Massage Therapy for Pain and Function in Patients With Arthritis

A Systematic Review of Randomized Controlled Trials

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Background: Massage therapy is gaining interest as a therapeutic approach to managing osteoarthritis and rheumatoid arthritis symptoms. To date, there have been no systematic reviews investigating the effects of massage therapy on these conditions.

Design: Systematic review was used.

Objectives: The primary aim of this review was to critically appraise and synthesize the current evidence regarding the effects of massage therapy as a stand-alone treatment on pain and functional outcomes among those with osteoarthritis or rheumatoid arthritis.

Methods: Relevant randomized controlled trials were searched using the electronic databases Google Scholar, MEDLINE, and PEDro. The PEDro scale was used to assess risk of bias, and the quality of evidence was assessed with the GRADE approach.

Results: This review found seven randomized controlled trials representing 352 participants who satisfied the inclusion criteria. Risk of bias ranged from four to seven. Our results found low- to moderate-quality evidence that massage therapy is superior to nonactive therapies in reducing pain and improving certain functional outcomes. It is unclear whether massage therapy is more effective than other forms of treatment.

Conclusions: There is a need for large, methodologically rigorous randomized controlled trials investigating the effectiveness of massage therapy as an intervention for individuals with arthritis.

Key Words: Massage Therapy, Arthritis, Pain, Disability, Mobility, Systematic Review

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Arthritis

Arthritis and other rheumatic conditions include a spectrum of more than 100 diseases and musculoskeletal conditions, with most involving pain, stiffness, and swelling in and around joints. Arthritis and chronic joint symptoms affect more than 50 million Americans and are the leading cause of disability.[1] In addition, arthritis carries a heavy economic burden in the United States, with estimates reaching US $128 billion (including inpatient and outpatient care, medications, and lost productivity).[2]

Osteoarthritis (OA) has been reported to make up the most disability and economic costs associated with arthritis.[3] The National Health and Nutrition Examination Survey and national census data indicate that OA affects approximately 26.9 million US adults (age, >25 yrs).[3] Clinical features of OA include pain, stiffness, joint crepitus, and functional limitations, often seen in individuals older than 50 yrs. Osteoarthritis has a multifactorial etiology, with increasing age, female sex, previous injury, muscular imbalance, joint laxity, and obesity among the strongest risk factors.[4] Osteoarthritis has been associated with muscle atrophy, alterations in joint mechanics, and movement impairment, all of which are thought to further perpetuate the progression of OA.[5] Peripheral and central nervous system changes, commonly characterized as peripheral and central sensitization, are thought to augment the pain experience of some chronic OA patients.[6,7] These changes include neuroinflammation, decreased activation threshold of nociceptive fibers, and increased local release of neuropeptides, which ultimately increase responsiveness to both noxious and innocuous stimuli.

Rheumatoid arthritis (RA) is estimated to be present in 2% of adults in North America.[8] Rheumatoid arthritis is a progressive autoimmune disease involving chronic inflammation beginning in the synovial membranes of joints.[9] Progression of RA involves the inflamed synovial tissue invading and damaging the cartilage within joints and eroding bone, ultimately leading to joint deformities. In addition, muscle fibers experience degenerative changes, and tendons and ligaments lose their elasticity and contractile capacity.[10] Peripheral sensitization has become an increasingly recognized mechanism of the amplification of pain and tenderness over involved joints.[11] Furthermore, given the symmetrical expression, poor relation between disease activity and symptoms, as well as generalized pain at both articular and nonarticular regions, impaired pain processing in the CNS is also suspected.

