

Review

Effectiveness of Massage Therapy for Chronic, Non-malignant Pain: A Review

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Previous reviews of massage therapy for chronic, non-malignant pain have focused on discrete pain conditions. This article aims to provide a broad overview of the literature on the effectiveness of massage for a variety of chronic, non-malignant pain complaints to identify gaps in the research and to inform future clinical trials. Computerized databases were searched for relevant studies including prior reviews and primary trials of massage therapy for chronic, non-malignant pain. Existing research provides fairly robust support for the analgesic effects of massage for non-specific low back pain, but only moderate support for such effects on shoulder pain and headache pain. There is only modest, preliminary support for massage in the treatment of fibromyalgia, mixed chronic pain conditions, neck pain and carpal tunnel syndrome. Thus, research to date provides varying levels of evidence for the benefits of massage therapy for different chronic pain conditions. Future studies should employ rigorous study designs and include follow-up assessments for additional quantification of the longer-term effects of massage on chronic pain.

Keywords: Fibromyalgia – headache pain – low back pain – musculoskeletal pain – recurrent pain

Introduction

Massage therapy has been defined as soft-tissue manipulation by trained therapists for therapeutic purposes (1). Massage therapy has a long history, being first described in China during the second century B. C. and soon thereafter in India and Egypt (1). More recently, massage therapy has been administered using mechanical devices in addition to hands-on treatment by therapists. Massage can be applied to single or multiple body parts or to the entire body. There are many different types of massage therapy including Swedish massage, Shiatsu, Rolfing, reflexology and craniosacral therapy. Most of the published trials on massage therapy have utilized Swedish or Swedish-type massage.

Despite the growing popularity of massage, there is inconsistent empirical support for its effectiveness in chronic pain. Although the effects of massage therapy on chronic pain has been the subject of prior reviews (described subsequently), most of these reviews have focused on a single chronic pain condition and the level of supportive evidence appears to vary greatly, depending on the particular pain condition investigated. This review aims to bring together the existing data on the effectiveness of massage therapy for a wide range of chronic, non-malignant pain conditions. (Evidence regarding the effects of massage on acute pain is reviewed under ‘Meta-Analysis—Massage Therapy Effects on Pain. Chronic pain has been defined by the International Association for the Study of Pain (IASP) as continuous or recurrent pain that persists for longer than the normal time of healing, generally about 3 months (2). It is hoped that by providing an overview of the field, gaps in extant research may be identified in order to inform future clinical trials.

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Typically, massage is viewed as adjunctive therapy to help prepare the patient for exercise or other interventions, and is rarely administered as the main treatment (3). Following the methodology of the Cochrane Collaboration, the focus of this review will be on those studies in which massage for pain relief is delivered alone rather than as part of a treatment package, since it is difficult to draw conclusions regarding the effectiveness of massage when multiple treatments are involved. In addition, the emphasis of this review will be on randomized, controlled trials (RCTs) or quasi-RCTs of massage therapy. As noted above, the main purpose of this article is to provide a broad overview of extant literature on the application of massage to a wide range of chronic pain conditions. Prior reviews have typically focused on a single pain complaint, even though many chronic pain patients present with multiple pain conditions. Thus, the current review summarizes the findings of existing reviews and meta-analyses as well as key individual studies that have appeared since the publication of these comprehensive reviews. Although this approach is limited as it depends heavily on the methodology used in extant reviews and the quality of the methodology likely varied across reviews, it was considered the most feasible approach in order to synthesize the large number of studies examining massage for a broad array of chronic pain conditions.

This review is organized as follows. First, empirical findings of effectiveness are presented according to the type of chronic pain condition examined; each of these sections concludes with a summary statement of the level of evidence for the specific pain condition studied. (A summary table of the overall findings is also presented in Table 6.) It should be noted that a review of the findings from the handful of studies on mixed chronic pain problems is also included. Second, the results of a meta-analysis of massage therapy for pain complaints are discussed. This study was unusual in that it examined massage therapy effects across a number of pain complaints. The review concludes with a summary of the findings across the various chronic pain conditions, together with a discussion of putative mechanisms, clinical implications and recommendations for future trials.

Methods

The PubMed, PsychInfo, CINAHL, and Cochrane Library databases searched up to July 2006 using the keywords 'massage', 'pain', 'analgesia' and 'analgesics'. As noted above, the focus of this article is to provide a comprehensive overview of the evidence regarding massage therapy for chronic, non-malignant pain. Thus, due to the large number of trials uncovered using the present search strategy, reviews by the Cochrane

Collaboration and other authors were used where applicable to identify relevant trials. Primary studies that were excluded by the Cochrane group or others due to methodological or other limitations were therefore not included in the present review. However, findings from relevant primary studies that had been published since these reviews appeared were included. Only those chronic, non-malignant pain conditions that had been examined by at least one controlled trial were included in this review. The studies included in this review focused on adult participants; the application of massage therapy for chronic pain in children has been discussed in a prior review (4,5). The study findings are summarized in Tables 1–6. Mean reductions in the main pain outcome measure are shown in the Tables. Since the most commonly used pain outcome measure was a visual analog scale or VAS rating of pain intensity, means for this outcome are reported whenever possible.

Results

Empirical Findings

Massage Therapy for Low Back Pain

The Cochrane Collaboration recently published a report on the use of massage therapy for non-specific low back pain (LBP) (3). Their comprehensive review included studies published until May 2001 and was substantively amended at the end of January 2002. The review included randomized or quasi-randomized trials testing the use of any type of massage (using hands or mechanical device) as an intervention for LBP. The Cochrane review identified nine publications which reported the results of eight randomized trials (Table 1 for detailed information). Note that the studies by Hsieh *et al.* (6) and Pope *et al.* (7) listed in Table 1 reported results from the same trial. One study was in German (8) (results not shown in Table 1) and the remainder were in English. Numerous studies were excluded from the review; many studies were excluded because massage was tested within a treatment package combined with various other therapies. Standardized criteria were applied to the included studies to assess methodological quality. For the eight trials, five were judged to be of high methodological quality (denoted as ** in Table 1) and three were deemed to be of low quality (denoted * in Table 1).

