing et al⁵⁶ reported pain and problems with circulation. Yeung et al⁵⁵ and Leibing et al⁵⁶ found this integrated therapy to be more effective than acupuncture alone, while Weiner et al found no difference between the integrated therapy and acupuncture or exercise therapy alone. The Yeung et al and Weiner et al studies were high-quality, while the Leibing et al study was low-quality, leading to a level 3 best evidence score (conflicting evidence).

Acupuncture and Physiotherapy

Only the Itoh et al⁵⁷ article was identified in this category. The participants all had chronic LBP. The authors used a standardized set of acupuncture points for needling and applied transcutaneous electric nerve stimulation (TENS) stimulation using pads separately from the needles. The only adverse event reported was deterioration of the symptoms in one participant. This study was high-quality and did not find the integrated therapy to be clinically effective. This led to a level 3 best evidence score against using this integrated therapy.

Acupuncture and Conventional Medical Care

Three studies that used integrated acupuncture and conventional medical treatments were found. All participants had chronic LBP. Meng et al⁵⁸ and Molsberger et al⁵⁹ used a standardized set of traditional acupuncture points with the option to choose additional points. Gunn et al⁶⁰ chose to needle muscle motor points instead of traditional acupuncture points. Meng et al⁵⁸ reported adverse events such as aches, bruises, light-headedness, and increased pain. Gunn et al⁶⁰ and Molsberger et al⁵⁹ did not report on the occurrence of adverse events. All three studies were high-quality and found that the integrated therapy was more effective than conventional medical care alone, leading to a level 1 best evidence score for using this integrated therapy.

Exercise and Physiotherapy

Only the Mayer et al⁶¹ study was found in this category. The participants all had acute LBP and received heat wrap therapy and McKenzie protocol exercises. No

Table 6 Best Evidence Synthesis

Modalities Used	Clinically Effective		Clinically Not Effective		Level of Best Evidence
Quality of Study	High	Low	High	Low	
SMT and Exercise	Childs, 2004 ⁴³ Mohseni-Bandpei, 2006 ⁴⁴	UK BEAM, 2004 ⁴⁶	Bronfort, 2008 ⁴⁵		Clinically effective level 2
SMT and Physiotherapy		Beyerman, 2006 ⁴⁷	Hurley, 2004 ⁴⁸ Hurwitz, 2002 ⁴⁹		Clinically not effective level 2
SMT and Conventional Medical Care	Ongley, 1987 ⁵²		Jüni, 2009 ⁵⁰ Hancock, 2007 ⁵¹		Clinically not effective level 4
SMT, Exercise and Conventional Medical Care	Niemistö, 2003 ⁵³				Clinically effective level 2
SMT and Topical Ointment				Zhang, 2008 ⁵⁴	Clinically not effective level 3
Acupuncture and Exercise	Yeung, 2003 ⁵⁵	Leibing, 2002 ⁵⁶	Weiner, 2008 ⁶³		Clinically effective level 3
Acupuncture and Physiotherapy			Itoh, 2009 ⁵⁷		Clinically not effective level 3
Acupuncture and Conventional Medical Care	Gunn, 1980 ⁶⁰ Meng, 2003 ⁵⁸ Molsberger, 2002 ⁵⁹				Clinically effective level 1
Exercise and Physiotherapy	Mayer, 2005 ⁶¹				Clinically effective level 2
Conventional Medical Care with Choice of Acupuncture, Chiropractic, or Massage			Eisenberg, 2007 ⁶²		Clinically not effective level 3

Quality as measured on Cochrane Back Review Group scale: High, ≥ 6 ; Low, < 6 .
Abbreviation: SMT, spinal manipulative therapy.

adverse events from the therapy were reported. This high-quality study found that the integrative therapy was clinically effective, leading to a level 2 best evidence score for using this integrated therapy.

Conventional Medical Care With Choice of Acupuncture, Chiropractic, or Massage

Only the Eisenberg et al⁶² study was found in this category. All patients had acute LBP. Of the participants in the treatment group, 51.4% chose massage therapy, 25.7% chose chiropractic, 19.6% chose acupuncture, and 3.4% declined additional therapy. No details on the conduction of CAM therapies were provided by the authors. Adverse events reported included minor discomfort among 5% of those receiving acupuncture care, 8% of those receiving chiropractic care, and 7% of those receiving massage. This study, deemed high-quality by the CBRG scale, found that the integrative care was not clinically effective, leading to a level 3 best evidence score against using this integrated therapy.

