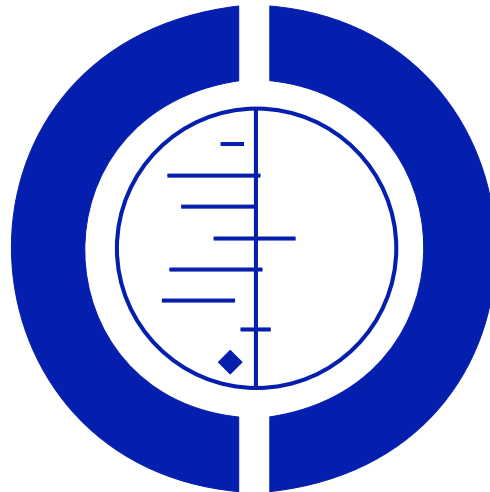


# Massage for mechanical neck disorders (Review)

Haraldsson BG, Gross AR, Myers CD, Ezzo JM, Morien A, Goldsmith C, Peloso PM, Bronfort G, Cervical Overview Group



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## ABSTRACT

### Background

Mechanical neck disorders (MND) are common, disabling and costly. Massage is a commonly used modality for the treatment of neck pain.

### Objectives

- To assess the effects of massage on pain, function, patient satisfaction and cost of care in adults with neck pain.
- To document adverse effects of treatment.

### Search strategy

Cochrane CENTRAL, MEDLINE, EMBASE, MANTIS, CINAHL, and ICL databases were electronically searched, without language restriction, from their inception to September 2004

### Selection criteria

Studies using random or quasi-random assignment were included.

### Data collection and analysis

Two reviewers independently conducted citation identification, study selection, data abstraction and methodological quality assessment. Using a random-effects model, we calculated the relative risk and standardized mean difference.

### Main results

Nineteen trials met the inclusion criteria. Overall, the methodological quality was low, with 12/19 assessed as low-quality studies. Trials could not be statistically pooled because of heterogeneity in treatment and control groups. Therefore, a levels-of-evidence approach was used to synthesize results. Assessment of the clinical applicability of the trials showed that the participant characteristics were well reported, but neither the descriptions of the massage intervention nor the credentials or experience of the massage professionals were well reported.

Six trials examined massage as a stand-alone treatment. The results were inconsistent. Of the 14 trials that used massage as part of a multimodal intervention, none were designed such that the relative contribution of massage could be ascertained. Therefore, the role of massage in multimodal treatments remains unclear.

### Authors' conclusions

No recommendations for practice can be made at this time because the effectiveness of massage for neck pain remains uncertain.

Pilot studies are needed to characterize massage treatment (frequency, duration, number of sessions, and massage technique) and establish the optimal treatment to be used in subsequent larger trials that examine the effect of massage as either a stand-alone treatment

or part of a multimodal intervention. For multimodal interventions, factorial designs are needed to determine the relative contribution of massage.

Future reports of trials should improve reporting of the concealment of allocation, blinding of outcome assessor, adverse events and massage characteristics. Standards of reporting for massage interventions, similar to CONSORT, are needed. Both short- and long-term follow-up are needed.

## PLAIN LANGUAGE SUMMARY

### Massage for mechanical neck pain

Neck pain is common and can limit a person's ability to participate in normal daily activities. Massage is a widely used treatment for neck pain. In this review, it was defined as touching or manipulating the soft tissues surrounding the neck with the hand, foot, arm or elbow. There are a number of different types of massage. This review included studies that looked at Traditional Chinese massage, ischemic compression, self-administered ischemic pressure using a J-knob cane, conventional Western massage and occipital release, among other techniques. It did not include studies that examined techniques such as Reiki or Polarity.

We included 19 trials (1395 participants) in this review that assessed whether massage alone or in combination with other treatments could help reduce neck pain and improve function. Results showed that massage is safe and any side effects were temporary and benign. However, neither massage alone nor massage combined with other treatments showed a significant advantage over other comparison groups. Alone, or in combination with other treatments, it was compared to no treatment, hot packs, active range-of-movement exercises, interferential current, acupuncture, exercises, sham laser, TENS, manual traction, mobilization, education and pain medication.

There were a number of challenges with this review. Overall, the quality of the studies was poor and the number of participants in most trials was small. Most studies lacked a definition, description, or rationale for massage, the massage technique or both. In some cases, it was questionable whether the massage in the study would be considered effective massage under any circumstance. Details on the credentials or experience of the person giving the massage were often missing, and only 11/19 trials reported enough detail to determine who actually was giving the massage. There was such a range of massage techniques and comparison treatments in the studies that we could not combine the results to get an overall picture of the effectiveness of massage. Therefore, no firm conclusions could be drawn and the effectiveness of massage for improving neck pain and function remains unclear.

## BACKGROUND

Neck disorders are common and can be severely disabling and costly (Cote 1998; Linton 1998; Makela 1991; Rajala 1995; Takala 1982; Westerling 1980). A significant proportion of direct health care costs associated with neck disorders are attributable to visits to health care providers and to sick leave and the related loss of productive capacity (Borghouts 1998; Linton 1998; Skargren 1998a). Occupation-related neck disorders may cause absenteeism as commonly as low-back pain (Kvarnstrom 1983; Brattberg 1989; Palmer 2001).

Neck pain is experienced by 26% to 71% of the population in their lifetime (Brattberg 1989; Cote 1998; Makela 1991; Rajala 1995). In the 2003 US National Health Interview Survey, 14.7% of adults age 18 and older reported they had experienced neck pain during the past three months that lasted one day or more and 15.1% experienced migraine or severe headaches lasting one day or more (Lethbridge-Cejk 2005). Neck pain frequently becomes chronic and 10% of males and 17% of females have reported neck

pain that lasted longer than six months (Bovim 1994). In Quebec, seven per cent of compensation claims are neck-related (Spitzer 1987). Motor vehicle crashes leave 24% to 50% of casualties with persistent symptoms at 12 months (Cassidy 2000; Radanov 1994). In 1995 and 1996, the estimated cost of chronic pain in general (including lost work days, therapy and disability) was \$150 billion to \$215 billion USD each year (National Res 2001; US Census 1996).

Massage is used to treat persistent neck pain. However, studies of its effectiveness on neck pain have generally been short-term and inconclusive (Bogduk 2000; Gross 1996; Gross 2002; Hoving 2001; Kjellman 1999; Peeters 2001).

## OBJECTIVES

The objectives were (1) to assess the effect of massage either alone or in combination with other treatments on pain, neck-related function, disability, patient satisfaction and global perceived effect in adults with mechanical neck disorders, (2) to assess the sec-

ondary outcomes of adverse events and cost of care and (3) where appropriate, to conduct sensitivity analyses to assess the influence of study methodological quality, symptom duration and subtypes of the disorder on the magnitude of treatment effects.

## CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW

### Types of studies

Any published or unpublished randomized controlled trial (RCT) or quasi-RCT, either in full text or abstract form, was included. A quasi-RCT uses methods of allocation that are subject to bias in assignment, such as, odd-even numbers, day of week, patient record or social security number. As the total number of studies in this field is not large, we included quasi-RCTs

### Types of participants

The participants were adults who suffered from acute (less than 30 days), sub-acute (30 days to 90 days) or chronic (longer than 90 days) neck disorders categorized as:

- Mechanical neck disorders (MND), including whiplash associated disorders (WAD) category I and II (Spitzer 1987, Spitzer 1995), myofascial neck pain, and degenerative changes (Schumacher 1993),
- Neck disorder with headache (NDH) (Olesen 1988, Olesen 1997, Sjaastad 1990),
- Neck disorders with radicular findings (NDR), including WAD category III (Spitzer 1987, Spitzer 1995).

Studies were excluded if they investigated neck disorders with

- definite or possible long tract signs (e.g. myelopathies),
- neck pain caused by other pathological entities (e.g. rheumatoid arthritis, ankylosing spondylitis, spasmodic torticollis, fractures and dislocations) (Schumacher 1993),
- headache not of cervical origin but associated with the neck,
- co-existing headache, when either neck pain was not dominant or the headache was not provoked by neck movements or sustained neck postures, or
- 'mixed' headache.

### Types of intervention

Massage in this review was defined as contact with or manipulation of the soft tissues of the human body with the hand, foot, arm or elbow on the structures of the neck. Studies using massage, either alone or in combination with other therapies and contrasted against a control or comparison group, were included in this review. Massage techniques included Swedish techniques, fascial or connective tissue release techniques, cross fiber friction, and

myofascial trigger point techniques. Techniques based on subtle energy manipulations, with or without physical contact with the patient (Reiki, Polarity), were excluded.

The comparison groups were a control treatment or another treatment. Control treatments included (a) sham or placebo, (b) no treatment control, (c) active treatment control (i.e. massage + Ultrasound (US) versus US) or (d) inactive treatment control (i.e. massage + sham US versus sham US). Other active treatments included (a) one active treatment versus another very different active treatment (i.e. massage versus exercise), (b) one type of treatment (i.e. Chinese massage) versus another type of a similar treatment (i.e. Western massage) or (c) one dosage of a treatment versus another dosage of the same treatment (i.e. 3 weeks with 9 sessions of Chinese massage versus 3 weeks with 3 sessions of Chinese massage).

### Types of outcome measures

The outcomes of interest were pain relief, neck-related disability, function, patient satisfaction and global perceived effect (Turk 2004). We did not set any restriction on the type of measures used in the studies to assess these outcomes as there were no universally accepted measurement tools available. When available, we also extracted data on adverse events and cost.

The duration of the follow-up period was defined as:

- **immediately post-treatment:** up to one day,
- **short term follow-up:** between one day and three months,
- **intermediate term follow-up:** between three months and one year,
- **long term follow-up:** one year and beyond.

## SEARCH METHODS FOR IDENTIFICATION OF STUDIES

See: Back Group methods used in reviews.

A research librarian searched the computerized bibliographic databases of the medical, chiropractic, and allied health literature from their inception to September, 2004, without language restrictions. These databases included CENTRAL (The Cochrane Library 2004, issue 4), MEDLINE (January 1966 to September 2004), EMBASE (January 1980 to September 2004), Manual Alternative and Natural Therapy (MANTIS) (1985 to September 2004), Cumulative Index to Nursing and Allied Health Literature (CINAHL) (January 1982 to March 2004), Index to Chiropractic Literature (ICL) (1980 to September 2004). We also screened references, communicated with the Cochrane Back Group Co-ordinator, contacted content experts and searched our own personal files to identify studies.

Since this review was one of a series on manual therapies, this search was part of a comprehensive search for all manual

therapies. Potential trials for massage therapy were separated from the total search results. Subject headings (MeSH) and key words included anatomical terms, disorder or syndrome terms, treatment terms and methodological terms consistent with those advised by the Cochrane Back Group (van Tulder 2003). See Table 06 for the Search Strategy for MEDLINE. It was adapted as indicated for the other databases.

## METHODS OF THE REVIEW

### Study Selection

Pairs of reviewers, each with one or more areas of expertise from medicine, physiotherapy, chiropractic, massage therapy, statistics or clinical epidemiology, independently identified citations and selected studies. We assessed agreements for study selection using the quadratic weighted Kappa statistic (Kw); Cicchetti weights (Cicchetti 1976). A third reviewer was consulted in case of persisting disagreement.

### Data Abstraction

Two reviewers independently abstracted data using a standardized form. We contacted primary authors if data were not reported on primary outcomes. We imputed values when the author could not be contacted or data were not available (Little 1984, Sutton 2002; See Gross 2002 for these imputations rules). When data could not be retrieved from the author, the author's report of significance was reported in tabular form (See Characteristics of Included Studies table). We also documented adverse events reported by the primary author.

### Data Analysis and Synthesis

For continuous data, we calculated standardized mean differences and 95% confidence intervals (SMD; 95% CI) using a random-effects model. In the absence of clear guidelines on the size of clinically important effect sizes, we used a commonly applied system by Cohen 1988: small (0.20), medium (0.50) or large (0.80). We assumed the minimum clinically important difference to be 10 on a 100-point pain intensity scale. Similarly, we considered a minimum clinically important difference to be a change of five units on the 50-unit Neck Pain Disability Index (Stratford 1999).

For continuous outcomes reported as medians, we calculated effect sizes based on Kendall [Kendall 1963 (p 237)]. We calculated relative risks (RR) for dichotomous outcomes. To facilitate analysis, data imputation rules were used when necessary (Gross 2002). The number needed to treat (NNT) and treatment advantage calculations were planned for primary findings when a clear positive effect was seen; however, this was not carried out for most trials because most of them did not demonstrate strong evidence of benefit. All calculated analyses are reported in the Characteristics of Included Studies table under the subheading 'Calculated Results'. If more than one time period was reported in

the paper, only our calculations of the longest follow-up time are reported in the table. Results reported in the manuscript appear as 'Reported Results'. We conducted power analyses for trials reporting nonsignificant findings (Dupont 1990) and these are reported in the same table.