In one study (9), massage was compared with a placebo (sham laser). Massage was found to be superior to the placebo treatment. In the other seven trials, massage was compared with various active treatments. These studies showed that massage was superior to relaxation (10), acupuncture (11) and education (11); massage was equal to corsets (6,7) and exercises (9); massage was inferior to

Table 1. Summary of results for studies included in the Cochrane Review on massage therapy (MT) for low back pain

Study	n	Pain duration	Control conditions	Outcomes	Findings (Mean reduction in pain)
Hsieh <i>et al.</i> (1992) (6)**	63	Not stated	Spinal manipulation (SM); Corset (CT); Transcutaneous muscular stimulation (TMS)	Oswestry Low Back Pain Q'aire Roland-Morris Activity Scale	SM (20) > MT (9.2) (SM = CT) > MT; SM > TMS
Cherkin <i>et al.</i> (2001) (11)**	262	61% = >1 year	Acupuncture (AC); Self-care education (SC)	Symptom scale (0–10) 1 year F/U Roland Disability Scale 1 year F/U Use of Medications (1 year F/U) SF-12 (Physical Health) 1 year F/U SF-12 (Mental Health) 1 year F/U	MT (2.6) > SC (1.5) MT (3.0) = SC (2.3); MT > AC (1.7) MT > SC; MT > AC MT = SC; MT > AC MT > SC; MT > AC MT > SC MT = SC = AC MT > SC; MT > AC MT = SC = AC
Hernandez-Reif <i>et al.</i> (2001) (10)*	24	Not stated but >6 m	Progressive muscle relaxation (PMR)	VAS pain intensity (0–10) McGill Pain Questionnaire Range of Motion (ROM)	MT (3.9) > PMR (1.6) MT = PMR MT > PMR
Hoehler <i>et al.</i> (1981) (13)*	95	48–52% < 1 m 17–29% > 6 m	SM	Patient-rated pain (unspecified scale) Straight-leg raise	MT = SM MT = SM
Pope <i>et al.</i> (1994) (7)**	164	29% < 6 m 35% = 6–12 m 36% > 2 years	SM; TMS; CT	VAS pain intensity (0–10) ROM (flexion/extension) Maximum voluntary extension effort Sorensen fatigue test	MT (17.2) = SM (24.1) = TMS (9.6) = CT (15.9) MT = SM = TMS = CT MT = SM = TMS = CT MT = SM = TMS = CT
Godfrey <i>et al.</i> (1984) (12)*	81	Not stated but <14 days	SM; Low-level electrical stimulation (LES)	Pain, stiffness, tenderness (0–4) Daily activities (0–4) Self-reported limitations due to pain Fingertip flexion test	MT = SM = LES MT = SM = LES MT = SM = LES MT = SM = LES
Melzack <i>et al.</i> (1983) (14)**	41	Mean = 36.2 wks	Transcutaneous electrical nerve stimulation (TENS)	McGill Pain Questionnaire (PRI) Straight-leg raise Back Flexion	TENS (85%) > MT (38%) (>50% reduction on PRI) TENS > MT TENS = MT
Preyde <i>et al.</i> (2000) (9)**	98	Mean range = 12.0–14.8 wks	Soft-tissue manipulation (STM); Exercise (EX); Sham laser therapy (SL) <i>Note: Above were compared with Comprehensive Massage Therapy (CMT) which included STM and EX</i>	Roland Disability Questionnaire 1 month F/U Lumbar ROM	CMT (5.9) > EX (0.3), SL (0.4); STM (5.2) > EX, SL CMT (6.8) > EX (1.5), SL (0.7); (STM (5.7) = EX) > SL CMT = STM = EX = SL

Note: **denotes high quality study per Cochrane review (3); *denotes low quality study per Cochrane review (3). The Hsieh and Pope studies reported findings from the same trial.

Table 2. Summary of findings for studies on massage therapy (MT) for headache pain

Study and type of headache	n	Pain duration	Comparison conditions	Outcomes	Findings (Mean reduction in pain)
Nilsson <i>et al.</i> (1997) (17)*					
Cervicogenic Headaches	54	Not stated but ≥ 3 m	Spinal manipulation (SM)	VAS pain intensity (0–10)	SMT (17.0) > MT (4.2)
			NOTE: The above was compared with MT plus placebo	Headache duration	SMT > MT
Wylie <i>et al.</i> (1997) (18)					
Migraine and Tension-type	67	Mean = 10.2 years	Acupuncture	Pain total index (hours \times severity)	
			NOTE: The above was compared with MT plus relaxation	Migraine	MT (171.7) > AC (128.0)
			Tension-type	MT (217.0) = AC (119.5)	
			Both groups combined	MT = AC	
			Headache index (number \times severity)		
			Migraine	MT > AC	
			Tension-type	MT = AC	
Both groups combined	MT = AC				
Migraine Days	MT = AC				
Hanten <i>et al.</i> (1999) (20)					
Tension-type	65	Not stated	Resting position (RP); No treatment (CON)	VAS pain intensity (0–10)	MT (19.3) > [RP (11.2) = CON (7.8)]
			NOTE: The above was compared with CV-4 technique	VAS pain affect (0–10)	MT > (RP = CON)

Note: *this study was included in the Cochrane review of non-invasive physical treatments for chronic/recurrent headache (15).

spinal manipulation (6,7,12,13) and transcutaneous electrical nerve stimulation (TENS) (14). The single German study showed that acupressure/pressure point massage techniques provided more pain relief than classical (Swedish) massage (8).