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Utility of Massage Therapy

Current models of pain recognize the complex interaction of biopsychosocial factors on the pain experience.[12,13] It follows that a number of centrally and locally mediated mechanisms may be responsible for the purported hypoalgesic effect of massage therapy (MT). To begin, anxiety and cognitive stress are known correlates of pain. Accordingly, several studies have shown that MT decreases stress and anxiety.[14–16] Moreover, reductions in stress and anxiety lead to decreases in sympathetic activity and increases in parasympathetic activity.[17,18] The resultant increase in vagal tone is associated with an attenuation of stress hormones, a process that may lead to pain reduction. Others suggest that the mechanical pressure levied by MT stimulates mechanoreceptors within muscular and connective tissue, which reduces motor unit firing rate,[19,20] and ultimately tension across the joints affected by arthritis. It is also possible that specific mechanical pressures imposed by MT may signal large, primary afferent nerve fibers, which are believed to interfere with nociceptive signaling,[21] effectively closing the "pain gate" through presynaptic and postsynaptic inhibition.[22,23] Massage therapy may also influence the body's chemistry by releasing endogenous opiates into the blood stream.[24] The hypoalgesic effect of MT may also reflect changes in the local cellular environment. Specifically, the mechanical pressure of MT, in concert with a vasodilatory response induced by an increase in parasympathetic nervous system activity, may augment local blood flow and clearance of inflammatory mediators (e.g., prostaglandin) that are known to sensitize peripheral nociceptors.[25] In cases where central sensitization is the dominant pain mechanism, the pain-reducing effect of MT remains unclear. Cognitions, pain coping strategies, and affective distress may contribute to central sensitization,[26,27] in which case massage may initiate positive cognitive and emotional changes that assist in the desensitization of the nervous system.

There is no cure for OA and RA; as such, medical treatment is aimed at relieving symptoms. Given the concerns many have for the long-term use of pharmacological interventions,[28–30] complementary and alternative therapies have become increasingly popular among patients with arthritis.[31–33] Massage therapy has been reported to be one of the most commonly used among the wide array of alternative therapies,[34] with relatively minor adverse effects.[35] Massage has also been reported to have positive results with respect to OA and RA related outcomes in several randomized controlled trials (RCTs) and prospective investigations.[36–44] Accordingly, this review aimed to critically appraise and synthesize the current evidence regarding the effects of MT as a stand-alone treatment on pain and functional outcomes among those with OA or RA.

BOX 1. MEDLINE search strategy on MT for OA and RA

1. Osteoarthritis
2. Rheumatoid arthritis
3. Arthritis
4. or/1–3
5. Massage*
6. Trigger point therapy
7. Swedish massage therapy
8. Myofascial release
9. Connective tissue massage
10. or/5–9
11. Randomized controlled trials
12. Controlled trials
13. or 11 and 12
14. 4, 10, and 13

BOX 2. Inclusion criteria

Participants - studies involving individuals with OS or rheumatoid arthritis, with no limitations on participant age, sex, or nationality were included.
Intervention - studies where MT was used as the sole intervention were included. Massage therapy may be delivered using a variety of methods. For the purposes of this review, MT was defined as the intentional and systematic manipulation of the soft tissues of the body to enhance health and healing.[1] Studies using energy manipulation (e.g., Reiki) or mechanical devices were excluded.
Control - research where there was a comparison group involving either no treatment or an intervention not involving a form of MT was included.
Outcomes - studies were included if the main outcomes of interest included pain and physical function outcomes.
In study design, only RCTs reported in English were included.

METHODS

This systematic review was registered on PROSPERO (PROSPERO CRD42016037654) and was aligned with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines for reporting systematic reviews that evaluate healthcare interventions (see Supplementary Checklist, http://links.lww.com/PHM/A392).[45]

Information Sources and Search Strategy

The initial search of published articles using the electronic databases Google Scholar, MEDLINE, and PEDro was conducted from inception until April 2016. The search strategy was developed in MEDLINE (Box 1) and was adapted to other databases. A manual search of reference lists was also conducted.

Eligibility Criteria

Eligibility criteria were framed using the Patient Intervention Comparison Outcome Study Design methodology. All identified studied focused on pain and function in patients with arthritis. To be included in this review, articles had to meet the criteria detailed in Box 2.

