REVIEW ARTICLE

Evidence-Based Review of Manual Therapy Efficacy in Treatment of Chronic Musculoskeletal Pain

Andrew V. Bokarius, BS; Vladimir Bokarius, MD, PhD
Comprehensive Care Consultants, Chowchilla, California, U.S.A.

■ **Abstract:** Chronic musculoskeletal pain contributes greatly to the community's disability and morbidity. Although many interventions are employed for treating chronic musculoskeletal pain, few have been proven in randomized controlled trials. Manual therapy is a widely used method for managing such conditions, but to date, its efficacy has not been established. This evidence-based review aims to assess the efficacy of manual therapy interventions for chronic musculoskeletal pain. MEDLINE, CINAHL, EBM Reviews (Cochrane DSR, ACP Journal Club, DARE, and CCTR), Ovid Healthstar, and PsycINFO databases were searched from 1961 to March 2009 using keywords of interest. Potential studies for inclusion were reviewed independently by two reviewers. Methodological quality was assessed based on the Physiotherapy Evidence Database scale. Trials were quantitatively categorized according to the Modified Oxford Centre for Evidence-based Medicine Levels of Evidence. Meta-analysis was not possible due to heterogeneity of outcome measures. Evidence supports some manual therapy techniques in chronic low back and knee pain. ■

Key Words: musculoskeletal diseases, pain, physical therapy modalities

Address correspondence and reprint requests to: Andrew V. Bokarius, BS, Comprehensive Care Consultants, 2670 Amalfi, Chowchilla, CA 93610, U.S.A. E-mail: bokariusa@gmail.com.
Submitted: June 1, 2009; Revision accepted: February 4, 2010
DOI. 10.1111/j.1533-2500.2010.00377.x

INTRODUCTION

Chronic musculoskeletal pain places a large burden on our society. Prevalence of chronic pain in the U.S.A. is approximated from 10% to 30%.[1–4] Including healthcare expenses, the estimated annual cost of this debilitating condition in the U.S.A. is $100 billion.[5] Data from the American Productivity Audit (August 2001 to July 2002), a telephone health and work survey of 28,902 adults, indicates that over 52.7% of respondents report chronic musculoskeletal pain in the past 2 weeks, and 12.7% report productive work time lost due to the pain. The lost productive time cost was estimated at $61.2 billion per year; however, 76.6% of the lost time was due to decreased work performance, not absence from work.

Of the known musculoskeletal disorders, back pain is the leading cause of disability in Americans under 45 years old. Over 26 million Americans between 20 and 64 years of age report frequent back pain.[6] An estimated 28% of adults with low back pain report limited activity due to chronic pain, compared with 10% of adults without low back pain. Also, adults reporting low back pain are more likely to experience psychological distress than people without low back pain.[7] Worldwide, about one-half of patients with chronic pain report low back pain, and among other conditions, one-fifth report widespread pain and one-third report shoulder pain.[8]

As the U.S. population ages, the contribution of chronic pain to patient suffering can be expected to increase significantly. Moreover, pain is reported to

disrupt sleep throughout the week in approximately 20% of 42 million American adults. Thus, the quality of life for this population is affected. As long as chronic pain remains a serious public health problem, research in new approaches for treatment are needed. Research studies should ideally aim to categorically match the best treatments for each pain disorder.

Although a number of interventions for chronic pain are available, manual therapy is a relatively noninvasive and often less expensive form of treatment. Manual therapy interventions encompass numerous treatment methods and techniques for various chronic musculoskeletal disorders. In our review, "manual therapy" was defined according to the American Academy of Orthopedic Manual Physical Therapists: any "hands-on" treatment provided by a physical therapist. Treatment may include moving joints in specific directions and at different speeds to regain movement (joint mobilization and manipulation), muscle stretching, passive movements of the affected body part, or having the patient move the body part against the therapist's resistance to improve muscle activation and timing. Selected specific soft tissue techniques may also be used to improve the mobility and function of tissue and muscles. In order to attempt to assess efficacy of such treatments, published randomized controlled trials (RCTs) were reviewed. The goal was to determine the value of manual therapy interventions for managing chronic musculoskeletal pain.