Beneficial Effects for Subacute and Chronic Non-specific Low Back Pain

The Cochrane review concluded that massage therapy may be beneficial for patients with subacute and chronic non-specific LBP, particularly when combined with exercises and education. They also noted that the results of one high quality study showed that the benefits of massage last as long 1 year following the end of active treatment (11). The benefit obtained from massage exceeded that achieved from relaxation, education or acupuncture. However, the beneficial effects may be less than that provided by spinal manipulation or TENS. The Cochrane Review noted that there is insufficient evidence regarding the effects of massage on acute back pain and on specific forms of massage for chronic LBP.

Although the Cochrane review represents a synthesis of the most rigorous trials to date examining massage for LBP, it should be noted that the review based their conclusions on a relatively small number of studies. For example, their conclusions regarding the superiority

of massage to relaxation and acupuncture were based on only a single study each, and therefore await further confirmation in future trials. On the other hand, the studies included in the review demonstrated therapeutic effects for massage that exceeded or equaled those obtained from various active treatment conditions. This level of evidence is more encouraging than that obtained from trials showing that massage is superior to no treatment or waitlist control.

Pain Management for Headaches from Massage Therapy

The Cochrane Collaboration also published a recent review of non-invasive physical treatments for chronic/recurrent headache (15). This review included studies published until November 2002 and was substantively updated in May 2004. The review studied five types of headaches (i.e. migraine, tension-type, cervicogenic, mixed tension-type and migraine and post-traumatic headache), and a broad range of treatments were examined. Of the 22 studies that met inclusion criteria, only one trial, reported in two studies (16,17) examined the impact of massage on headaches. In this trial, massage plus placebo laser was compared with spinal manipulation for cervicogenic headache. The findings of this study indicated that spinal manipulation was superior to massage for headache pain intensity, headache duration and medication use (Table 2).

Table 3. Summary of findings for studies on massage therapy (MT) for neck and shoulder pain and carpal tunnel syndrome

Study and type of pain	<i>n</i>	Pain duration	Comparison conditions	Outcomes	Findings (Mean reduction in pain)
Irnich <i>et al.</i> (2001) (28)				VAS pain intensity (0–100)	AC (17.3) > MT (3.1); AC = SLA (11.4)
Neck pain	177	21.5–22.6% > 5 years	Acupuncture (AC); Sham laser acupuncture (SLA)	3 month F/U Range of Motion (ROM) 3 month F/U Pressure pain threshold (algometer) 3 month F/U Spontaneous pain (7 point scale) 3 month F/U Motion-related pain (7-point scale) 3 month F/U Global complaints (7-point scale) 3 month F/U Health-related quality of life (SF-36) 3 month F/U	AC (15.0) = MT (8.1); AC = SLA (11.2) AC > MT; AC = SLA AC = MT; AC = SLA AC = MT; AC = SLA AC = MT; AC = SLA AC > MT; AC = SLA AC > MT; AC > SLA AC > MT; AC = SLA AC > MT; AC > SLA AC > MT; AC = SLA AC = MT; AC = SLA AC = MT; AC = SLA
Dyson-Hudson <i>et al.</i> (2001) (24)					
Shoulder pain	18	Mean range = 13.4–16.2 years	AC	Wheelchair user's shoulder pain index ROM	AC (23.3) = MT (21.7) AC = MT
Mok and Woo (2004) (25)					
Shoulder pain	102	Not stated	No treatment control (CON)	VAS pain intensity (unspecified scale) State anxiety (STAI) Heart rate Systolic blood pressure Diastolic blood pressure	MT (14.6) > CON (0.2) MT > CON MT > CON MT > CON MT > CON
van den Dolder (2003) (27)					
Shoulder pain	29	Mean range = 26–30 weeks	CON	McGill Pain Questionnaire VAS pain intensity (0–10) Present Pain Intensity (PPI) scale Verbal descriptors Functional Disability ROM	MT (26.6) > CON (0.1) MT = CON MT > CON MT > CON MT > CON
Field (2004) (32)					
Carpal Tunnel Syndrome	16	Mean = 6.7 years	CON	VAS pain intensity (0–10) Grip Strength State anxiety (STAI) Profile of Mood States — Depression Physician assessed CTS symptoms	MT (3.2) > CON (.08) MT > CON MT > CON MT > CON MT > CON

Table 4. Summary of findings for studies on massage therapy (MT) for fibromyalgia

Study	<i>n</i>	Pain duration	Comparison conditions	Outcomes	Findings (Mean reduction in pain)
Sunshine <i>et al.</i> (1996) (33)	30	Not stated	Transcutaneous electrical stimulation (TENS); Sham TENS (STENS)	Immediate post-session State anxiety (STAI) Profile of Mood States (POMS) — Depression Salivary cortisol Pre- Post Treatment Self-Report Interview — Pain (unspecified scale) Stiffness Fatigue Sleep Dolorimeter test Physician assessment of condition Depression (CES - D)	MT = TENS; TENS, MT > STENS MT = TENS; TENS, MT > STENS MT = TENS; TENS, MT > STENS MT (3.3) > TENS (0.2); STENS (1.6) MT > TENS; STENS MT > TENS; STENS MT > TENS; STENS MT > TENS; STENS MT = TENS; TENS, MT > STENS MT = TENS = STENS
Field <i>et al.</i> (2002) (34)	20	Mean years in treatment = 9.2	Progressive muscle relaxation (PMR)	Immediate post-session STAI POMS – Depression Pre- Post Treatment VAS pain intensity (0–10) VAS fatigue (0–10) VAS stiffness (0–10) Physician assessment of condition Number of tender points CES - D	MT = PMR MT = PMR MT (2.3) > PMR (1.4) MT > PMR MT > PMR MT > PMR MT > PMR MT > PMR
Brattberg (1999) (35)	48	86% > 5 years; 50% > 10 years	No treatment control (CON)	VAS pain intensity (0–100) Disability rating index Sleep disturbance (0–5) Hospital anxiety and depression scale Anxiety Depression	MT (26.3) > CON (1.4) MT = CON MT = CON MT = CON MT > CON
Alnigenis <i>et al.</i> (2001) (36)	37	Mean range = 5–10.4 years	Usual care (UC); UC plus phone calls (UCP)	Arthritis impact measurement scale Pain (0–10) Rheumatology attitudes index CES-D Quality of well being scale	MT (0.9) = UC (1.0) = UCP (0.3) MT = UC = UCP MT = UC = UCP MT = UC = UCP