Methodological Quality

Two reviewers (NN, JC) independently assessed the methodological quality of studies within this systematic review using the PEDro scale.[46] The PEDro scale has been shown to have good levels of validity and reliability.[47,48] The total PEDro score ranges from 0 to 10 points, with a score of 6 or higher considered of high quality,[49] and those with scores lower than 6 considered low quality. If the relevant information was not explicitly reported in the primary study, the domain was graded "no." There were no disagreements between the reviewers regarding quality assessments of the eligible studies.

Although we did not perform a quantitative analysis, we assessed the quality of evidence for each outcome using an adapted GRADE approach as recommended in the *Cochrane Handbook for Systematic Reviews of Interventions*.[50] The quality of the evidence was rated high, moderate, low, or very low

for each outcome on the basis of the performance against the following five factors: risk of bias, indirectness of evidence, inconsistency of results, imprecision of results, and publication bias.

Data Extraction

Two independent reviewers (NN, JC) extracted data from the included studies, including information regarding the authors, sample sizes, study population (mean age, sex, arthritis location), interventions (description of MT used, duration of treatment, frequency), control group, and outcomes (pain and physical function).

Included Studies

The selection process for the studies used in this review is presented in Figure 1. The initial search identified 175 articles. Once duplicates were removed, the remaining 57 titles and abstracts were screened, where 45 studies were excluded and the remaining 12 were assessed for eligibility. Of the remaining 12 articles, seven RCTs met the inclusion criteria.

RESULTS

Description of Studies

Table 1 presents the characteristics and outcomes of the included studies. The seven RCTs were published between 1997 and 2015 and included 352 participants with either OA or RA.[36–38,40,41,43,51] It is worth mentioning that four of the seven studies were from the same research group, the Touch Research Institute.[37,40,41,51] The per-study sample sizes ranged from 20 to 125 and the lengths of the interventions ranged from 4 to 12 wks. One trial involved only female participants.[51] All studies used a type of MT as the sole intervention, with three trials relying on a licensed massage therapist (LMT) to deliver the treatment,[36,43,51] one involving only self-massage,[38] one involving a parent-delivered massage,[40] and two trials using a combination of daily self-massage and LMT delivered treatment.[37,41] The areas massaged were described as the whole body,[36,40,43] the neck,[41] the wrist and hand,[37] and the knee.[38,51] The total minutes of massage exposure for the trial period ranged from 120 to 960 mins. Two investigations performed