OBJECTIVE

The aim of this study was to provide an evidence-based review and to help determine the efficacy of manual therapy interventions for chronic musculoskeletal pain.

METHODS

Search Methods

MEDLINE, CINAHL, EBM Reviews (Cochrane DSR, ACP Journal Club, DARE, and CCTR), Ovid Healthstar, and PsycINFO databases were searched from 1961 to March 2009 for efficacy of manual therapy in the treatment of chronic musculoskeletal pain.

Search Keywords

Adjustment, Alexander, compression, deep tissue, developmental kinesiology, Feldenkrais, fibromyalgia, friction, manipulation, manual, manual therapy, massage, mobilization, muscle energy technique (MET), musculoskeletal, myofascial, myofascial release, nonspecific, oscillation, pain, physical therapy, positional release, reflexology, rolfing, strain-counterstrain, stretching, Swedish, traction, transverse friction, vibration.

Characteristics of included trials:

1. RCTs
2. Study participants were >18 years of age
3. Chronic musculoskeletal pain or disorder, lasting >3 months*
4. All randomized comparison groups received either sham therapy or no intervention†; studies in which the control and the treatment groups both received an identical additional intervention were included.
5. Studies with any outcome measures were included.
6. Studies of any languages of original text were included.

Characteristics of excluded trials:

1. Nonrandomized studies
2. Headache, cancer pain, pelvic pain, postoperative pain, and dental pain
3. Trails comparing pharmacological interventions against manual therapy.
4. "Randomized" trials that conducted prestudy screening to determine "treatability" of the subjects recruited for a specific method; such methodology does not produce a true random population sample.
5. Clinical trials comparing two or more manual therapy methods without a proper sham/control group; such trials provide limited evidence for efficacy of a single method, since most manual therapy interventions have unverified efficacy.
6. Exercise-based intervention trials; they are a separate modality and not part of manual therapy.

Data Collection and Analysis

Two hundred trials were identified by reviewing abstracts from the search queries by one author (A.V.B.) based on relevance to the review: if the treatment was a manual technique, and the treatment population was suffering from chronic pain (noncancer, nonpostopera-

*Studies selecting patients with a history of 6 or more episodes in the past year were included.

†A mimic of the true intervention or an intervention known to have no efficacy on treatment (such as detuned ultrasound) were both accepted as sham therapy. No intervention meant either no therapist care or usual physician care.

tive, etc.), full text of the article was obtained. The review was followed by a manual search for all pooled references.

Following identification of potential studies for inclusion, the methods sections of all trials were reviewed independently according to the inclusion/exclusion criteria by two reviewers. Consensus and discussion were used to resolve disagreements. For trials meeting the inclusion criteria, methodological quality was assessed based on the Physiotherapy Evidence Database scale (PEDro) (http://www.pedro.org.au/english/downloads/pedro-scale/), designed for assessing validity of physical therapy trials. The scale rated methodological quality with respect to: random allocation, concealed allocation, baseline similarity, blinding of participants, therapists and assessors, measures of key outcomes from more than 85% of participants, intention-to-treat analysis, between-group statistical comparisons, point measures, and measures of variability.

Articles that provided evidence for chronic musculoskeletal pain and manual techniques were categorized and scored quantitatively according to the Modified Oxford Centre for Evidence-based Medicine Levels of Evidence (as indicated by study design). The following adjustments were made to the evidence levels, as the search included only RCTs: Level A included randomized, controlled double-blind or quasi double-blind studies[‡] with at least 50 subjects per treatment group; Level B included smaller, randomized, controlled, double-blind trials, and single-blind trials; Level C included unblinded RCTs and retrospective cohort studies. Quantitative scoring was also provided for allocation concealment: A—adequate; B—unclear; and C—inadequate. The methodology, diagnosis, participants, interventions, outcome measures, Modified Oxford Centre Level of Evidence, PEDro scale, main outcomes, and allocation concealment were recorded for each trial in the "Methods characteristics of included trials" and "Results characteristics of included trials" Supporting Information Tables S1 and S2, respectively. Heterogeneity was assessed separately by the two reviewers: outcome measures from included trials were identified and compared between trials. No statistical analysis was used, as the outcome measures differed significantly. Quantitative and qualitative assessments were made for all included trials independently also by the two reviewers, and discussion was facilitated to reach consensus when the authors disagreed.