The Cochrane review concluded that there is moderate evidence that massage plus placebo laser is inferior to spinal manipulation for pain intensity and duration in relation to cervicogenic headache.

The Cochrane review did not include the results of Wylie and colleagues (18) compared massage and relaxation to acupuncture for headache pain in patients with migraine or combined headache and patients

Table 5. Summary of findings for studies on massage therapy (MT) for mixed chronic pain

Study	<i>n</i>	Pain duration	Comparison conditions	Outcomes	Findings (Mean reduction in pain)
Walach <i>et al.</i> (2003) (37)	29	Not stated but > 6 months	Usual care (UC)	Pain intensity (1–9 point scale) Profile of Mood States (tiredness) CES-D State anxiety (STAI) Frankfurt body concept scales	MT (1.0) > UC (0.1) MT > UC MT > UC MT > UC MT = UC
Hasson <i>et al.</i> (2004) (38)	129	Not stated but > 3 months	Progressive Muscle Relaxation (PMR)	Pain (unspecified scale) Post-treatment 3 month F/U Mental energy (unspecified scale) Post-treatment 3 month F/U Self-perceived health status (5-point scale) Post-treatment 3 month F/U	MT (14.5) > PMR (2.1) MT (.03) = PMR (1.3) MT > PMR MT = PMR MT > PMR MT = PMR
Plews-Ogan <i>et al.</i> (2005) (39)	30	Not stated but > 3 months	Mindfulness-based stress reduction (MBSR); UC	VAS pain unpleasantness ratings (0–10) 1 month F/U SF-12 physical health 1 month F/U SF-12 mental health 1 month F/U	MT (2.9) > UC (.13); MBSR (.7) = UC MT = MBSR = UC MT = MBSR = UC MT = MBSR = UC MBSR > UC; MBSR = MT

with tension-type headaches. Patients received six sessions lasting 45 min. For the massage and relaxation condition, it is unclear how much of each session was devoted to relaxation which included muscle and breathing exercises as well as visualization techniques. All patients exhibited significant decreases in pain total index (PTI; monthly number of headache hours multiplied by severity) and headache index (HI; monthly number of attacks multiplied by severity). For patients with tension-headaches ($n=40$), there was no difference in pain outcomes based on intervention type. However, for patients with migraines ($n=27$), those who received massage had significantly lower PTI and HI scores than those who received acupuncture (Table 2). The number of migraine days did not vary across treatments. These findings suggest that massage may be superior to acupuncture for migraine headaches. But, because massage was combined with relaxation and other self-help techniques, it is not possible to draw definitive conclusions regarding the specific effects of massage based solely on these findings.

Craniosacral therapy is based on the notion that movement restrictions in the cranial structures of the skull adversely impact rhythmic impulses conveyed through the cerebral spinal fluid from the cranium to the sacrum (19). Thus, craniosacral therapy is a form of

massage that uses gentle pressure on the plates of the patient's skull. Few controlled studies have been conducted on craniosacral therapy and a recent review concluded that there is insufficient evidence to support the effectiveness of this approach (19). One study, not included in the review, examined the CV-4 craniosacral technique on tension-type headaches (20). The CV-4 technique moves with the narrowing and widening of the skull, or the cranial rhythm; the basis of the technique is the compression of the fourth ventricle. Sixty patients were randomly allocated to one of three conditions: (i) a 10 min session during which multiple still points were induced by the CV-4 technique; (ii) a 10 min session during which the head and neck were positioned according to the resting position technique; (iii) a 10 min no treatment control. Immediately following treatment, the CV-4 group reported less pain intensity and pain affect than the control group; there were no differences between the resting position group and controls.

Moderate Evidence for Craniosacral Massage in Managing Tension-Type Headache Pain

There have been surprisingly few published RCT's on massage therapy for headache pain. The single study

Table 6. Summary of overall findings

Type of pain	Number of studies	Results (number of studies)	Quality ranking (global assessment of quality)
Low back pain	8	MT > relaxation (1), education (1), acupuncture (1) MT = corsets (2), exercise (1) MT < spinal manipulation (4), TENS (1)	1 (good)
Shoulder pain	3	MT > acupuncture (1), no treatment (2)	2 (moderate)
Headache pain	3	MT > rest for migraine (1) and tension-type (1) MT < spinal manipulation for cervicogenic (1)	3 (moderate)
Fibromyalgia	4	MT > TENS (1), relaxation (1) MT = no treatment (1), usual care (1)	4 (preliminary)
Mixed chronic pain	3	MT > usual care (1) MT = relaxation (1), meditation and usual care (1)	5 (preliminary)
Neck pain	1	MT = acupuncture (1)	6 (preliminary)
Carpal tunnel	1	MT > no treatment (1)	7 (preliminary)

Note: Quality Ranking refers to the overall ranking of the quality of the literature on the effectiveness of massage therapy for each chronic pain condition relative to the other chronic pain conditions discussed in this review.