DISCUSSION

LBP remains a vexing problem throughout the world, causing significant pain and disability. Many years of research into the optimal approach to treating LBP have failed to find an ideal solution for all cases. Most likely, various combinations of modalities will be necessary for the different populations of LBP.^{30,31} This systematic review set out to determine if an integrated approach including combinations of CAM therapies and conventional medical care would be more effective than single modality treatment for the management of

LBP. Overall, the results of this systematic review indicate that integrated modalities seem to be effective for this condition.

Twenty of the 21 studies included acupuncture and/or SMT. This is probably due to these modalities being used commonly to treat LBP and the more advanced state of the research communities in the professions that use these interventions.

Complementary and Alternative Medicine Combined With Conventional Medical Care

The combination of conventional medical therapy and CAM modalities appears to be the most promising approach to the management of chronic cases of this complex condition. A consensus among three high-quality trials that used acupuncture and conventional medical integrated therapy found it to be more effective for the management of chronic LBP than conventional medical care alone.⁵⁸⁻⁶⁰ However, none of these studies compared the integrated therapy with acupuncture alone. Future studies are required to determine if this integrated therapy is better than acupuncture alone. There were also no studies found on the use of this integrated therapy for acute LBP.

Combining conventional medical therapy and SMT led to conflicting evidence depending on the chronicity of the LBP. Two high-quality studies used participants with acute LBP and did not find that the integrated therapy was more effective than conventional medical care alone.^{50,51} One high-quality study used participants with chronic LBP and found that the integrated therapy was more effective than conventional medical therapy alone.⁵²

The optimum management of acute LBP requires further study. In addition to the above studies, Eisenberg et al⁶² found that offering patients with acute LBP the choice of a CAM modality (acupuncture, chiropractic, or massage therapy) in addition to conventional medical care increased patient satisfaction and costs but did not improve outcomes. This may be due to the nature of acute LBP. In many cases it initially seems to resolve regardless of the therapy used, but there is high chance of recurrence. Long-term studies need to be performed to clarify which therapies are most effective in preventing future episodes.

Complementary and Alternative Medicine Combined With Active or Passive Care

Exercise has the advantages of being low risk, cost-effective approach that transfers responsibility for care to the patient. The addition of exercise to CAM therapies appears to be a promising approach to managing acute and chronic LBP. Five studies examined integrated therapy combining SMT and exercise. Of these, three high-quality^{43,45} and one low-quality study⁴⁶ found that the integrated therapy was more effective than conventional medical therapy, physiotherapy, and exercise or exercise alone. One of these, Niemisto et al,⁵³ combined conventional medical care, SMT, and exercise therapy. The Bronfort et al study⁴⁵ had three groups which all received integrative therapy: SMT and strengthening exercise, SMT and stretching exercise, or conventional medical care with strengthening exercises. The three groups were all found to be equally effective, leading to the conclusion that SMT and strengthening exercise therapy was not more effective than the other two groups. However, the design of this study precludes coming to any conclusion about the effectiveness of integrated SMT and exercise compared to SMT or conventional medical therapy alone since all groups included some form of exercise.

Three studies^{55,56,63} addressed the use of integrated therapy including acupuncture and exercise therapy for chronic LBP. One high-quality⁵⁵ and one low-quality⁵⁶ study found that this integrated therapy was more effective than exercise alone or with sham acupuncture. Weiner et al⁶³ did not find this integrated therapy to be more effective than acupuncture alone, but the participants in this study were all seniors aged 65 years or older, which may have impacted the outcomes.

While integrated CAM therapy with active care appears to be effective, combining passive physiotherapy modalities with CAM therapy was found to be generally ineffective.^{48,49,56,57} This was a surprising finding considering that this combination is often used as a standard treatment for LBP. This reinforces the modern paradigm that passive care alone may not be helpful in the management of LBP. On the other hand, combining active care with passive physiotherapy may be more effective as demonstrated by the Mayer et al⁶¹ study, which found that integrated therapy combining exercise with heat wrap was more effective than heat wrap

or exercise alone or a control group. The authors described the participants of the study as having acute LBP, but the inclusion criteria specified that the condition had to have been present between 2 days and 3 months, which is commonly considered subacute.