[‡]Quasi double-blind refers to blinding assessors and subjects, because true double-blinding is not possible for manual therapy studies, which would require blinding of therapists.

RESULTS

Description of Trials

A total of 19 trials fulfilled the inclusion criteria.

Low Back Pain—11 Trials. Manipulation (high-velocity, low-amplitude thrust; HVLA) following full joint range of motion treatment was compared to no intervention,[9] or sham therapy (detuned ultrasound) with both groups receiving written exercises.[10] Manipulation/mobilization (combination of myofascial release, strain-counterstrain, MET, soft tissue, HVLA thrusts) was compared to sham (manipulation mimic) and no intervention.[11] Manual therapy (MET and stabilizing exercises) was compared to no intervention (physician consultation) with both control and treatment groups receiving written home exercises.[12] Posterior-anterior mobilization applied to spinous processes and light mobilization were compared to no intervention in separate trials.[13,14] Mobilization and manipulation (oscillatory movements, rotation techniques in posteroanterior or transverse directions, traction, HVLA thrusts, active spinal exercises, local heat) were compared to sham therapy (detuned microwave radiation).[15] MET was compared to sham therapy (MET mimic) with specific exercises (to help improve the musculoskeletal system) and nonspecific exercises (not designed to treat musculoskeletal disorders).[16] Manual therapy (techniques not described) was compared to spinal stabilization exercises and to no intervention.[17] Reflexology was compared to sham therapy (self-relaxation) and no intervention.[18] Feldenkrais method was compared to no intervention.[19]

Fibromyalgia—4 Trials. Swedish and Shiatsu massage were compared to sham therapy (muscle relaxation).[20] Manual therapy (movement, self-massage, and stretching) was compared to sham therapy (muscle relaxation).[21] Swedish massage was compared to standard physician care,[22] and connective tissue massage was compared to no intervention.[23]

Neck/Shoulder Pain—2 Trials. Manual therapy (manual pressure release) was compared to sham therapy (very light pressure) in treating myofascial trigger points in the upper trapezius.[24] "Neural/direct" manual therapy (neural treatment: gliding, oscillation,

contract-relax techniques) was compared to "articular/indirect" manual therapies (glenohumeral and thoracic mobilization) and to no intervention with home exercises for each treatment group in treating cervicobrachial pain syndrome (CBPS).[25]

Knee Pain—2 Trials. Mobilization and manipulation (passive stretching followed by HVLA thrust) were compared to sham therapy (detuned ultrasound) in treating patellofemoral pain syndrome (PFPS).[26] Manual therapy (transverse friction, stretches, gliding) was compared to no intervention in treating anterior knee pain.[27]

Risk of Bias

Trials varied from 1 to 9 on the PEDro scale in methodological quality. Full descriptions of individual study methodologies are provided in the "Methods characteristics of included trials" and "Results characteristics of included trials" Supporting Information Tables S1 and S2. Study size varied greatly (median sample = 70, range 20 to 457). Eleven of 19 studies had small (<100), 3/19 studies had medium ($100 < N < 200$), and 5/19 studies had large ($N > 200$) population sizes. Many small-sample trials had low power when demonstrating a significant difference between groups. In addition, 6/19 trials had adequate allocation concealment;[9,11,12,14,17,27] the remaining 12 were unclear and one was inadequate. Also, 11/19 had blinded outcome assessor(s);[9–13,15,17,20,24,25,27] 1/19 had blinded subjects.[9] Furthermore, 4/19 studies had greater than 20% loss to follow-up;[13,16,22,26] and 7/19 trials included an intention-to-treat analysis.[9,12,16–18,25,27]