included in the Cochrane review of non-invasive treatments for recurrent/chronic headache found that spinal manipulation resulted in greater pain reduction than massage plus sham laser for cervicogenic headache. One other study reported that massage may be more beneficial than acupuncture for migraine headaches but that both approaches were equally effective for tension-type headaches. A single study found that craniosacral therapy led to superior pain reduction compared with rest positioning and no intervention for tension-type headaches. This latter study using CV-4 technique was included in a recent review of manual therapies for tension-type headaches (21). The review authors gave this study a score of 6 out of 10 possible points for methodological quality, suggesting that there is moderate evidence from this trial that the CV-4 technique exerts a beneficial effect on pain related to tension-type headaches. As noted in the review, given that headaches are among the most common problems seen in medical practice (22), there is an urgent need to establish the effectiveness of manual therapies, including massage in the treatment of headache pain. The review also noted that not only is tenderness of the pericranial myofascial tissues one of the prominent features of tension-type headache, myofascial tissues may play an important role in the genesis of such headaches (23). Because the aim of soft tissue manipulation is to alter mechanical stress caused by myofascial tissue disorders, the review concluded that massage techniques may therefore be an effective therapy for

tension-type headaches. However, further large-scale studies are needed before conclusions regarding the effectiveness of massage for tension-type or other types of headaches can be drawn.

Shoulder Pain — Moderate Support for the Use of Massage Therapy

Three analyses examined the effects of massage for shoulder pain. The first study compared acupuncture to Trager Psychophysiological Integration (a form of massage) in 18 patients with chronic shoulder pain who used manual wheelchairs as their primary means of mobility (24). Each patient received 10 treatments over 5 weeks; the acupuncture sessions lasted approximately 20–30 min and the Trager sessions lasted approximately 45 min. By 5-week follow-up, both groups exhibited improvements in pain and range of motion (see Table 3); there were no significant differences between groups. The study authors concluded that both acupuncture and Trager were effective for shoulder pain in wheelchair users. In their meta-analysis of massage therapy effects (discussed subsequently) this study was included as evidence supporting the benefits of massage on the delayed assessment of pain (i.e. pain that is assessed following a period after which no treatment is delivered).

Mok and Woo (25) analyzed hospitalized stroke patients with shoulder pain who were randomly assigned

to receive slow-stroke back massage (SSBM) (26) or no intervention control. SSBM was administered for 10 min before bedtime for seven consecutive days. Patients who received SSBM experienced decreases in pain, anxiety, heart rate and blood pressure, compared with no such changes in controls (see Table 3). Another study (27) compared patients with shoulder pain who received six 15–20 min sessions of massage over two weeks ($n=15$) to a waitlist control ($n=14$). Patients who received massage improved significantly in functional disability, pain, and range of motion, whereas the control group evidenced no changes on these outcomes (Table 3).

These results provide moderate support for the use of massage for shoulder pain. However, the patient characteristics varied greatly across studies (e.g. stroke patients; wheelchair users) suggesting that generalizability of the findings may be limited. Moreover, with the exception of Mok and Woo (25) these studies had small sample sizes and only the study by Dyson-Hudson *et al.* (24) included a follow-up assessment. Finally, two of these studies compared massage with no treatment control. Additional studies are needed to determine whether massage therapy leads to improvements in shoulder pain when controlling for non-specific effects of treatment (e.g. increased clinician time/attention). Replication of these findings of these three studies in larger samples and with longer follow-up evaluation periods is warranted.

Comparison with Acupuncture for Neck Pain

Another group (28) examined patients with chronic neck pain randomly assigned to one of the following conditions: acupuncture ($n=56$), massage ($n=60$), 'sham' laser acupuncture ($n=61$). Patients received five 30-min treatments over 3 weeks. For the main outcome, pain VAS (0–100) ratings, acupuncture was superior to massage, but no different than sham laser immediately after treatment. However, by 3-month follow-up, there were no differences between acupuncture and massage or between acupuncture and sham laser (Table 3). Among the secondary measures, acupuncture showed more improvement than massage across most measures assessed immediately post-treatment. Nevertheless by 3-month follow-up, acupuncture was superior to massage only on spontaneous pain, global complaints and motion-related pain.

Effectiveness of Massage Therapy for Neck Pain Remains Unclear

The authors of the previous work concluded that acupuncture appears to be effective in the short-term for chronic neck pain, it should be noted that by the 3-month follow-up, acupuncture was no more

effective than massage or sham laser acupuncture on most outcome measures. Unfortunately, the study did not include direct comparisons between the massage and sham laser conditions. Therefore, it is not possible to determine whether massage was superior to a placebo condition. An unpublished master's thesis (29) has been cited in a recent meta-analysis as providing support for the longer-term effects of massage on pain (30). These studies were included in a very recent Cochrane Review on massage for mechanical neck disorders (31), which also included a broad array of interventions such as traditional Chinese massage, ischemic compression, self-administered ischemic pressure using a J-knob cane, and occipital release, among others. The review authors noted that many of these approaches were of questionable value. The review concluded that no practice recommendations could be made since the effectiveness of massage for neck pain remains unclear.

Preliminary Support for Pain Relief in Carpal Tunnel Syndrome

Patients with carpal tunnel syndrome (CTS) were randomly assigned to either a 4-week course of massage therapy or usual care (32). The massage group received a 15-min massage once a week from a massage therapist and were also taught self-massage to be done daily at home prior to bedtime. The massage group evidenced improvements in pain, grip strength, anxiety and depression compared with no such improvements in the control group (Table 3). Physician assessments of carpal tunnel symptoms also indicated significant improvements in the massage group versus no change in the control group.

The findings of this single study provide preliminary support for the application of massage to CTS. However, the sample size was very small, and it is unclear whether the physicians assessing the patients were aware of group assignment. Moreover, it is unclear to what extent patients practiced self-massage at home and whether the amount of massage administered was related to treatment response. Further work with larger samples and more rigorous study methodology are needed to determine the effectiveness of massage therapy for CTS.