Prior to calculation of a pooled effect measure, we used clinical judgment to assess the reasonableness of pooling. We had planned to assess statistical heterogeneity using a chi-square test between groups, using a random-effects model. In the absence of heterogeneity ( $P$  greater than 0.05), we planned to pool the SMD or RR. Due to insufficient data in any one treatment category, this was not feasible. Sensitivity analysis or meta-regression for the factors of symptom duration, methodological quality and subtype of neck disorder were planned but not carried out because we did not have enough data in any one category.

To reach final conclusions, we used these levels of evidence (Sackett 2000; van Tulder 2003):

- **Strong evidence** denoted consistent findings in multiple high quality RCTs.
- **Moderate evidence** denoted findings in a single, high quality RCT or consistent findings in multiple low-quality trials.
- **Limited evidence** indicated a single low-quality RCT.
- **Conflicting evidence** denoted inconsistent results in multiple RCTs.
- **No evidence** meant no studies were identified.
- **Evidence of adverse effect** was used for trials that showed lasting negative changes.

*Consistent* was defined as two-thirds of the trials with the same result. The term *evidence of no benefit* was used for trials or meta-analyses with negative results and large enough (e.g. at least 80% power or at least 70 participants per intervention arm) to have a low risk of false-negatives. Since we were unaware of other criteria available for neck-specific trials, we based the sample size per intervention arm on criteria for clinically important changes in outcomes seen in rheumatoid arthritis trials (Goldsmith 1993).

## DESCRIPTION OF STUDIES

We identified 19 trials (1395 participants) from 538 citation postings:

- six trials assessed multiple disorders (Brodin 1985; Fialka 1989; Hoving 2002; Karlberg 1996; Provinciali 1996; Schnabel 2002),
- 13 studied mechanical neck disorder (Brodin 1985; Fialka 1989; Gam 1998; Hanten 1997; Hanten 2000; Hou 2002; Hoving 2002; Irnich 2001; Jordan 1998; Karlberg 1996; Levoska 1993; Provinciali 1996; Schnabel 2002),

- seven studied headache of cervical origin (Ammer 1990; Fialka 1989; Karlberg 1996; Nilsson 1997; Provinciali 1996; Reginiusen 2000; Schnabel 2002),
- three evaluated neck disorder with some radicular signs and symptoms (Brodin 1985; Koes 1992; Kogstad 1978),
- four trials were non-English: three were in German (Ammer 1990; Fialka 1989; Schnabel 2002); one was in Danish (Kogstad 1978).

See 'Characteristics of Included Studies' table for further details on treatment characteristics, co-interventions, baseline values, absolute benefit, reported results, SMD, RR, side effects and cost of care. We excluded 14 studies after reviewing the full text, based on the type of participant (5/14), intervention (7/14), outcome (2/14) or design (1/14). See 'Characteristics of excluded studies' table for details.

Gam 1998, Irnich 2001, and Koes 1992 provided additional data. The P value was transformed into a standard deviation unit for Provinciali 1996. The variance measure equals the square root of 2/30 times the standard deviation squared where n (experimental) and n (control) are equal to 30. We assumed the standard deviations for both groups were the same.

## METHODOLOGICAL QUALITY

We used at least two independent reviewers with varied professional background to assess methodological quality, using the three criteria lists described below:

- the validated Jadad 1996 criteria (maximum score five, high quality greater than 2, See Table 01),
- the Cochrane Collaborative Back Review Group criteria (van Tulder 2003) (maximum criteria 11, high quality greater than five criteria met, See Table 01)
- the Cochrane system for grading quality of allocation concealment (A to D, See Table 01; See assignment in 'Characteristics of included studies' table)

Because they are validated, we used the Jadad criteria for the primary classification of methodological quality. We acknowledge that double blinding - one of the Jadad criteria - cannot be easily performed in massage therapy. As none of the currently available criteria lists for measuring the internal validity or 'quality' of trials can be applied without reservation, we assessed the correlation between the Jadad and van Tulder scales [Spearman Rank Correlation (Rho)] and between studies classified as high or low quality by the two systems [Cohen's Kappa (K)]. We noted explicit details on study design, number analyzed and randomized, intention-to-treat analysis, and power analysis in the methods column of the 'Characteristics of included studies' table.

Table 04 and Table 05 provide methodological quality scores for each trial. Of the 19 trials, 12 received a low-quality score according to the Cochrane Back Group scale. Few trials (5/19) described or used appropriate concealment of allocation. Few (6/19) avoided or controlled for co-interventions and only slightly more than half (10/19) reported blinding the outcome assessor.

### Clinical Applicability

Clinical applicability addresses whether the results are understandable and usable by clinicians who may wish to use the interventions. To assess clinical applicability, we developed a six-item checklist using the criteria from a number of sources (Altman 2001; Guyatt 1994; Shekelle 1994; van Tulder 2003). Clinical applicability for each study was assessed independently by two reviewers (See Table 02).

The clinical applicability checklist was comprised of questions determining whether specific items had been satisfactorily reported (Questions 1 and 2) and satisfactorily performed (Questions 3, 4, 5, and 6). Each of the six questions had subsections. For example, within the main question on patient characteristics, subsections asked whether gender and age had been reported. All subsections had to be satisfactorily answered for the main question to be rated as satisfactory.

Table 03 shows the results of the assessment. Only the characteristics of the study participants (i.e., gender, age) were well reported (18/19 trials). The characteristics of the massage were adequately reported in less than half the trials (8/19) with descriptions of the dose and massage technique most frequently absent. Details of the credentials or experience of the person administering the massage were also frequently missing and only 11/19 trials reported enough detail to determine who delivered the intervention. Statistical results were seldom reported according to CONSORT guidelines (Altman 2001).

For the performance questions, the main outcome was rated as being client-centered in all trials (19/19) and the timing of evaluation of outcome was rated as sensible in most (17/19) trials. Adverse effects were infrequently reported; hence, only 2/19 trials were rated as having adequately balanced efficacy with safety.

## RESULTS

Trials were small, with a median of 20 participants per arm (mode=15; range 8 to 87). We were not able to pool trials due to substantial heterogeneity in the massage treatment, variations in multimodal treatment combinations and different control groups. We were also unable to carry out sensitivity analysis for symptom duration, methodological quality and disorder subtype because we did not have enough data in any one category of massage. However, effect sizes of individual trials are shown in the 'Characteristics of Included studies' table.

### 1. Massage alone versus control



We found no strong or moderate evidence of benefit for massage compared to a control for either pain or function.

**Pain:** Four trials compared massage to a control for pain. They showed limited evidence of no benefit for pain relief when compared to various forms of control.