Efficacy of Manual Therapy Interventions

Chronic Low Back Pain. HVLA manipulation produced pain reduction, improvement in pain intensity, functional disability, and spinal mobility, as well as enhanced recovery rate.[9,10] Licciardone et al. 2003 reported improvements in back pain, better physical functioning, and mental health as compared to no intervention when treating patients with manipulation and mobilization; however, no significance was found when comparing treatment groups to sham therapy.[11] Another study compared mobilization and manipulation treatment to sham therapy and found greatest improvements at 1 month follow-up; however, the difference virtually disappeared after 1 year follow-up assessment; the study also reported a high rate of recurrent back pain regardless of group allocation.[15] Mobilization treatment demonstrated evidence in increasing the number of participants returning to work early post-treatment and after a 1-year follow-up;[14] another study demonstrated posterior-anterior mobilization effective in decreasing one measure of pain; however, the effects measured were short term.[13]

MET with specific exercises for musculoskeletal dysfunction improvement was reported efficacious for short-term reductions in pain,[16] and MET with stabilizing exercises remained effective through 5 and 12 months follow-up assessments.[12]

Goldby et al. 2006 reported that spinal stabilization alone demonstrated statistically significant improvements in pain and dysfunction at 6 months and 1 year follow-ups.[17]

Reflexology did not demonstrate significant impact on treating chronic low back pain (CLBP).[18] Feldenkrais method showed limited efficacy in reducing the affective dimension of pain, but no efficacy with regard to the sensory and evaluative dimensions of pain, nor the patient's pain-related anxiety state.[19]

Fibromyalgia. Swedish massage efficacy was not significant in reducing pain for subjects with fibromyalgia syndrome;[22] however, Swedish and Shiatsu massage interventions presented an increase in sleep hours and a decrease in sleep movements, substance P levels, pain ratings, and the amount of tender points.[20] Movement, self-massage, and stretching interventions demonstrated decreases in depressed mood, anxiety, and regional pain.[21] Connective tissue massage provided only temporary relief from pain; 3 and 6 months after treatment, pain returned.[23]

Neck/Shoulder Pain. Manual pressure release significantly decreased the pain-pressure threshold for early post-treatment results for upper trapezius trigger points.[24] Direct and indirect manual therapy home exercises demonstrated significant improvements in pain and disability for CBPS.[25]

Knee Pain. Mobilization and manipulation (HVLA thrusts) supported the possibility that manipulation may be beneficial in treating PFPS.[26] Manual therapy resulted in significant improvement in active knee flexion and step-climbing ability for anterior knee pain.[27]

Highest Evidence

A categorization of the included trials by Modified Oxford Levels of Evidence is presented in Table 1. A dissection by PEDro scale scores of the trials included is

Table 1. Modified Levels of Evidence for Included Trials

Evidence Level	A	B	C
References	Geisser et al.[16] Triano et al.[9]	Allison et al.[25] Field et al.[20] Fryer and Hodgson[24] Goldby et al.[17] Goodsell et al.[13] Licciardone et al.[11] Mohseni-Bandpei et al.[10] Niemistö et al.[12] Sims-Williams et al.[15] Van den Dolder and Roberts[27]	Alnigenis et al.[22] Brattberg[23] Field et al.[21] Hagen et al.[14] Poole et al.[18] Rowlands and Brantingham[26] Smith et al.[19]

Included references categorized by the Modified Oxford Centre for Evidence-based Medicine Levels of Evidence in the order from highest to lowest levels A, B, and C.

Table 2. PEDro Scale—Unpartitioned Scores for Included Trials

PEDro Score (x/10)	References
9	Triano et al.[9]
8	Goldby et al.[17]; Niemistö et al.[12]; Van den Dolder and Roberts[27]
7	Allison et al.[25]; Geisser et al.[16]
6	Hagen et al.[14]; Licciardone et al.[11]; Mohseni-Bandpei et al.[10]; Poole et al.[18]
5	Brattberg[23]; Field et al.[20]; Fryer and Hodgson[24]; Goodsell et al.[13]; Sims-Williams et al.[15]; Smith et al.[19]
4	Alnigenis et al.[22]; Field et al.[21]
3	Rowlands and Brantingham[26]

Included references categorized by the PEDro scale from highest to lowest scores.