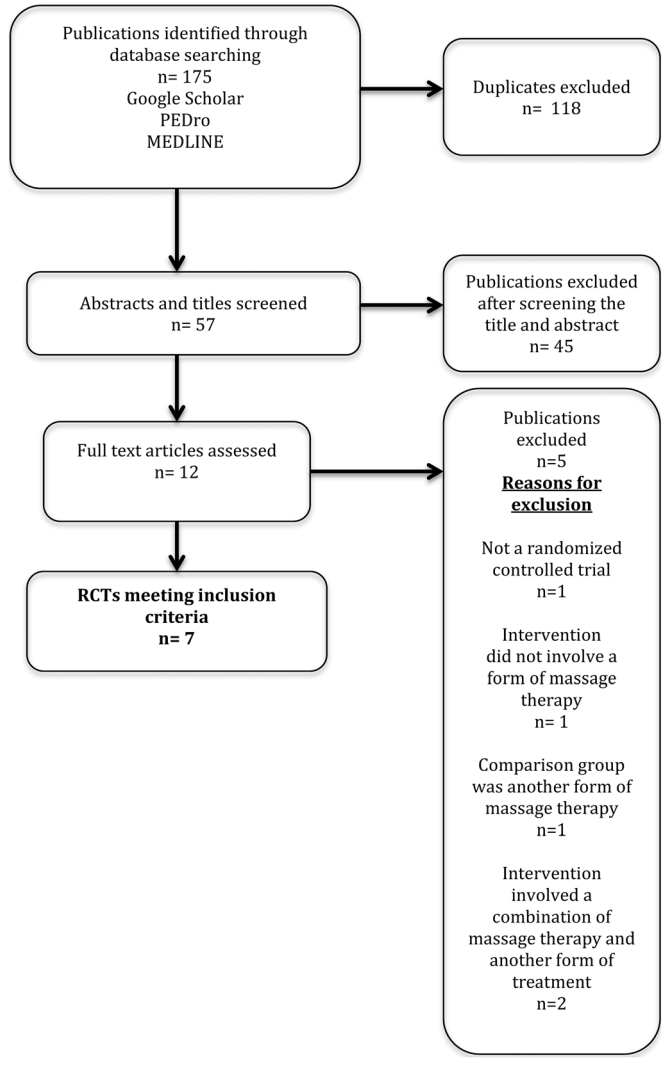

FIGURE 1. Flow diagram of search results.

TABLE 1. Summary of interventions, outcome measures and study findings

Main Author (Year)	Participants Location and/or Type of Arthritis, Mean Age, Sex (% Female)	Experimental Group Description	Control Group Description	Outcomes	Authors' Conclusions
Field et al (2015)[42]	Knee OA (n = 40), 47 y, 100% F	LMT performed 30-min moderate pressure MT to the quadriceps and hamstrings 1/wk × 4 wks (n = 23)	WLC (n = 17)	Immediately after the trial, statistically significant changes in favor of the MT group for the following: • WOMAC pain score ($P < 0.005$) • WOMAC activity score ($P < 0.05$) • 8-foot walk ($P < 0.001$) • Standing knee ROM flexion ($P < 0.05$) • Supine knee ROM flexion (0.05)	Moderate pressure MT to the quadriceps and hamstring muscles is effective for increasing ROM and lessening ROM-related pain in those with knee arthritis.
Field et al (2014)[41]	Neck arthritis (n = 37), 47 y, 77% F	LMT performed 30-min moderate pressure MT 1/wk × 4 wks in addition to 15-min daily neck self-massage (n = 24)	WLC (n = 24)	Immediately after the trial, statistically significant changes in favor of the MT for ROM ($P < 0.01$), ROM-associated pain ($P < 0.005$)	Moderate pressure MT to the cervical region is effective for increasing ROM and lessening ROM-related pain in those with neck arthritis.
Atkins and Eichler (2013)[38]	Knee OA (n = 40), 66 y, 86% F	Self-massage 20 min 2 d/wk × 12 wks. 8 of the 12 wks were supervised (n = 21)	Usual care (not described, n = 19)	Immediately after the trial, significant between-group differences in favor of MT group in 21 of 24 WOMAC subscales including pain, stiffness, physical function, and total mean WOMAC ($P < 0.05$). No significant difference in postscore knee flexion ROM	Those with OA of the knee benefit from self-massage
Perlman et al (2012)[36]	Knee OA (n = 125), 68 y, 70% F	LMT performed treatment on all groups. EG 1: 30 min Swedish massage (1 d/wk × 8 wks, n = 25) EG 2: 30-min Swedish massage (2 d/wk × 8 wks, n = 25) EG 3: 60-min Swedish massage (1 d/wk × 8 wks, n = 25) EG 4: 60-min Swedish massage (2 d/wk × 8 wks, n = 25)	Usual care (not described, n = 25)	Immediately after the 8-wk trial, WOMAC Global scores improved significantly in the 60-min groups (24.0 points; 95% CI, 15.3 to 32.7) compared with the control group (6.3 points; 95% CI, 0.1 to 12.8). VAS scores improved significantly −39.8, (95% CI, −48.1 to −31.4) in EG 3 and −31.3 (95% CI, −39.4 to −22.9) in EG 4 compared with usual care group. No significant differences in knee ROM compared with control group. At 24 wks, no significant effects were seen in any outcome measure compared with usual care group.	60-min weekly massage seems to be an optimal dose in improving pain and function in those with OA of the knee.
Field et al (2007)[37]	Hand arthritis (n = 22), 47 y, 93% F	LMT performed 15-min treatment to the affected wrist and hand 1 d/wk. In addition, 15-min daily self-massage × 4 wks (n = 11)	No treatment (n = 11)	Immediately after the trial, the MT group showed significantly greater improvement in pain ($P < 0.01$) and perceived grip strength ($P < 0.05$) compared with the control group.	MT improved perceived grip strength and reduced pain in those with hand OA