#### *Nonsignificant Results*

- One session of ischemic compression (90 second hold) showed similar effect to an active control treatment of hot packs and active range-of-movement for chronic myofascial pain, measured immediately post treatment [SMD -0.54 (95%CI: -1.25 to 0.16)] (Hou 2002: B2 v B1).
- Five days of twice daily sessions of self-administered massage using a J-cane tool for MND of unknown duration showed similar effect to a range-of-motion control at short-term follow-up [SMD -0.61 (-1.24 to 0.03)] (Hanten 2000). Note: the paper reported significant findings favouring the massage group; these were not replicated in our analysis.
- Five sessions of conventional Western massage for subacute and chronic MND were not significantly different from a sham laser group, when measured immediately post treatment [SMD -0.01 (95%CI: -0.38 to 0.36)] (Irnich 2001: M v S).
- One session of occipital release for mechanical neck disorder (duration disorder not reported) showed similar effects to a no treatment control [SMD -0.07 (95%CI: -0.69 to 0.58)] (Hanten 1997: 1 v 3).

**Function:** One trial (Cen 2003: A v C) assessed function and noted that Traditional Chinese Massage was significantly better than a no treatment control for chronic MND, measured by the Nordwick Park Pain Questionnaire [SMD (A v C):-1.75, 95%CI: -2.82 to -0.68 ]. The treatment duration was for 18 sessions over six weeks.

## **2. Massage alone versus comparison treatment**

**Pain:** Three trials had arms comparing massage alone to other treatment. Results were conflicting.

- Massage versus acupuncture showed a significant benefit immediately after treatment favouring acupuncture, but no significant difference at three months, for subacute/chronic pain (Irnich 2001: M v A).
- A trial of massage versus exercise showed no significant difference between the groups for pain at short-term followup (Hanten 1997: 1 V 2).
- One trial showed no significant difference between massage plus sham laser and manipulation at short-term follow-up (Nilsson 1997). Note: The paper reported significant findings favouring the manipulation group; these were not replicated in our analysis. The review team felt that since the sham laser was inert, the massage was essentially a stand-alone treatment in this case.

**Function:** One trial of massage versus exercise showed nonsignificant results in favour of massage for functional improvement immediately post treatment (Cen 2003: A v B). Note: The paper reported significant findings favouring massage; these were not replicated in our analysis.

## **3. Multimodal treatment versus control**

When massage was used as part of a multimodal approach, we were unable to determine its additive, subtractive or individual effect. We recognize that massage may be combined with other treatments in clinical practice, but such trials are of limited value unless some treatment combination can be observed to be of benefit. Although we present the results related to treatment combinations, we did not find a combinable trend. We did note there was no uniform definition and often there was no definition of the massage technique or related dosage. The limited clinical applicability of such trials was one of our biggest concerns.

### **3a. Multimodal treatment: Massage plus electrotherapy plus other treatment versus control**

**Pain:** Two trials yielding three relevant comparisons assessed pain. Results of two were significant and one was not significant.

#### *Significant findings*

- Massage with transcutaneous electrical nerve stimulation (TENS) was significantly better than an active control treatment of hot packs and active range-of-motion exercises. Both groups received the active control. The treatment for myofascial neck pain was applied over one session and measured immediately post treatment [SMD -1.07 (95%CI: -1.91 to -0.24)] (Hou 2002: B3 v B1). The duration of the disorder was not specified.
- Massage with interferential current was significantly better than an active treatment control for myofascial neck pain, given over one session and measured immediately post treatment [SMD -1.20 (95%CI: -2.05 to -0.36)] (Hou 2002: B6 v B1).

#### *Nonsignificant findings*

- Nine sessions over three weeks of massage, manual traction, mobilization, heat, education and analgesic were not significantly better than analgesics alone for chronic mechanical neck disorder with or without radicular findings or degenerative changes at short-term follow-up (Brodin 1985: 3 v 1). Note: The paper reported significant findings favouring group 3; these were not replicated in our analysis.

**Function:** Neither of these trials reported functional outcomes.

### **3b. Multimodal treatment: Massage plus exercise plus other treatment versus control**

**Pain:** Six trials yielding seven relevant comparisons used a treatment intervention of massage plus exercise plus other treatments. Of these, four comparisons showed significant results favouring the treatment group, and three showed nonsignificant results.

### *Significant results*

- Massage (transverse friction on trigger points followed by myofascial technique) with exercise and ultrasound was significantly better than a no treatment control for chronic mechanical neck disorder (Gam 1998: a v c). These eight sessions over four weeks were assessed for an intermediate follow-up period.
- Massage with exercise, mobilization, relaxation, analgesic and education was significantly better than a wait list control for subacute mechanical neck disorder with or without headache (Karlberg 1996). A median of 13 sessions were given over nine weeks; pain was measured immediately following the treatment period.
- Massage with exercise and traction was significantly better than a no treatment control for acute MND with or without headache. Ten sessions of massage were given over five weeks; pain was measured immediately following this treatment period (Fialka 1989: 3 v 4).
- Lymph drainage / muscle function massage with exercise and hot packs was significantly better than an active control of soft collar, non steroidal anti-inflammatories and Ranitidin for acute WAD and NDH (Schnabel 2002). The treatment occurred over two weeks and the outcome was measured at short-term (four weeks) follow-up.

### *Nonsignificant results*

- Massage (transverse friction on trigger points followed by myofascial technique) with exercise and sham ultrasound was not significantly different than a no treatment control for chronic mechanical neck disorder [SMD -0.27 (95%CI:-0.90 to 0.35)] (Gam 1998: b v c). Results from these eight sessions over four weeks of care were followed up for six months. The power of this trial was small (6%).
- Massage with exercise, heat and electrotherapy (ultrasound, short-wave diathermy) was not significantly different than a placebo (detuned ultrasound and short-wave diathermy) for subacute and chronic mechanical neck disorder (Koes 1992: PT v pl). The outcomes were measured in both the short and long term.
- Massage with exercises, mobilization, education and analgesics was significantly better than mock therapy [massage, manual traction, electrical stimulation], education and analgesics for chronic mechanical neck disorder with or without radicular and degenerative findings. Pain intensity was measured after nine weeks of treatment (Brodin 1985: 3 v 2).

**Function:** Three trials yielding four relevant comparisons assessed functional outcomes. One significantly favoured the treatment group (Schnabel 2002); three showed no significant difference (Gam 1998 a v b; Gam 1998: a v c; Koes 1992).

### **3c. Multimodal treatment: Massage plus manipulation versus control or other treatment**

**Pain:** Two trials (Kogstad 1978; Reginiussen 2000) used a treatment group of massage plus manipulation. Both reported significant results favouring treatment immediately after treatment.

- Massage with manipulation was significantly better than exercise and diathermy, both immediately post-treatment and at three months' follow-up (Reginiussen 2000).
- Massage with manipulation was significantly better than placebo tablets immediately post-treatment, but not at 18 months' follow-up (Kogstad 1978).