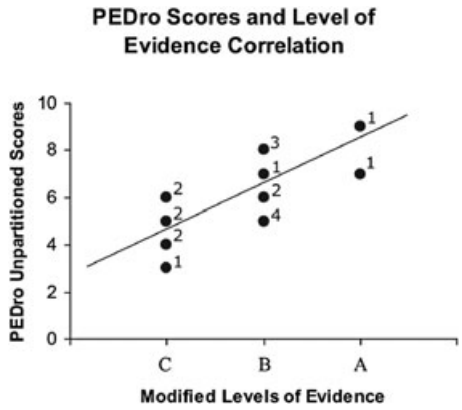

Figure 1. PEDro Scores (x/10) and Level of Evidence Correlation. This analysis demonstrates positive correlation between levels of evidence and methodological quality assessment scales ($r = 0.67$; $P < 0.001$). Numerical values next to the coordinates indicate the number of trials represented by each point.

presented in Table 2. Highest level of evidence (Level A) with highest methodological quality (PEDro: 9/10) supported HVLA manipulation for treating CLBP.[9] The study recruited a large sample population ($N > 150$) and was thus high-powered to demonstrate the reported effects. Another Level A study, although lower in methodological classification, advocated MET with specific exercises for musculoskeletal dysfunction improvement for treating CLBP.[16] Moreover, Level B studies with high methodological scores (PEDro: 8/10) presented good evidence for employing MET with spinal stabilizing exercises for CLBP.[12,17] Level B evidence also supported manual therapy for knee pain (PEDro: 8/10),[27] and for CBPS (PEDro: 7/10).[26]

Quantitative Categorization and Methodological Quality Relation

The modified Oxford Centre for Evidence-based Medicine Levels of Evidence is a new tool in quantitative assessment and categorization of study designs. PEDro scale assessment of methodological quality of trials is a well-established measurement. A correlation analysis was run to assess validity of the modified evidence level classification scale. Figure 1 demonstrates a strong positive relation between the two scales, when evidence levels A, B, and C are ranked 3, 2, and 1, respectively ($r = 0.67$ $P < 0.001$). The figure indicates lower level of evidence trials correlating with lower methodological quality and vice versa for the included trials.

DISCUSSION

The evidence-based review revealed very few double-blind, randomized, controlled studies for manual therapy interventions and few single-blind, controlled studies. Strong evidence supports interventions of manipulation, MET, and spinal stabilization for treating CLBP and knee pain with successful short-term and long-term recovery. However, other evidence, albeit of lower level, points away from utilizing manipulation and mobilization in CLPB treatment. Evidence for other

musculoskeletal disorders is scarce. Although good (Level B) in design, neck/shoulder pain trails were performed on small participant groups ($N < 50$) and were thus too low in statistical power to demonstrate significant effect of treatments. Fibromyalgia trials were also conducted on small populations ($N < 50$) and were mostly Level C evidence. Although results indicated some efficacy in reducing pain and improving patients' quality of life, such low evidence does not complement clinical understanding of manual therapy application to chronic musculoskeletal illnesses. Trials with small numbers of participants may be biased by Type II error (the failure to demonstrate a true difference, or false negatives). Therefore, reports of no significant benefit may be equivalent to no evidence to support or refute the use of a treatment.

Most manual methods queries returned with none or very low evidence to support their efficacy in treating musculoskeletal pain. Many chronic pain disorders that burden our society have not been investigated by RCTs, and are therefore missing from this review.

It must be noted that numerous clinical trials investigating manual therapy treatments have been performed. Although high-powered, these trials assign comparison groups to other physiotherapy interventions (such as exercise, TENS, etc.). Trials without proper control, sham therapy groups provide limited evidence for supporting or refuting a manual therapy treatment since most physiotherapy interventions do not have established efficacy.