Perlman et al (2006)[43]	Knee OA ($n = 68$), 68 y, 78% F	LMT performed 60-min total body Swedish massage (wks 1–4: 2 d/wk; wks 5–8: 1 d/wk; $n = 34$)	Usual care, pain medication, or hot and cold therapy ($n = 34$)	Immediately after the trial, the MT group showed significantly greater improvements in the following: • WOMAC pain, stiffness, and physical functional disability domains, and VAS ($P < 0.01$). • Knee ROM ($P = 0.03$) • Time to walk 50 ft ($P < 0.01$) 8-wk follow-up, MT group demonstrated significant improvements compared with control: Pain: VAS ($P < 0.004$) Function: • WOMAC stiffness ($P < 0.05$) • WOMAC functionality ($P < 0.009$) • WOMAC global ($P < 0.005$) • Time to walk 50 ft ($P < 0.02$)	MT seems to be efficacious in the treatment of OA of the knee.
Field et al (1997)[37]	Juvenile RA ($n = 20$), 9.8 y, 70% F	Parent performed 15-min total body Swedish massage daily × 30 d ($n = 10$)	PRT involving 15 min of contracting and relaxing muscles of the body each day for 30 d ($n = 10$)	Immediately after the trial, physician assessment of pain and morning stiffness was greater in the massage group compared with the relaxation group ($P < 0.05$).	Massage performed by parents of children with RA can help decrease pain.

CI, confidence interval; EG, experimental group; F, female; WLC, wait list control.

follow-up assessments after the interventions.[36,43] With respect to control conditions, six studies allocated participants to an inactive group described as a wait list control, no treatment, or usual care group.[36–38,41,43,51] Usual care, when described, included the use of medication and hot or cold packs. One study used progressive muscle relaxation therapy (PRT) involving the systematic tensing and relaxing of muscles throughout the body to serve as the comparison group.[40]

Quality

The PEDro scores have been presented in Table 2, with scores ranging from 4 to 7. Two studies were considered of high quality,[36,43] whereas five studies had PEDro scores less than 6 and were considered of low quality.[37,38,40,41,51] The most common issues included lack of concealed allocation and blinding of therapists, subjects, and assessors.

Synthesis of Results

Because of the overall high risk of bias, inconsistent reporting of relevant data, and heterogeneity with respect to the reported outcomes, MT techniques, patient populations, involved structures, and lengths of treatments among the primary studies, we decided to limit the synthesis of our results to a narrative form.

Comparisons

We divided the comparisons into studies comparing MT to a nonactive control category or an active category. The nonactive control grouping included investigations where the participants were on a wait list to receive treatment, received usual care involving medication and cryotherapy only, or received no treatment. The active grouping included any comparison group in which participants received some form of attention that could conceivably lead to a treatment effect.

Massage Versus Nonactive Control

Six studies (332 participants) reporting pain outcomes met the inclusion criteria for this comparison.[36–38,41,43,51] The studies provided low evidence (downgraded because of risk of bias, imprecision) that MT is superior to a nonactive therapy for reducing pain in individuals with arthritis.

Five studies (310 participants) provided very low-level evidence (downgraded because of risk of bias, imprecision, and inconsistency) that MT is superior to nonactive therapy for improving range of motion (ROM). One study with a low risk of bias[36] and one with a high risk of bias,[38] reported no statistically significant between-group differences in knee flexion and extension ROM among MT recipients when compared with control participants. Conversely, one trial with a low risk of bias[43] and two trials with a high risk of bias[41,51] did report significant between-group differences in improvements in knee flexion and extension ROM[51] as well as neck lateral flexion, extension, and flexion ROM[41] compared with nonactive control participants.