**Function:** One trial (Reginiussen 2000) assessed function and reported significantly better function in the treatment group immediately post-intervention, but not at three months.

### **3d. Multimodal treatment: Massage plus other treatments versus other treatments**

Various multimodal treatments that incorporated massage were compared to other multimodal treatments. It was impossible to determine the independent role of massage in these treatment combinations. There were seven trials yielding 12 relevant 'other-treatment' comparisons.

**Pain:** All seven trials documented pain outcomes. Two comparisons significantly favoured the multimodal massage group; nine showed no significant between-groups difference; and one favoured the other group.

### *Significant results*

Two comparisons favoured the multimodal massage group for acute or subacute mechanical neck disorder or both:

- Massage with mobilization, eye fixation exercises, education on home exercise, relaxation or psychological support was significantly better than ultrasound, TENS, or pulsed electromagnetic therapy at intermediate follow-up (Provinciali 1996)
- Massage with exercise and traction was significantly better than Iontophoresis for pain immediately post treatment (Fialka 1989: 3 v 2)

### *Nonsignificant results*

Nine comparisons showed no significant difference between the two groups for subacute or chronic pain:

- Massage with mobilization, manual traction, heat ultrasound and proprioceptive neuromuscular facilitation (PT) showed no significant difference from chiropractic manipulation (CH) or intensive exercise (Int) at either immediate or long-term follow-up (Jordan 1998:PT v Int; Jordan1998: PT v CH).
- Massage, manual traction, exercise, interferential and heat (PT) was not significantly different than visits to the general practitioner (GP) (Hoving 2002: PT v GP).

- Massage with exercise and traction was not significantly better than inferential current for pain immediately post treatment (Fialka 1989: 3 v 1)
- Massage and munaripack versus direct galvanic current, ultrasound and ultraviolet light were not significantly different for pain when measured at immediate follow-up (Ammer 1990: 3 v 2).
- Massage and munaripack versus manipulation and pulsed galvanic current were not significantly different for pain when measured at immediate follow-up (Ammer 1990: 3 v 1)
- Massage with passive exercise for MND was not significantly better than an active exercise group for either short- or long-term follow-up. However, the active exercise group was significantly better in reducing head pain in the short term, but not the long term (Levoska 1993).
- Massage in a multimodal combination compared to mobilization/manipulation (MT) or general practitioner visits (GP) was not significantly different for pain in the short and long term (Koes 1992: PT v MT; Koes 1992: PT v GP).

#### *Significant results favouring the other treatment*

Massage, manual traction, exercise, interferential and heat (PT) compared to manipulation and mobilization (MT) showed results significantly favouring MT at long-term follow-up (Hoving 2002: PT v MT).

**Function:** Four trials yielding seven relevant comparisons documented functional outcomes. Of these, one (Provinciali 1996) showed significantly less return-to-work time for the treatment group; the majority (six comparisons) (Hoving 2002: PT v GP; Hoving 2002: PT v MT; Jordan 1998: PT v Int; Jordan 1998: PT v CH; Koes 1992: PT v GP; Koes 1992: PT v MT) showed no significant difference between groups.

#### **Adverse events and cost of care**

We noted that only three of the 19 studies reported side effects (Brodin 1985; Hoving 2002; Irnich 2001). The side effects were short lived and benign, mostly pertaining to transient discomfort after treatment.

One study assessed cost of care (Hoving 2002). This trial compared physical therapy modalities of massage, manual traction, exercise, interferential and heat (PT) to mobilization and stabilization techniques (MT). There was no significant difference between the PT and MT groups for total costs or total indirect costs. However, there was a significantly less total direct costs for the MT group.

## **DISCUSSION**

Although there has been a marked increase in the number of publications that incorporate massage since our last review (Gross

1996), the contribution of massage to managing cervical pain remains unclear. Our paper did not find strong or moderate level of evidence for massage alone relative to a control. Our findings are similar to the Cochrane review on conservative treatments for whiplash, which also found a predominance of low-quality, underpowered trials leading to their conclusion that “no firm conclusions could be drawn” (Verhagen 2004).

Six studies in our review assessed massage as a single treatment; however, each study used a different form of “massage” (e.g., Traditional Chinese massage, ischemic compression, self-administered ischemic pressure using a J-knob cane, conventional Western massage and occipital release). It is likely that the various techniques labeled as massage made it difficult to find any statistically unique effect of massage. Moreover, of the trials with nonsignificant findings, two gave only one treatment (Hanten 1997; Hou 2002), and one only assessed a self-administered massage (Hanten 2000), practices that are likely to be considered sub-optimal in the clinical setting. It is also likely that the small sample sizes (median 20 per arm) and the inability to pool data made it difficult to find any statistically significant effect.

Our review also did not find a strong or moderate level of evidence for or against massage in studies that combined massage with other modalities. Several difficulties undermined our understanding of the contribution of massage to the overall effect. Primarily, the designs were not such that the relative contribution of massage could be ascertained from other therapies with which it was combined. Factorial designs would be needed to tease out the contribution of massage from other therapies, and these were not done. For example, two commonly used neck-pain modalities are deep tissue massage and manipulation. A 2x2 factorial design randomizing first to massage or no treatment, and then randomizing each of those groups to manipulation or no treatment would yield a study that allows comparison of four experimental situations: no treatment, massage alone, manipulation alone and the two treatments combined. In the absence of factorial designs, we aimed to find a superior multimodal treatment in general, but no such trend emerged.

Moreover, most studies lacked a definition, description, or rationale for massage as a treatment or the massage technique selected. There are numerous massage techniques and these techniques can have different physiological effects. A massage taxonomy with standardized vocabulary, definitions and mechanisms of action of various massage approaches would greatly assist researchers in selecting appropriate techniques and interpreting the results of massage studies.

In addition to massage technique, researchers need to establish optimal parameters for the other components of the massage treatment, including: frequency (number of MT sessions per week), duration (length of time of each massage session) and dosage (depth/pressure and duration of application of depth). Pilot studies of massage to establish an optimal, or at least adequate treatment,

should be conducted prior to doing a larger trial. These pilot studies would serve a purpose similar to the small dose-finding studies conducted in pharmaceutical trials that are used to establish a minimally effective dose.

Some of the treatment components may affect pain outcomes as suggested in the meta-analysis by Moyer and colleagues (Moyer 2004). When assessing the total number of treatments, the authors reported no effect on pain immediately after a single massage, but a significant pain reduction days to weeks after multiple massages. They found no significant trend for duration of a session, but emphasize that in massage for pain relief, neither the optimal frequency, optimal duration of session, nor the “decay” time in analgesic effect is known.