Equivocal Support for Analgesic Effects in Fibromyalgia

The effects of massage therapy on fibromyalgia have been examined in four investigations. Two of these studies were conducted by Tiffany Field and colleagues. In the first study (33), women with fibromyalgia were randomly assigned to receive massage, TENS or sham TENS for 30 min twice a week for 5 weeks. Immediately following treatment on the first and last days, the massage therapy group evidenced reductions in anxiety,

depression and salivary cortisol. The TENS group experienced the same improvements but only on the last day. The sham TENS groups demonstrated no such improvements. By the end of treatment, the massage therapy group reported less pain, stiffness, fatigue and difficulty sleeping (as assessed via interviews), as well as improvements in dolorimeter test value and physician's assessment of clinical condition (Table 4). The TENS group improved on this latter measure only. Limitations of this study include inadequate information regarding the interview items. Moreover, it was unclear whether interviewers and physicians were blind to patient group assignment.

The Field group (34) also randomly assigned fibromyalgia patients to receive either massage therapy or progressive muscle relaxation (PMR) for 30 min twice a week for 5 weeks. Both groups reported reductions in anxiety and depression immediately following treatment on the first and last days. By the end of treatment, the massage group evidenced significant reductions in self- and physician-assessed pain and symptoms, as well as reductions in the number of tender points and substance P levels (Table 4). No significant improvements were seen in the PMR group.

Brattberg (35) randomly allocated patients with fibromyalgia to massage therapy or no treatment control. The massage group received 15 massages of indeterminate length over 10 weeks. Comparisons immediately post-treatment revealed greater improvements in pain, depression and quality of life in the massage group relative to controls, but no differences in disability, sleep disturbance or anxiety (Table 4). Brattberg maintained that there was a 37% reduction in pain following the massage treatment but that 30% of the improvement in pain had disappeared by 3-month follow-up and 90% of the reduction in pain was gone by the 6 month follow-up. Thus, it appears that the benefits of massage for fibromyalgia do not persist over the longer-term after the termination of active treatment. Brattberg recommended that following an initial treatment of 15 sessions, maintenance therapy may be instituted (e.g. once or twice per month).

Another study randomly assigned 37 patients with fibromyalgia to one of three conditions: massage, usual care, usual care with follow-up phone calls from a nurse (36). The massage group received 10 treatments of indeterminate length over 24 weeks.

Unfortunately, only 16 patients completed the full study protocol (six patients in the each of the two usual care groups and four patients in the massage group). Although the massage group showed a trend towards greater improvement in pain and self-efficacy for managing their condition, there were no between-group differences by the end of treatment (Table 4), likely due to the small cell sizes.

Summary — Massage Therapy for Fibromyalgia

The evidence supporting the use of massage for fibromyalgia is mixed. Whereas the Field group has found that massage leads to improvements in pain and symptoms compared with relaxation (33) or TENS (34), their work suffers from methodological limitation such as small sample size, inadequate blinding of assessors and an absence of follow-up assessments. The two other studies found either no benefits for massage (36) or only short-term benefits that eroded over time (35). Replication of the positive results reported by the Field group in an independent research group would increase confidence in their findings.

Application to Mixed Chronic Pain Conditions

Whereas the majority of existing trials of massage therapy have examined patients with discrete chronic pain syndromes, three studies have investigated the impact of massage on patients with a variety of chronic pain complaints. Walach and colleagues (37) conducted a randomized controlled trial comparing massage therapy (10–20 min sessions administered twice weekly for 5 weeks) to usual care for patients with various chronic pain symptoms (i.e. lower back, neck, shoulders, headaches). By 3-month follow-up, patients who received massage reported less pain, depression, anxiety and tiredness relative to controls (Table 5). However, the study authors noted that their study was limited due to lack of equivalence across groups on demographic characteristics. Moreover, it is unclear whether the groups were similar in terms of the type of pain complaints represented or important clinical characteristics such as the duration and/or severity of pain.

Another study randomly assigned patients with chronic pain to receive either massage or relaxation (listening to a PMR tape recording) (38). The massage group received 6–10 sessions lasting 30 min each; patients were treated 1–3 times per week. The relaxation group listened to the audiotape twice a week for 5 weeks. Although the massage group evidenced improvements in pain, mental energy and self-perceived health status compared with the relaxation group immediately following treatment, by 3-month follow-up, there were no differences between groups.

In a third analysis, patients with chronic musculoskeletal pain were randomly assigned to mindfulness-based stress reduction (MBSR), massage or usual care (UC) (39). MBSR involved 8 weekly 2.5-h sessions in a group format, with audiotaped meditation exercises assigned as daily home practice. The massage group received 1-h massage once per week for 8 weeks. At post-treatment, the massage group reported less pain unpleasantness and improved mental health compared

with the usual care group. However, by 1-month follow-up, there were no differences among the groups in pain intensity or pain unpleasantness (Table 5).

Moderate Support for Short-term Benefits of Massage Therapy for Mixed Chronic Pain Conditions

These reports provide modest support for the immediate benefits of massage for a variety of chronic pain complaints. However, it appears that these treatment gains were not maintained following the end of active treatment. A potential difficulty with such studies including heterogeneous pain complaints is ensuring that treatment and control conditions are equivalent on key clinical and demographic characteristics. On the other hand, evidence of therapeutic effects across a variety of pain conditions supports the generalizability of the findings to a potentially broader group of patients. Future studies incorporating samples with mixed chronic pain conditions may also examine which types of pain conditions may benefit most from massage therapy in order to promote a more targeted approach to treatment.