Challenges of Integrated Care

There are some challenges to combining CAM modalities together or with conventional medical therapy. If multiple practitioners treat the same patients without coordinating care, there will be additional costs and time spent on each therapy, fragmentation of patient records, and duplication of services.⁸ There may also be an inconvenience to the patient if more than one clinic needs to be visited. These challenges can partially be mitigated by the increasing prevalence of multidisciplinary clinics, interprofessional collaboration and practitioners who can offer multiple therapies. For example, contemporary chiropractic and acupuncture education includes exercise therapy as part of their curriculum. Increased short-term costs may be justified if the integrated therapy leads to reduced chronic disability.

LIMITATIONS

One limitation was the large number of CAM modalities that could potentially be used in an integrated approach for LBP and the limited number of studies found. For several combinations of modalities, no articles could be identified. Among the integrated therapies that were included in this study, for each there were only one to four studies identified. This makes it impossible to draw a definitive conclusion regarding the most effective treatment for LBP. For example, even though every study except one used SMT or acupuncture treatment, no study was found that integrated these two therapies. In addition, the control group of many trials only included one of the interventions that were part of the integrated therapy. For example, all studies of integrated acupuncture and conventional medical care compared it to conventional medical care alone, but not to acupuncture alone.

Another limitation of this study was that only articles published in English were selected. This may have led to missing articles published in other languages. This is a particular concern for articles about acupuncture, which are often published in Chinese language journals.

Most of the studies included only participants who were described as having chronic LBP. Studies on LBP are often inconsistent when describing the chronicity categories of acute, subacute, chronic, and recurrent or do not describe this aspect at all. This may lead to uncertainty when attempting to translate research findings to clinical care. To add to the confusion, recent studies have pointed out that many cases of LBP that are originally considered acute and then resolved instead lead to recurrent LBP. Interventions that do not seem effective in the short-term may prove to be superior in preventing chronic recurrences and disability. Future studies should also explore the effects of integrated therapies on acute,

chronic, and recurrent LBP. It is important for future studies to include long-term follow-up to determine if cases of LBP have truly resolved.

A limitation to combining results of the studies was the heterogeneity of the treatment modalities and outcomes used. For example, SMT delivered by chiropractors may differ significantly from that delivered by physical therapists. Some acupuncture trials used traditional points, while others used motor points. Numerous variations of pain and disability scales were used by the studies described in this article. In addition, Gunn et al⁶⁰ used a self-generated LBP and disability questionnaire for the primary outcome measure, and Hancock et al⁵¹ used a VAS for pain in an unconventional manner for the primary outcome measure (number of days until zero is recorded).

One common concern for all studies of CAM modalities is that blinding of the patient and practitioner is often impossible. This combined with the common use of subjective pain and disability scales also led to the outcomes not being blinded. Despite this, 17 of the 21 studies scored in the high-quality range as determined by the CBRG scale.

CONCLUSIONS

Patients often try an integrated approach for treatment of LBP, using a combination of conventional medical care and CAM modalities. Previous systematic reviews have examined the use of individual CAM modalities for LBP and found promising results. This systematic review sought to determine if an integrated approach that includes different CAM therapies or CAM therapies combined with conventional medical care is more effective for the management of LBP than either alone. The studies found support the conclusion that integrated therapy which includes SMT combined with exercise therapy and acupuncture combined with conventional medical care or with exercise therapy appears to be more effective than select single therapies alone for treating LBP, although many questions remain. More studies are needed as most of the articles included participants with chronic LBP and there is a lack of RCTs for many CAM modalities used in an integrated manner. Further research into the integrated management of LBP is clearly needed to provide better guidance for patients and clinicians, as is the development of researchers with expertise in CAM modalities. In particular, there is a need for long-term studies that use cost effectiveness in addition to pain and disability from LBP as outcomes.