The massage treatment components need to be reported in the manuscript in a transparent, standardized way. We note that many of the trials in this review did not report sufficient details on the massage characteristics to permit replication. Reporting conventions such as those proposed in the CONSORT statement (Altman 2001) for clinical trials generally, or the STRICTA statement (MacPherson 2002) for clinical trials of acupuncture specifically, are needed for massage trials to address the reporting and methodological issues that are inherent to the design of massage trials.

We also note lack of reporting on the qualifications or experience of those performing the massage. This may reflect the lack of consideration given to this issue. Individuals who do massage range from those with no formal training to those with doctoral degrees in massage therapy. Potential variability in outcomes may be associated with the level of experience or training of those who performed the massage. Future trials need to provide justification for the therapist(s) selected to perform the intervention. To ensure the competence of the massage professional(s), investigators in recent studies have set minimal credential and experience criteria and even conducted a working interview (Eisenberg 2002).

The majority of trials did not report adverse events. From the trials reporting them, adverse effects of massage appear to be minimal and transient. It was not clear from the reports whether adverse effects had not been measured or had been measured but none occurred. In order to achieve a balanced discussion between efficacy and harm, trials need to document all adverse events in a standardized format and, equally important, to document if none occur.

In our review, no trials met the criteria of double-blinding (blinded patients and care providers). This is because in massage studies, blinding patients can be difficult and blinding care providers is impossible. Therefore, other design features must attempt to compensate for the lack of blinding. Treatments need to be equally credible and acceptable to patients to minimize placebo effects and high dropout rates. It is also important to collect and report information on patients' previous experience with massage, or their expectations of massage, in order to assess the impact of expecta-

tations. Finally, although it is difficult to blind the patients and therapists, the outcome assessor can and always should be blinded.

The outcome measures in the studies described in our review were diverse and several were not validated. The use of reliable and valid outcome measures is essential in order to reduce bias, provide precise measures and allow for comparisons across trials. Disability-oriented outcomes such as 'return-to-work', 'activities of daily living' and 'function' were rarely reported. We suggest these be included in future studies.

Our approach to summarizing the literature has several strengths. We conducted a comprehensive, librarian-assisted search of multiple databases. A minimum of two people extracted data, while the principal investigator verified data entry. In addition, to minimize bias, we used a group consensus approach coupled with the Sackett (Sackett 2000) and van Tulder (van Tulder 2003) hierarchy on the strength of the evidence.

The weakness of this paper rests with limitations of the primary studies. We were unable to make any firm statements about the strength of the evidence due to four major limitations of the studies: (a) the number of studies that were of low methodological quality; (b) the majority of studies used massage as one component in a multimodal treatment but failed to use a research design such as a factorial design that could ascertain the relative contribution of massage; (c) no study provided pilot data justifying the minimal effective 'amount' of massage (frequency, duration, dose, technique), thus there is little information on what constitutes a beneficial amount of massage and (d) many studies were underpowered but could not be pooled due to heterogeneous populations, massage techniques, treatment combinations and control groups.

## AUTHORS' CONCLUSIONS

### Implications for practice

Due to the limitations of existing studies, we are unable to make any firm statement to guide clinical practice.

### Implications for research

For trials using massage as either a stand-alone treatment or part of a multimodal intervention, pilot studies of various massage treatments are needed to ascertain an optimal massage treatment (frequency, duration, number of sessions and massage technique), which can then be used in a subsequent larger trial. For multimodal interventions, factorial designs are needed to determine the relative contribution of massage. Adverse events in massage trials should be assessed and consistently reported. Future trials should improve reporting of the concealment of allocation, blinding of outcome assessor and participant, adverse events or lack of such events and massage characteristics. Standards of reporting for massage interventions similar to CONSORT are needed. Both short-

and long-term follow-up are needed. Future meta-analyses need to consider prognostic factors (for example: psychological factors, central sensitization) during sensitivity analysis. For this to occur, trials need to assess these items during the conduct of the trial.

## POTENTIAL CONFLICT OF INTEREST

None

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\* Indicates the major publication for the study

**T A B L E S****Characteristics of included studies**

<b>Study</b>	<b>Ammer 1990</b>
Methods	RCT Number Analyzed/Randomized: 45/45 Power Analysis: NR Intention-to-treat Analysis: NR
Participants	Acute/subacute/ chronic NDH
Interventions	INDEX TREATMENT: G3: Massage, munaripack [mustard paste, cayenne pepper & kaolinerde combined in water]  COMPARISON TREATMENT: G2: ultrasound, direct galvanic current, ultraviolet light G1: manipulation, pulsed galvanic current  Treatment Schedule: 2 weeks, 10 sessions total Duration of Follow-up: Immediate
Outcomes	PAIN INTENSITY (5-point scale) Baseline Median: G1 3, G2 3, G3 3 Reported Results: Not significant, no P value reported, alpha set equal to 0.01  PATIENT PERCEIVED EFFECT (5-point scale) Baseline: NR Reported Results: NR  SIDE EFFECT: NR COST OF CARE: NR
Notes	

## Characteristics of included studies (Continued)

Allocation concealment B – Unclear

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### Study Ammer 1990: 3 v 1

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Methods See Ammer 1990

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Participants

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Interventions

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Outcomes

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Notes

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Allocation concealment B – Unclear

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### Study Ammer 1990: 3 v 2

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Methods See Ammer 1990

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Participants

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Interventions

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Outcomes

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Notes

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Allocation concealment B – Unclear

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### Study Brodin 1985

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Methods RCT  
Number Analyzed/Randomized: 63/71  
Intention-to-treat Analysis: NR  
Power Analysis: NR

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Participants Chronic mechanical neck disorder with 25% having radicular findings or lower cervical degenerative changes

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Interventions INDEX TREATMENT:  
G3: Massage, superficial heat, mobilization, manual traction, education (cervical school), analgesics  
COMPARISON TREATMENT:  
G2: Mock therapy (massage, manual traction, electrical stimulation), education (cervical school), analgesics  
G1: Analgesics  
Treatment Schedule: 3 weeks, 9 total sessions  
Duration of Follow-up: 1 week

---

Outcomes PAIN INTENSITY (9-point scale transformed to dichotomous outcomes)  
Reported Results: Significant favoring G3v1; G3v2  
Calculated Results:RR (G3v1): 0.44 (95%CI: 0.16 to 1.24); RR (G3v2): 0.42 (95%CI: 0.15 to 1.21)  
SIDE EFFECTS: 10 patients from G1; mock therapy (G2) reported slight discomfort  
REASON FOR DROPOUT: acute abdominal pain (n = 1); acute cerebral (?) disease (n = 1); vacation and infection (n = 1); acute pain in several joints (n = 1); incapable of following planned treatment (n = 4)  
COST OF CARE: NR