While 19 trials are included in this review, there is substantial heterogeneity with respect to the interventions tested and outcome measures recorded; hence, trials could not be combined in meta-analysis to reach an overall conclusion about the effect of manual therapy interventions for any chronic pain disorder.

During the search, overall discrepancies in classification of manual therapy techniques, and poor adherence to international classification of pain disorders have been observed. For instance, manual therapy interventions such as myofascial release, MET, and positional release must be recognized separately from massage techniques such as gliding, friction, or vibrations, since the latter methods were not developed specifically for treating musculoskeletal disorders. Also, international classification of pain disorders is not followed consistently throughout studies. Although diagnosing musculoskeletal disorders is difficult, trials performed within defined diagnostic categories would be of greater clinical value.

With the current evidence available, it is difficult to draw clear conclusions regarding best manual therapy treatment options for chronic musculoskeletal pain. Powerful studies with strong methodological design must be carried out to establish efficacy of manual therapy interventions. Although currently clinical practice is likely to comprise combinations of manual therapy, physiotherapy, and pharmacological interventions, efforts must be made to establish efficacy of single manual therapy treatments before future research can begin to assess combinations of treatments.

We propose the following elements for an improved approach to research design of manual therapy studies:

1. Randomized, controlled, quasi double-blinded design study (blinded assessors and subjects)
2. Concealed allocation analyzing results using intention-to-treat principles, adequate follow-up, and proper statistical reporting
3. Large sample sizes and strict inclusion/exclusion criteria to decrease Type II errors, and thus increase the power of the study
4. Use of proper sham therapy for comparison groups
5. Use of a thorough description of the manual therapy method/technique employed
6. Adherence to international classification of pain disorders, and thus a clear, well-defined diagnosis for the population selected for the trial
7. Uniform outcome measures to improve inter-study reliability
8. Centralized training of therapists
9. Addition of open-label extension to the studies using sham therapy for control
10. Using the above criteria for decision to publish in peer-reviewed journals

Future reviews may implement similar assessment strategies to those utilized here. Analysis of the quantitative and qualitative rating systems employed in this review revealed a strong correlation, suggesting a reliable interrelationship between the two scales. Thus, it can be inferred that a trial of higher methodological quality is likely to produce higher level of evidence.

Limitations

Much effort has been placed into obtaining all available published RCTs relevant to this review. However, successful acquisition of all appropriate trials may not have been ideal. Some studies may have been missed, and their results may differ from the trials presented here.

CONCLUSIONS

This evidence-based review of manual therapy techniques for the treatment of chronic musculoskeletal pain has yielded few high-power trials. To date, the best evidence for effective treatment of chronic musculoskeletal pain exists in support of manipulation, MET, and spinal stabilization.

Although seemingly clinically effective, worldwide use of manual therapy for treatment of chronic pain caused by musculoskeletal disorders lacks scientific evidence. Scarcity of existing research calls for more trials. An improved research design of manual therapy studies would increase the level of evidence and efficacy in manual therapy practice.

REFERENCES

1. Loney PL, Stratford PW. The prevalence of low back pain in adults: a methodological review of the literature. *Phys Ther*. 1999;79:384–396.

2. Ospina M, Harstall C. *Prevalence of Chronic Pain: An Overview*. Edmonton, AB: Health Technology Assessment, Alberta Heritage Foundation for Medical Research; 2002 (Report no. 29).

3. Verhaak PF, Kerssens JJ, Dekker J, Sorbi MJ, Besing JM. Prevalence of chronic benign pain disorder among adults: a review of the literature. *Pain*. 1998;77:231–239.

4. Walker BF. The prevalence of low back pain: a systematic review of the literature from 1966 to 1998. *J Spinal Disord*. 2000;13:205–217.

5. National Institutes of Health. (1998) NIH guide: new directions in pain research I. [WWW document]. URL http://grants.nih.gov/grants/guide/pa-files/PA-98-102.html [accessed on December 2009].

6. Edwards RR, Doleys DM, Fillingim RM, Lowery D. Ethnic differences in pain tolerance: clinical implications in a chronic pain population. *Psychosom Med*. 2001;63:316–323.