REFERENCES

- Hart LG, Deyo RA, Cherkin DC. Physician office visits for low back pain. Frequency, clinical evaluation, and treatment patterns from a US national survey. *Spine*. 1995;20(1):11-9.
- Walker BF. The prevalence of low back pain: a systematic review of the literature from 1966 to 1998. *J Spinal Disord*. 2000;13(3):205-17.
- Chou R, Qaseem A, Snow V, et al. Diagnosis and treatment of low back pain: a joint clinical practice guideline from the American College of Physicians and the American Pain Society. *Ann Intern Med*. 2007;147(7):478-91.
- Buchbinder R, Blyth FM, March LM, Brooks P, Woolf AD, Hoy DG. Placing the global burden of low back pain in context. *Best Pract Res Clin Rheumatol*. 2013;27(5):575-89.
- Hoy D, Brooks P, Blyth F, Buchbinder R. The epidemiology of low back pain. *Best Pract Res Clin Rheumatol*. 2010;24(6):769-81.
- Dagenais S, Caro J, Haldeman S. A systematic review of low back pain cost of illness studies in the United States and internationally. *Spine J*. 2008;8(1):8-20.
- Savigny P, Kuntze S, Watson P, et al. Low back pain: early management of persistent non-specific low back pain. London, England: Royal College of General Practitioners (UK); 2009.
- Haldeman S, Dagenais S. A supermarket approach to the evidence-informed management of chronic low back pain. *Spine J*. 2008;8(1):1-7.
- Koes BW, van Tulder MW, Thomas S. Diagnosis and treatment of low back pain. *BMJ*. 2006;332(7555):1430-4.
- Cherkin DC, Deyo RA, Wheeler K, Ciol MA. Physician views about treating low back pain. The results of a national survey. *Spine*. 1995;20(1):1-9; discussion 9-10.
- Roelofs PDDM, Deyo RA, Koes BW, Scholten RJPM, van Tulder MW. Non-steroidal anti-inflammatory drugs for low back pain. *Cochrane Database Syst Rev*. 2008;(1):CD000396.
- Chaparro LE, Furlan AD, Deshpande A, Mailis-Gagnon A, Atlas S, Turk DC. Opioids compared to placebo or other treatments for chronic low back pain: an update of the Cochrane Review. *Spine*. 2014 Apr 1;39(7):556-63.
- Brumitt J, Matheson JW, Meira EP. Core stabilization exercise prescription, part 2: a systematic review of motor control and general (global) exercise rehabilitation approaches for patients with low back pain. *Sports Health*. 2013;5(6):510-513.
- Choi BK, Verbeek JH, Tam WW-S, Jiang JY. Exercises for prevention of recurrences of low-back pain. *Cochrane Database Syst Rev*. 2010;(1):CD006555.
- Van Tulder MW, Koes BW. Low back pain: chronic. Clinical evidence. London, England: BMJ Publishing Group; 2006.
- Eisenberg DM, Davis RB, Ettner SL, et al. Trends in alternative medicine use in the United States, 1990-1997: results of a follow-up national survey. *JAMA*. 1998;280(18):1569-75.
- Furlan AD, Yazdi F, Tsertsvadze A, et al. Complementary and alternative therapies for back pain II. *Evid Rep Technol Assess (Full Rep)*. 2010;(194):1-764.