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Notes

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Allocation concealment B – Unclear

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### Study Brodin 1985: 2 v 1

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Methods See Brodin 1985

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Participants

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Interventions

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Message for mechanical neck disorders (Review)

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## Characteristics of included studies (Continued)

Outcomes

Notes

Allocation concealment B – Unclear

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### Study **Brodin 1985: 3 v 1**

Methods see Brodin 1985

Participants

Interventions

Outcomes

Notes

Allocation concealment B – Unclear

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### Study **Brodin 1985: 3 v 2**

Methods See Brodin 1985

Participants

Interventions

Outcomes

Notes

Allocation concealment B – Unclear

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### Study **Cen 2003**

Methods RCT cross-over (1st period data used)  
Number Analyzed/Randomized: 28/31  
Intention-to-treat Analysis: NR  
Power Analysis: NR

Participants Chronic MND

Interventions INDEX TREATMENT:  
Group A: Traditional Chinese Therapeutic Massage using the following two techniques: One finger mediation massage that uses tip and/or whole surface of thumb, Rolling massage uses the fifth metocarpalphalangeal joint and hypothenar eminence, both use swinging back and forth motion 120 times per minute; 30 minutes duration 3 times a week for 6 weeks.  
  
COMPARISON TREATMENT:  
Group C: No treatment control  
Group B: Therapeutic exercise program; specific stretching (head tilt, trapezius stretch, neck flexion, shoulders and neck rolls) for 10 minutes directed by physician with weekly follow up for 6 weeks.  
  
Treatment Schedule: Group A = 6 weeks, 18 total sessions; Group B = 1 initial visit, 5 telephone follow ups; Duration of Follow-up: Immediate

Outcomes FUNCTION (Northwick Park Pain Questionnaire; score 0 to 100):  
Baseline Mean: A 32.4, B 27.8, C 31.5  
Reported Results: significant difference favors group A v B, A v C  
Calculated Results:  
SMD (AvC): -1.75 (95%CI -2.82 to -0.68)\*  
SMD (AvB): -0.55 (95%CI random: -1.53 to 0.42)  
  
ADVERSE EVENT: NR  
COST OF CARE: NR

Notes

## Characteristics of included studies (Continued)

Allocation concealment B – Unclear

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### Study Cen 2003: A v B

Methods See Cen 2003

Participants

Interventions

Outcomes

Notes

Allocation concealment B – Unclear

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### Study Cen 2003: A v C

Methods See Cen 2003

Participants

Interventions

Outcomes

Notes

Allocation concealment B – Unclear

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### Study Fialka 1989

Methods RCT  
Number Analyzed/Randomized: 60/ 60  
Intention-to-treat Analysis: NR  
Power Analysis: NR

Participants Acute MND and NDH

Interventions INDEX TREATMENT  
Group 3: Combined therapy of traction, therapeutic exercises, massage [THGM].  
  
COMPARISON TREATMENT  
Group 1: Stereodynamic interferential current with 2 electrodes on the neck and another 2 on thoracic spine, 15 minute treatment duration  
  
Group 2: Iantophoresis of 20 minute duration  
  
Group 4: Control group, no treatment  
  
CO-INTERVENTION: NR  
  
Duration of Treatment: 2 times a week for 5 weeks  
Duration of follow-up: Immediate

Outcomes PAIN:  
Neck pain and headache (present or absent)  
Number experiencing outcome (out of 15):  
Headache: Group 3=5, Group 1=8, Group 2=5, Group 4=7.  
Neck pain: Group 3=3, Group 1 8, Group 2=9, Group 4=9.  
  
Reported Results: Not clear  
  
Calculated Results:  
RR (3 v 4): 0.33(95% CI:0.11, 0.99)\*  
RR (3v1): 0.22 (95% CI 0.04 to 1.11)  
RR (3v2) 0.17(95% CI: 0.03 to 0.85)\*

**Characteristics of included studies (Continued)**

ADVERSE EVENT: NR

COST OF CARE: NR

Notes

Allocation concealment B – Unclear

**Study Fialka 1989: 3 v 1**

Methods See Fialka 1989

Participants

Interventions

Outcomes

Notes

Allocation concealment D – Not used

**Study Fialka 1989: 3 v 2**

Methods See Fialka 1989

Participants

Interventions

Outcomes

Notes

Allocation concealment D – Not used

**Study Fialka 1989: 3 v 4**

Methods See Fialka 1989

Participants

Interventions

Outcomes

Notes

Allocation concealment D – Not used

**Study Gam 1998**

Methods RCT  
 Number Analyzed/Randomized:58/67  
 Intention to Treat Analysis: NR  
 Power Analysis: 10%

Participants Chronic MND

Interventions INDEX TREATMENT  
 Group A: Ultrasound to a maximum of 5 most tender trigger points, massage (transverse friction on the MTtP followed by myofascial technique applied on involved muscle groups, maximal duration 10 min.), exercise  
 Group B: Sham ultrasound, massage (same as Group A), exercise (same as Group A)  
 COMPARISON TREATMENT  
 Group C: Control group, no treatment  
 CO-INTERVENTION: Medication (as per three months prior)  
 Treatment Schedule: 4 weeks, 8 total sessions  
 Duration of Follow-up: 6 months

## Characteristics of included studies (Continued)

Outcomes                    PAIN AT REST (VAS 10 cm):  
Baseline Median: Group A 2.6, Group B 3.7, Group C 2.4

Reported Results: Not significant  
Calculated Results:

SMD (Ga v Gc): -0.75 (95% CI random: -1.4 to -0.10)\*  
SMD (Gb v Gc): -0.27 (95% CI random: -0.90, to 0.35) (power 6%)

PAIN ON FUNCTION (VAS 0-10 cm)  
Baseline Median: Group A 5.4, Group B 4.5, Group C 4.5

Reported Results:  
No significant differences were found between groups at any time

Calculated Results:  
SMD (Ga v Gc): -0.07 (95% CI random: -0.69 to 0.56)  
SMD (Gb v Gc): -0.00 (95% CI random: -0.62 to 0.62)

ADVERSE EVENT: NR  
COST OF CARE: NR

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### Notes

Allocation concealment    B – Unclear

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### Study                            Gam 1998 a V b

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Methods                      See Gam 1998

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Participants

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Interventions

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Outcomes

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Notes

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Allocation concealment    D – Not used

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### Study                            Gam 1998: a V c

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Methods                      See Gam 1998

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Participants

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Interventions

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Outcomes

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Notes

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Allocation concealment    B – Unclear

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### Study                            Gam 1998: b V c

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Methods                      See Gam 1998