Two trials with a low risk of bias[36,43] and one trial with a high risk of bias RCT,[38] involving 233 participants, provided moderate-quality evidence (downgraded because of imprecision) that MT is superior to nonactive therapies in improving The Western Ontario and McMaster's Osteoarthritis Index

TABLE 2. Methodological quality and reporting of eligible studies

Study	PEDro Score (0–10)	PEDro Scale Items*										
		1	2	3	4	5	6	7	8	9	10	11
Field et al (2015)[42]	4	Y	Y	N	Y	N	N	N	N	N	Y	Y
Field et al (2014)[41]	4	Y	Y	N	Y	N	N	N	N	N	Y	Y
Atkins and Eichler (2013)[38]	4	Y	Y	N	Y	N	N	N	N	N	Y	N
Perlman et al (2012)[36]	7	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y
Perlman et al (2006)[43]	7	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y
Field et al (2007)[37]	4	Y	Y	N	Y	N	N	N	N	N	Y	Y
Field et al (1997)[37]	5	Y	Y	N	Y	N	N	N	N	N	Y	Y

*PEDro scale items 1, eligibility criteria and source of participants; 2, random allocation; 3, concealed allocation; 4, baseline comparability; 5, blinded subjects; 6, blinded therapists; 7, blind assessors; 8, adequate follow-up; 9, intention-to-treat; 10, between-group comparisons; 11, point estimates and variability.

N, no; Y, yes.

(WOMAC) functional subscales. One study (22 participants) with a high risk of bias[37] provided low-quality evidence (downgraded because of risk of bias and imprecision) that MT was superior to a nonactive therapy for improving perceived grip strength in individuals with hand arthritis.

Two RCTs with a low risk of bias[36,43] and one RCT with a high risk of bias,[51] involving 233 participants, provided moderate-quality evidence (downgraded because of imprecision) that MT is superior to a nonactive comparator for improving walking function among those with OA of the knee. Perlman et al.[36,43] reported significantly faster 50-foot walk times among those receiving MT compared with usual care control participants, whereas Field et al.[51] reported decreased time to walk 8 feet in MT recipients compared with participants in a waitlist control group.

Massage Versus Active Treatment

One small study (20 participants) with a high risk of bias met the inclusion criteria for this category. Field et al.[40] investigated the effects of a 15-min parent-delivered daily massage to children with juvenile RA showed a significant group by time interaction effect. This study provided very low-quality evidence (downgraded because of high risk of bias, imprecision, and indirectness) that MT is superior to PRT for the outcomes of pain and morning stiffness in those with juvenile RA.

Adverse Events

Adverse effects were reported in two studies.[36,43] Perlman et al.[36] reported no adverse effects related to the MT intervention,[36] and Perlman et al.[43] reported that one participant experienced an increase in discomfort and subsequently dropped out of the trial.

DISCUSSION

This is the first systematic review attempting to appraise the effectiveness of MT on pain and functional outcomes among individuals with arthritis. Seven studies met the inclusion criteria for this review, which included a total of 352 participants. We noted a high level of heterogeneity across all studies with respect to patient populations, structures treated, type of MT, and outcomes reported. All but two studies were judged to have a high risk of bias. Issues related to blinding were present in all of the primary studies. In instances where the response criteria are subjective, such as the attenuation of pain, blinding is though to limit the influence of an individual's expectations and beliefs regarding a specific treatment. Although blinding of practitioners and patients is an inherent limitation of manual therapy interventions, blinding of the measurement assessor to treatment allocation is possible but not achieved or adequately reported in many trials in this review. In addition, few trials provided complete information regarding participant inclusion criteria, medication use, and important MT treatment variables such as depth of pressure and type of strokes. For these reasons, further research is needed to reveal the treatment effect of MT and to develop specific recommendations for clinical practice. The use of standardized checklists, such as the Consolidated Standards of Reporting Trials guidelines,[52] would enhance reporting and quality of future work and ultimately contribute to the development of clinical practice guidelines for the field of MT.