7. National Center for Health Statistics. *Health, United States, 2006 with Chartbook on Trends in the Health of Americans*. Hyattsville, MD: National Center for Health Statistics; 2007:32.

8. McBeth J, Jones K. Epidemiology of chronic musculoskeletal pain. Best practice and research. *Clin Rheumatol*. 2007;21:403–425.

9. Triano JJ, McGregor M, Hondras MA, Brennan PC. Manipulative therapy versus education programs in chronic low back pain. *Spine*. 1995;20:948–955.

10. 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;92:34–42.

11. Licciardone JC, Stoll ST, Fulda KG, et al. Osteopathic manipulative treatment for chronic low back pain: a randomized controlled trial. *Spine*. 2003;28:1355–1362.

12. Niemistö L, Lahtinen-Suopanki T, Rissanen P, Lindgren KA, 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;28:2185–2191.

13. Goodsell M, Lee M, Latimer J. Short-term effects of lumbar posteroanterior mobilization in individuals with low-back pain. *J Manipulative Physiol Ther*. 2000;23:332–342.

14. Hagen EM, Eriksen HR, Ursin H. Does early intervention with a light mobilization program reduce long-term sick leave for low back pain? *Spine*. 2000;25:1973–1976.

15. Sims-Williams H, Jayson MI, Young SM, Baddeley H, Collins E. Controlled trial of mobilisation and manipulation for patients with low back pain in general practice. *BMJ*. 1978;2:1338–1340.

16. Geisser ME, Wiggert EA, Haig AJ, Colwell MO. A randomized, controlled trial of manual therapy and specific adjuvant exercise for chronic low back pain. *Clin J Pain*. 2005;21:463–470.

17. Goldby LJ, Moore AP, Doust J, Trew ME. A randomised controlled trial investigating the efficiency of musculoskeletal physiotherapy on chronic low back disorder. *Spine*. 2006;31:1083–1093.

18. Poole H, Glenn S, Murphy P. A randomised controlled study of reflexology for the management of chronic low back pain. *Eur J Pain*. 2007;11:878–887.

19. Smith AL, Kolt GS, McConville JC. The effect of the Feldenkrais method on pain and anxiety in people experiencing chronic low back pain. *NZ J Physiother*. 2001;29:6–14.

20. Field T, Diego M, Cullen C, Hernandez-Reif M, Sunshine W, Douglas S. Fibromyalgia pain and substance P decrease and sleep improves after massage therapy. *J Clin Rheumatol*. 2002;8:72–76.

21. Field T, Delage J, Hernandez-Reif M. Movement and massage therapy reduce fibromyalgia pain. *J Bodywork Mov Ther*. 2003;7:49–52.

22. Alnigenis MNY, Bradley JD, Wallick J, Emsley CL. Massage therapy in the management of fibromyalgia: a pilot study. *J Musculoskelet Pain*. 2001;9:55–67.

23. Brattberg G. Connective tissue massage in the treatment of fibromyalgia. *Eur J Pain*. 1999;3:235–244.

24. Fryer G, Hodgson L. The effect of manual pressure release on myofascial trigger points in the upper trapezius muscle. *Int J Osteopath Med*. 2005;9:248–255.

25. Allison GT, Nagy BM, Hall T. A randomized clinical trial of manual therapy for cervico-brachial pain syndrome—a pilot study. *Man Ther*. 2002;7:95–102.

26. Rowlands BW, Brantingham JW. The efficacy of patella mobilization in patients suffering from patellofemoral

pain syndrome. *J Neuromusculoskeletal Syst*. 1999;7:142–149.

27. Van den Dolder PA, Roberts DL. Six sessions of manual therapy increase knee flexion and improve activity in people with anterior knee pain: a randomised controlled trial. *Aust J Physiother*. 2006;52:261–264.

SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

Table S1. Methods Characteristics of Included Trials.
Table S2. Results Characteristics of Included Trials.

Please note: Wiley-Blackwell are not responsible for the content or functionality of any supporting materials supplied by the authors. Any queries (other than missing material) should be directed to the corresponding author for the article.