Meta-Analysis — Massage Therapy Effects on Pain

As noted above, the majority of primary analyses and review articles have focused on the application of massage to discrete pain conditions. Moyer and colleagues (30) have published a recent meta-analysis of massage therapy research that examined the effects of massage for a variety of both chronic and acute pain symptoms. Data across trials were aggregated to investigate these effects across pain conditions on the immediate and delayed assessment of pain. According to Moyer *et al.* (30), immediate assessment of pain pertains to ‘single dose effects’ or short-term effects observed on the same day following massage therapy. The delayed assessment of pain reflects ‘multiple dose effects,’ which refers to outcomes that were assessed at various time points after treatment has been discontinued and following multiple sessions of massage. It should be noted that several of the studies included in this meta-analysis were also included in the Cochrane reviews discussed earlier in this article.

Moyer and colleagues (30) concluded that massage therapy did not exhibit a significant effect on the immediate assessment of pain. The studies included in this category examined a wide range of pain problems ranging from back pain, neck pain, cancer pain, headaches and fibromyalgia, as well as acute pain in relation to surgery and other procedures (e.g. amniocentesis; cardiac catheterization). However, Moyer *et al.* (30) did conclude that massage evidenced a significant effect for the delayed assessment of pain. They maintained that patients who received a course of massage and

were evaluated several days or weeks after the end of active treatment exhibited levels of pain that were on average 62% lower than controls. This conclusion was based on the results of 5 studies—two of these were conducted with patients experiencing LBP (9,11), one was conducted with patients with tendonitis (40), one was conducted with patients experiencing shoulder pain (24) (discussed earlier in this article), and one was an unpublished master’s thesis (29) examining patients with neck pain.

It should be noted that the Moyer *et al.* (30) analysis of the delayed assessment of pain did not include three of the trials discussed earlier in this article that did not find long-term benefits for fibromyalgia (35) and mixed chronic pain (38,39). The latter two studies were published after the Moyer review was completed; it is unclear why the study on fibromyalgia was not included in the meta-analysis. Nevertheless, the rigorous approach employed by Moyer and colleagues, which expressly included the calculation of between-group effect sizes and the aggregation of data across numerous trials lends confidence to their overall conclusion that multiple applications of massage therapy appears to confer lasting benefits on pain. Their work did not however, speak to the time period over which such analgesic effects are maintained, or the rate at which such effects decay. These considerations warrant further examination in additional studies.

Discussion

The existing literature provides varying levels of support for the effectiveness of massage therapy for chronic pain. The most abundant and rigorous evidence was found for the effects of massage on non-specific LBP. The Cochrane Collaboration (3), concluded that massage therapy may be beneficial for patients with subacute and chronic non-specific LBP, especially when combined with exercises and education. Whereas the evidence supporting the application of massage for LBP is fairly robust, there is less support for the use of massage for the other chronic pain conditions reviewed. This review suggests that the level of evidence for massage therapy effects by pain condition is (in order from most to least): LBP, shoulder pain, headache pain, fibromyalgia, mixed chronic pain, neck pain and CTS.

Although shoulder pain has been the subject of only three studies, all of the studies yielded positive outcomes for pain and were methodologically rigorous, with one study including over 100 patients (25). Moreover, one of these studies was cited by Moyer *et al.* (30) in their meta-analysis indicating that massage therapy demonstrates significant effects on the long-term assessment of pain. Like shoulder pain, massage for headache pain has only been the subject of three studies but the data are

somewhat weaker. The Cochrane Collaboration (15) concluded that there is moderate evidence that spinal manipulation is superior to massage plus placebo laser for pain related to cervicogenic headache, although these conclusions were based on the results of a single trial reported in two studies (16,17). Two additional studies provided preliminary evidence for the benefits of massage and craniosacral therapy in the treatment of pain related to migraine headaches (18) and tension-type headaches (20), respectively. However, in the migraine study (18), massage was combined with relaxation and other self-help techniques, making it difficult to draw conclusions regarding the specific effects of massage.

There is considerably less support for the effectiveness of massage therapy in treating the remaining chronic pain conditions. Of the four studies examining massage therapy for fibromyalgia, only two studies, both by the same research group, revealed therapeutic effects (33,34), whereas the other two studies found no benefits (36) or improvements that attenuated over time (35). Thus, there is only modest evidence for the effectiveness of massage for pain related to fibromyalgia. For mixed chronic pain, the three studies to date provide somewhat conflicting findings. Whereas one study found that massage was superior to usual care (37), two other studies found that by follow-up, massage was no better than relaxation (38), mindfulness meditation or usual care (39). Taken together, these studies provide fairly weak support for the application of massage to mixed chronic pain. For neck pain, one trial using conventional massage techniques found that massage was similar to acupuncture by 3-month follow-up. A recent Cochrane review which included a broad array of massage techniques, many of which were considered questionable, reported that no firm conclusions could be drawn regarding the effectiveness of massage for neck pain (31). Only one published trial has investigated massage therapy effects on CTS; this study found that massage was superior to no treatment. Based on these findings, there is only preliminary evidence to support the effectiveness of massage for both neck pain and CTS.

Putative Mechanisms of Massage Therapy for Chronic Pain

The precise mechanism of action in massage therapy is not known. It has been proposed that increased parasympathetic activity (41) and a slowed-down physiological state may underpin the behavioral and physiological processes associated with massage. As discussed by Wright and Sluka (42), massage is thought to induce a variety of positive physiological effects that may contribute to tissue repair, pain modulation, relaxation, and improved mood. For example, these authors point to

research showing that massage has beneficial effects on arterial and venous blood flow and edema (43). In addition, they note that vigorous massage has been shown to increase local blood flow and cardiac stroke volume (44), as well as improve lymph drainage (45); massage also appears to have an anticoagulant effect (46). Finally, Wright and Sluka maintain that massage may activate segmental inhibitory mechanisms to suppress pain and that some techniques may activate descending pain inhibitory systems (43), as suggested by gate theory (discussed subsequently).