The overall quality of the evidence was assessed using the GRADE approach. Comparisons were based on whether the control group was an active or nonactive comparator. Evidence from every comparison was downgraded for imprecision because of the relatively small number of participants in each outcome.[53] Evidence was also downgraded if most results within a comparison were derived from studies with a high risk of bias. Overall, the quality of evidence for the comparisons ranged from "moderate" to "very low."

We found limited evidence suggesting that MT as a standalone treatment is more effective to nonactive controls in reducing pain and improving certain functional outcomes in individuals with arthritis. The hypoanalgesic effect of MT found in this review seems to be consistent among systematic reviews that have compared various forms of MT to nonactive treatments for a range of chronic pain conditions.[54,55]

We found conflicting evidence regarding the effects of MT on ROM. Although three trials did find significant improvements in ROM,[41,43,51] Atkins et al.[38] and Perlman et al.[36] found no significant between-group differences for the outcome of knee ROM. There are few possible explanations for the lack of improvement in knee ROM in the trial by Atkins trial. First, this investigation relied on self-massage, in which case sufficient pressure may not have been generated to elicit any positive effects on ROM. Second, the participants were actively massaging the quadriceps muscles, which may have limited any relaxation response that contributes to the positive effects of MT. Third, the massage treatment was limited to the quadriceps muscles, neglecting other muscles (e.g., hamstrings, gastrocnemius, adductors) known to influence knee ROM. Regarding the lack of between-group differences in the investigation by Perlman et al.,[36] it is possible that the small sample sizes in each treatment arm limited the detection of clinically relevant improvements. Although the specific pressure was not reported, Perlman et al.[36] used a Swedish massage protocol, which may have lacked the requisite pressure needed to prompt improvements in ROM. It is worth noting, however, that those

receiving 60 mins of biweekly MT did demonstrate significant within-group improvements in ROM from baseline at all assessment points (immediately after, 8-, and 16-wk postintervention).

Only one study compared the effects of MT with an active comparator.[40] The evidence for this comparison was downgraded to very low quality because of high risk of bias, imprecision, and indirectness. Regarding indirectness, although the trial met our inclusion criteria, we had concerns that the study population and massage delivery methods used in this study did not directly address our research question. Although this trial found that parents massaging their children with juvenile RA experienced greater reductions in pain when compared with children participating in PRT, the researchers noted that these results might have been related to the fact that the children were too young to understand how to adequately perform the PRT. To date, it is unclear what might constitute a credible active comparator for MT.[56] Sham massage or very light touch massage show promise[55]; however, it must be considered that touch of any kind may elicit nonspecific psychological effects that may influence outcomes.

Our results suggest that MT is well tolerated and safe for patients with arthritis. Among the 352 individuals who were part of this review, there was only one report of adverse effects, which led to the subject dropping out of the study. Of course, it should be considered that this low number might be due to the sparse reporting of adverse effects. In addition, further questions remain regarding how the severity of arthritis and the presence of peripheral sensitization and central sensitization might impact the tolerability of MT.

Only two studies in this review provided adequate follow-up data.[36,43] It follows that further investigation is needed regarding the long-term effectiveness of MT. Perlman et al.[43] conducted an 8-wk Swedish MT trial, which involved a follow-up 8-wk postintervention. It was shown that improvements in pain and function persisted up to 8 wks after the massage intervention. In a subsequent investigation, Perlman et al.[36] explored pain and functional outcomes in participants with OA 16 wks after the conclusion of an 8-wk MT intervention. No significant effects were reported in any outcome measure at this 24-wk assessment point when compared with the usual care control group. Of note, at 24-wk assessment point, MT recipients continued to demonstrate significant improvement in WOMAC Global scores compared with baseline.