- Hirsch O, Strauch K, Held H, et al. Low back pain patient subgroups in primary care—pain characteristics, psychosocial determinants and health care utilization. *Clin J Pain*. 2014.
- Furlan AD, van Tulder MW, Cherkin DC, et al. Acupuncture and dry-needling for low back pain. *Cochrane Database Syst Rev*. 2005;(1):CD001351.
- Rubinstein SM, van Middelkoop M, Assendelft WJ, de Boer MR, van Tulder MW. Spinal manipulative therapy for chronic low-back pain. *Cochrane Database Syst Rev*. 2011;(2):CD008112.
- Furlan AD, Imamura M, Dryden T, Irvin E. Massage for low-back pain. *Cochrane Database Syst Rev*. 2008;(4):CD001929.
- Furlan AD, Yazdi F, Tsertsvadze A, et al. Acupuncture for (sub)acute non-specific low-back pain. *Cochrane Database Syst Rev*. 2011;(8):CD009265.
- Assendelft WJ, Morton SC, Yu EI, Suttrop MJ, Shekelle PG. Spinal manipulative therapy for low back pain. *Cochrane Database Syst Rev*. 2004;(1):CD000447.
- Hayden JA, van Tulder MW, Malmivaara A, Koes BW. Exercise therapy for treatment of non-specific low back pain. *Cochrane Database Syst Rev*. 2005;(3):CD000335.
- Gagnier JJ, van Tulder MW, Berman B, Bombardier C. Herbal medicine for low back pain: a Cochrane review. *Spine*. 2007;32(1):82-92.
- Furlan AD, Imamura M, Dryden T, Irvin E. Massage for low back pain: an updated systematic review within the framework of the Cochrane Back Review Group. *Spine*. 2009;34(16):1669-84.
- Rubinstein SM, Terwee CB, Assendelft WJ, de Boer MR, van Tulder MW. Spinal manipulative therapy for acute low back pain: an update of the cochrane review. *Spine*. 2013;38(3):E158-177.
- Rubinstein SM, van Middelkoop M, Assendelft WJ, de Boer MR, van Tulder MW. Spinal manipulative therapy for chronic low-back pain: an update of a Cochrane review. *Spine*. 2011;36(13):E825-846.
- Frass M, Strassl RP, Friehs H, Müllner M, Kundi M, Kaye AD. Use and acceptance of complementary and alternative medicine among the general population and medical personnel: a systematic review. *Ochsner J*. 2012;12(1):45-56.
- Barnes PM, Bloom B, Nahin RL. Complementary and alternative medicine use among adults and children: United States, 2007. *Natl Health Stat Report*. 2008;(12):1-23.
- Guzmán J, Esmail R, Karjalainen K, Malmivaara A, Irvin E, Bombardier C. Multidisciplinary rehabilitation for chronic low back pain: systematic review. *BMJ*. 2001;322(7301):1511-6.
- Flor H, Fydrich T, Turk DC. Efficacy of multidisciplinary pain treatment centers: a meta-analytic review. *Pain*. 1992;49(2):221-30.
- Liberati A, Altman DG, Tetzlaff J, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *Ann Intern Med*. 2009;151(4):W65-94.
- NCCAM. Complementary, alternative, or integrative health: what's in a name? 2013. <http://nccam.nih.gov/health/whatisacam>. Accessed August 8, 2014.
- Furlan AD, Pennick V, Bombardier C, van Tulder M; Editorial Board,