The main theories regarding the analgesic effects of massage include gate theory, the serotonin hypothesis, and the restorative sleep hypothesis (47). According to gate theory (48), pressure receptors are longer and more myelinated than pain fibers, and thus pressure signals from massage are transmitted faster, closing the gate to pain signals. The serotonin hypothesis maintains that massage increases levels of serotonin, a neurotransmitter that modulates the pain control system (49). The restorative sleep hypothesis holds that because substance P, a neurotransmitter associated with pain is released in the absence of deep sleep, the ability of massage to increase restorative sleep reduces substance P and consequent pain (50). There is little definitive data to support these major theories concerning the mechanisms underlying the analgesic benefits of massage.

Clinical Implications: The Application of Massage Therapy for Chronic Pain

The existing literature suggests that massage therapy may be a useful approach for pain relief in a number of chronic, non-malignant pain conditions, particularly musculoskeletal pain complaints (e.g., shoulder pain, low back pain). Massage is typically administered as adjunct therapy to help prepare the patient for exercise or other interventions and is rarely administered as the main treatment (3). Thus, massage is not usually considered a first line treatment, but rather as a complement to other conventional first line approaches (e.g., physical therapy; medications). It should be noted that the studies reviewed above did not specifically report on findings regarding possible interactions of massage therapy with other CAM or conventional medicine approaches. Nevertheless, the increasing popularity of massage and the fact that it is typically used as an adjunctive approach with other established treatments suggests that massage may be successfully integrated into the treatment of a variety of chronic or recurrent non-malignant pain conditions. The paucity of data on negative side effects pertaining to massage does not necessarily mean that such effects do not exist. Future work should focus on systematically characterizing those patients for whom massage is not indicated.

Future Directions: Critical Issues for Studies on Massage Therapy for Chronic Pain

This review highlights the need for continued rigorous research on the effectiveness of massage therapy for chronic, non-malignant pain conditions. Somewhat surprisingly, this review indicated that very few studies to date have focused on massage for pain related to chronic/recurrent headaches and chronic neck pain. Given that massage promotes relaxation, it would appear to be a particularly appropriate therapy for tension-type headaches as well as migraine related to increased stress. Moreover, as pointed out above, massage therapy may alter the mechanical stress caused by myofascial tissue disorders (21) which have been implicated in tension-type headaches (23). In light of the contradictory findings noted above, future work may also continue to examine massage therapy effects on pain related to fibromyalgia which involves wide-spread, diffuse pain that is often not responsive to traditional approaches.

Numerous methodological problems were noted in the studies reviewed including small sample sizes, lack of equivalence across treatment and control groups, and inadequate blinding of assessors. However, one of the most notable limitations of the literature as a whole is that very few studies included follow-up assessments. As indicated by Moyer *et al.* (30) in their meta-analysis, the beneficial effects of massage therapy on pain are predominately evidenced *after* the end of active treatment. They concluded that such delayed effects on pain were substantial, with patients who were evaluated several days/weeks after treatment cessation exhibiting on average 62% less pain than controls and one study on LBP revealed significant benefits from massage persisting 1 year after the cessation of active treatment (11). It should be noted however, that the conclusions by Moyer *et al.* (30) were based on only 5 studies, suggesting that future trials of massage therapy should include follow-up assessments in order to further quantify such delayed effects. Moreover, additional studies may focus on examining the optimal time periods for the scheduling of 'booster' sessions to maintain treatment gains. Previous work has suggested that psychological treatment delivered according to a schedule with increasing time intervals between sessions (e.g. 1, 4, 10 intervening days) is more effective over the long-term compared to a uniform schedule (e.g. 5, 5, 5 intervening days) of treatment delivery (51). Thus, future research may also examine the optimal treatment schedule for delivery of massage therapy with a view to enhancing longer-term analgesic effects.

Limitations of the Current Review and Concluding Statements

The main limitation of the current study is its reliance on existing reviews and meta-analyses. Thus, many of the

conclusions drawn in this article are based on the findings of other authors. Relatedly, the soundness of the methodological approach of these existing reviews may have been limited (e.g. due to improper exclusion of specific studies) as well as highly variable across reviews. Nevertheless, the reliance on extant reviews was considered necessary in order to synthesize a vast and diverse literature examining a broad array of chronic pain conditions. Another limitation of the present study is that only those pain conditions that were the subject of at least one controlled trial of massage therapy were included. Thus, not all chronic pain problems were examined in this review. It is possible that positive effects for massage therapy on other chronic pain conditions may have been reported in uncontrolled trials and/or case studies.

In sum, this review identified important areas for future research on the effectiveness of massage therapy for chronic, non-malignant pain. Whereas there is fairly robust support for the analgesic effects of massage for non-specific LBP, there is only moderate support for such effects on shoulder pain and headache pain. Extant literature provides only modest, preliminary support for massage in treating fibromyalgia, mixed chronic pain, neck pain and CTS. One of the most important methodological considerations that should be addressed in future trials is the inclusion of follow-up assessments in order to allow further quantification of the longer-term effects of massage therapy on pain. Another key methodological consideration is the inclusion of comparison conditions that control for non-specific effects including physical contact and therapist time and attention. Moyer *et al.* (30) in their meta-analysis maintained that their positive findings for delayed assessment of pain are consistent with the notion that massage may promote pain reduction by enhancing restorative sleep. However, they note that data on sleep patterns was not included in the studies reviewed and therefore, this possibility remains to be tested. Thus, the careful consideration of potential mechanisms may inform future research, particularly with respect to the inclusion of key outcome variables as well as the examination of possible moderators and mediators of treatment response. Additional rigorous research is needed to establish massage therapy as a safe and effective intervention for the treatment of chronic, non-malignant pain.

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