Future Directions

Although this review provides low- to moderate-quality evidence that MT is an effective pain-relieving treatment for arthritis, several questions remain. Of particular note, the relevance of interpersonal contact between the MT recipient and the provider is not well understood, where it is possible that the outcomes of MT are partly a consequence of the therapeutic relationship (i.e., potential confounding factor).[57] Certainly, recipient attitudes about the practice of massage and perhaps the practitioner will influence treatment outcomes.[58] From the therapist's position, it is also plausible that displays of empathy and competency will influence treatment efficacy. Interestingly, one study in this review investigated the effects of a 12-wk, biweekly, 20-min self-massage intervention to the quadriceps muscles of individuals with OA,[38] effectively eliminating any interaction of therapist and recipient. The researchers found significant between-group differences in WOMAC pain, stiffness, function subscales, and total WOMAC scores ($P < 0.05$) when comparing the massage group ($n = 21$) with a wait list control ($n = 19$). Given that self-massage is a cost- effective and convenient management strategy, future trials should examine whether any differences in effect size exists between self-massage and therapist delivered MT.

With respect to dose, treatment variables such as number and duration of treatments are worthy of further exploration. Perlman et al.[36] conducted an 8-wk MT intervention, examining four different doses of MT (30 or 60 mins weekly or 30 or 60 mins biweekly). It was shown that increasing quantities of MT resulted in greater reductions in pain visual analog scores (VAS) and greater improvements in WOMAC Global scores up until the highest dose (i.e., 720 mins of total treatment time). Those in the highest dose group showed no significant differences in VAS scores or WOMAC scores compared with those receiving one weekly 60-min massage (i.e., 480 mins of total treatment time). Given the similar outcomes of the two 60-min doses and the superiority of the 60-min treatment to the 30-min treatments, the researchers concluded that a 60-min weekly massage might be optimal for pain reduction and improvement of functional outcomes in those with OA of the knee. Nonetheless, this trial was limited to four doses, where it is possible that an actual optimal MT dose might not have been captured. As such, it would be worthwhile to compare the enduring effects of less frequent (e.g., bimonthly, monthly) MT. Along these lines, economic analyses should also be incorporated into research designs to determine the most cost-effective dose of MT.

In clinical practice, MT is often used in combination with other treatments. It follows that future reviews investigating the effects of MT as an adjunctive therapy would be valuable. In addition, comparisons of different types of MT (e.g., trigger point therapy versus Swedish massage, Thai massage versus myofascial release, etc.) and pressure used during treatment would be informative. Questions also remain as to whether MT delivered to the region of the body affected by arthritis is more effective than whole body MT. Finally, OA and RA are each heterogeneous conditions. Accordingly, future research should investigate whether various subgroups of OA and RA patients may respond differently to distinct types and pressures of MT.

LIMITATIONS

In addition to the noted methodological issues of the primary studies, there are several limitations of this review that must be considered. First, our search strategy may not have captured all relevant studies. The electronic search was limited to English and we only included RCTs. In addition, although we used broad massage terms in our search strategy to ensure a comprehensive retrieval of MT studies, it is possible that studies using different forms of massage (e.g., tui na) were missed. Second, a relatively small number of studies were included in this review. Third, we recognize that the overall generalizability of the findings of this review may be limited because of the participants meeting eligibility criteria developed from a single group (The Touch Research Institute); however, the validity of this review should not be affected because the included studies revealed findings that were hypothesized a priori. Finally,

because of the heterogeneity of outcomes, participant populations, types of massage, and area of the body treated, a quantitative analysis was not performed.

CONCLUSIONS

The results of this systematic review provide low- to moderate-quality evidence that MT is more effective in improving selected functional outcomes and pain among individuals with OA and RA when compared with no treatment or usual care. The very low-quality evidence currently available is insufficient to draw conclusions regarding the effectiveness of MT in comparison with an active form of treatment. There is a need for well-designed, high-quality RCTs to increase the strength of evidence regarding the effectiveness of this intervention.

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