ACKNOWLEDGMENTS

The authors would like to acknowledge the help and support of Jeanette Duffels, Daniel Shen, and Drs Eric Hurwitz and Reed Phillips.

FUNDING

No external funding was received for this review.

- Cochrane Back Review Group. 2009 updated method guidelines for systematic reviews in the Cochrane Back Review Group. *Spine*. 2009;34(18):1929-41.
36. Bombardier C, Hayden J, Beaton DE. Minimal clinically important difference. *Low back pain: outcome measures*. *J Rheumatol*. 2001;28(2):431-38.
 37. Chapman JR, Norvell DC, Hermsmeyer JT, et al. Evaluating common outcomes for measuring treatment success for chronic low back pain. *Spine*. 2011;36(21 Suppl):S54-68.
 38. Deyo RA, Dworkin SF, Amtmann D, et al. Report of the NIH Task Force on research standards for chronic low back pain. *Spine J*. 2014.
 39. Garratt AM, Klaber Moffett J, Farrin AJ. Responsiveness of generic and specific measures of health outcome in low back pain. *Spine*. 2001;26(17):71-7; discussion 77.
 40. Maughan EF, Lewis JS. Outcome measures in chronic low back pain. *Eur Spine J*. 2010;19(9):1484-94.
 41. Ostelo RWJG, Deyo RA, Stratford P, et al. Interpreting change scores for pain and functional status in low back pain: towards international consensus regarding minimal important change. *Spine*. 2008;33(1):90-94.
 42. Yuan J, Purepong N, Kerr DP, Park J, Bradbury I, McDonough S. Effectiveness of acupuncture for low back pain: a systematic review. *Spine*. 2008;33(23):E887-900.
 43. Childs JD, Fritz JM, Flynn TW, et al. A clinical prediction rule to identify patients with low back pain most likely to benefit from spinal manipulation: a validation study. *Ann Intern Med*. 2004;141(12):920-8.
 44. Mohseni-Bandpei MA, Critchley J, Staunton T, Richardson B. A prospective randomised controlled trial of spinal manipulation and ultrasound in the treatment of chronic low back pain. *Physiotherapy*. 2006;92(1):34-42.
 45. Bronfort G, Haas M, Evans R, Kawchuk G, Dagenais S. Evidence-informed management of chronic low back pain with spinal manipulation and mobilization. *Spine J*. 2008;8(1):213-25.
 46. UK BEAM Trial Team. United Kingdom back pain exercise and manipulation (UK BEAM) randomised trial: effectiveness of physical treatments for back pain in primary care. *BMJ*. 2004;329(7479):1377.
 47. Beyerman KL, Palmerino MB, Zohn LE, Kane GM, Foster KA. Efficacy of treating low back pain and dysfunction secondary to osteoarthritis: chiropractic care compared with moist heat alone. *J Manipulative Physiol Ther*. 2006;29(2):107-14.
 48. Hurley DA, McDonough SM, Dempster M, Moore AP, Baxter GD. A randomized clinical trial of manipulative therapy and interferential therapy for acute low back pain. *Spine*. 2004;29(20):2207-16.
 49. Hurwitz EL, Morgenstern H, Harber P, et al. Second prize: the effectiveness of physical modalities among patients with low back pain randomized to chiropractic care: findings from the UCLA low back pain study. *J Manipulative Physiol Ther*. 2002;25(1):10-20.
 50. Jüni P, Battaglia M, Nüesch E, et al. A randomised controlled trial of spinal manipulative therapy in acute low back pain. *Ann Rheum Dis*. 2009;68(9):1420-7.
 51. Hancock MJ, Maher CG, Latimer J, et al. Assessment of diclofenac or spinal manipulative therapy, or both, in addition to recommended first-line treatment for acute low back pain: a randomised controlled trial. *Lancet*. 2007;370(9599):1638-43. doi:10.1016/S0140-6736(07)61686-9.
 52. Ongley MJ, Klein RG, Dorman TA, Eek BC, Hubert LJ. A new approach to the treatment of chronic low back pain. *Lancet*. 1987;2(8551):143-6.
 53. Niemistö L, Lahtinen-Suopanki T, Rissanen P, Lindgren K-A, Sarna S, Hurri H. A randomized trial of combined manipulation, stabilizing exercises, and physician consultation compared to physician consultation alone for chronic low back pain. *Spine*. 2003;28(19):2185-91.
 54. Zhang J, Enix D, Snyder B, Giggey K, Tepe R. Effects of Biofreeze and chiropractic adjustments on acute low back pain: a pilot study. *J Chiropr Med*. 2008;7(2):59-65.
 55. Yeung CKN, Leung MCP, Chow DHK. The use of electro-acupuncture in conjunction with exercise for the treatment of chronic low-back pain. *J Altern Complement Med*. 2003;9(4):479-490.
 56. Leibing E, Leonhardt U, Köster G, et al. Acupuncture treatment of chronic low-back pain—a randomized, blinded, placebo-controlled trial with 9-month follow-up. *Pain*. 2002;96(1-2):189-96.
 57. Itoh K, Itoh S, Katsumi Y, Kitakoji H. A pilot study on using acupuncture and transcutaneous electrical nerve stimulation to treat chronic non-specific low back pain. *Complement Ther Clin Pract*. 2009;15(1):22-5.
 58. Meng CF, Wang D, Ngeow J, Lao L, Peterson M, Paget S. Acupuncture for chronic low back pain in older patients: a randomized, controlled trial. *Rheumatology (Oxford)*. 2003;42(12):1508-17.
 59. Molsberger AF, Mau J, Pawelec DB, Winkler J. Does acupuncture improve the orthopedic management of chronic low back pain—a randomized, blinded, controlled trial with 3 months follow up. *Pain*. 2002;99(3):579-87.
 60. Gunn CC, Milbrandt WE, Little AS, Mason KE. Dry needling of muscle motor points for chronic low-back pain: a randomized clinical trial with long-term follow-up. *Spine*. 1980;5(3):279-21.
 61. Mayer JM, Ralph L, Look M, et al. Treating acute low back pain with continuous low-level heat wrap therapy and/or exercise: a randomized controlled trial. *Spine J*. 2005;5(4):395-403.
 62. Eisenberg DM, Post DE, Davis RB, et al. Addition of choice of complementary therapies to usual care for acute low back pain: a randomized controlled trial. *Spine*. 2007;32(2):151-8.
 63. Weiner DK, Perera S, Rudy TE, Glick RM, Shenoy S, Delitto A. Efficacy of percutaneous electrical nerve stimulation and therapeutic exercise for older adults with chronic low back pain: a randomized controlled trial. *Pain*. 2008;140(2):344-57.

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