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Participants

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Interventions

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Outcomes

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Notes

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Allocation concealment    B – Unclear

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### Study                            Hanten 1997

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Methods                      RCT  
Number Analyzed/Randomized:60/60  
Intention to Treat Analysis: NR

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## Characteristics of included studies (Continued)

	Power Analysis: NR
Participants	MND of unknown duration
Interventions	<p>INDEX TREATMENT</p> <p>Group 1 : Occipital release, patient in supine with patients head in examiner's hands, fingers extending upward, maintaining a slight amount of traction.</p> <p>COMPARISON TREATMENT</p> <p>Group 2: Active head retraction in sitting 10 repetitions, followed by retraction/extension for a total of five sets (McKenzie neck protocol).</p> <p>Group 3: Control group, no treatment</p> <p>Treatment Schedule: 1 session</p> <p>Duration of Follow-up: Immediate</p>
Outcomes	<p>PAIN PRESSURE THRESHOLD</p> <p>Baseline Mean (SD): Group 1 2.1 (1.0), Group 2 2.2 (1.0), Group 3 2.2 (1.2)</p> <p>Reported Results: There was no significant difference between the treatment groups and the control group (P&gt;0.05)</p> <p>Calculated Results:</p> <p>SMD (1v3): -0.07 (95%CI random: -0.69 to 0.55)</p> <p>SMD (1v2): -0.24 (95%CI random: -0.87 to 0.38)</p> <p>ADVERSE EVENT: NR</p> <p>COST OF CARE: NR</p>

### Notes

Allocation concealment B – Unclear

### Study Hanten 1997: 1 V 2

Methods See Hanten 1997

Participants

Interventions

Outcomes

Notes

Allocation concealment B – Unclear

### Study Hanten 1997: 1 V 3

Methods See Hanten 1997

Participants

Interventions

Outcomes

Notes

Allocation concealment B – Unclear

### Study Hanten 2000

Methods RCT

Number Analyzed/Randomized: 40/40

Intention to Treat Analysis: NA

Power Analysis: NR

Participants MND of unknown duration without radicular symptoms



### Characteristics of included studies (Continued)

Interventions	<p>INDEX TREATMENT Group 1: Self -ischemic compressions with a hand-held J shaped tool (sustained pressure until subject felt a release), sustained stretches to cervical spine and upper back muscles (30-60 seconds)</p> <p>COMPARISON TREATMENT Group 2: Active neck movements (flexion, lateral flexion, rotation) repeated 10 times, 2 times a day for 5 days Treatment schedule: 5 days Duration of follow-up: 3 days</p> <p>Duration of treatment: 5 days Duration of follow-up: 8 days</p>
Outcomes	<p>PAIN (VAS 100 mm, average over 24 hours) Baseline Median: Group 1 15.3 Group 2 19.1</p> <p>Reported Results: Favoring Group 1 (ANCOVA P=0.043)</p> <p>Calculated Results: SMD: -0.61 (95%CI random: -1.24 to 0.03)</p> <p>ADVERSE EVENT: NR COST OF CARE: NR</p>
Notes	
Allocation concealment	B – Unclear

### Study Hou 2002

Methods	<p>RCT Number Analyzed/Randomized: 19/19 Intention to Treat Analysis: NR Power Analysis: calculated?</p>
Participants	MND of unknown duration
Interventions	<p>INDEX TREATMENT B2: Ischemic compression (90 seconds sustained pressure), hot pack, active range of motion exercise. B3: Ischemic compression (90 seconds sustained pressure), TENS, hot pack, active range of motion. B6: Interferential current (100 hz for 20 minutes), myofascial release technique (unilateral stretch and traction of shoulder), hot pack, active range of motion.</p> <p>COMPARISON TREATMENT B1: Hot pack, active range of motion</p> <p>Treatment schedule: 1 session Duration of follow-up: Immediate</p>
Outcomes	<p>PAIN (VAS 100 mm) Baseline Mean (SD): B1 5.10 (1.78), B2 4.94 (1.93), B3 4.69 (2.24), B6 5.68(1.34)</p> <p>Reported Results: No significant difference (P&gt;0.05)</p> <p>Calculated Results: SMD (B2vB1): -0.54 (95%CI -1.25 to 0.16) SMD (B3vB1): -1.07 (95%CI -1.91 to -0.24) SMD (B6vB1): -1.20 (95%CI -2.05 to -0.36)</p> <p>ADVERSE EVENT: NR COST OF CARE: NR</p>
Notes	
Allocation concealment	B – Unclear

### Characteristics of included studies (Continued)

<b>Study</b>	<b>Hou 2002: B2 v B1</b>
Methods	See Hou 2002
Participants	
Interventions	
Outcomes	
Notes	
Allocation concealment	B – Unclear

<b>Study</b>	<b>Hou 2002: B2 v B3</b>
Methods	See Hou 2002
Participants	
Interventions	
Outcomes	
Notes	
Allocation concealment	B – Unclear

<b>Study</b>	<b>Hou 2002: B3 v B1</b>
Methods	See Hou 2002
Participants	
Interventions	
Outcomes	
Notes	
Allocation concealment	B – Unclear

<b>Study</b>	<b>Hou 2002: B6 v B1</b>
Methods	See Hou 2002
Participants	
Interventions	
Outcomes	
Notes	
Allocation concealment	B – Unclear

<b>Study</b>	<b>Hou 2002: B6 v B2</b>
Methods	See Hou 2002
Participants	
Interventions	
Outcomes	
Notes	
Allocation concealment	B – Unclear

<b>Study</b>	<b>Hoving 2002</b>
Methods	RCT Number Analysed/Randomised: 178/183 Intention-to-treat Analysis: conducted Power Analysis: conducted

## Characteristics of included studies (Continued)

Participants	Acute, subacute, chronic MND with and without radicular findings, NDH
Interventions	<p>INDEX TREATMENT</p> <p>Physical Therapy (PT): active exercise therapies: strengthening, stretching (ROM), postural/ relaxation/ functional exercise; optional modalities: manual traction, massage, interferential, heat; excluded specific mobilisations techniques, median 9 (IQR 7-12) sessions</p> <p>COMPARISON TREATMENTS</p> <p>Manual Therapy (MT): muscular and articular mobilisation techniques, coordination and stabilization techniques; low velocity passive movements within or at the limit of joint range; excluded manipulation; 45 minute sessions, one session per week for a maximum of 6 sessions [median 6 (IQR 5-6)]</p> <p>Continued Care by General Practitioner (GP): advice on prognosis, psychosocial issues, self care (heat, home exercise), ergonomics (pillow, work position), await further recovery; booklet (ergonomics, home exercise); medication: paracetamol, NSAID; 10 minute follow-up every 2 weeks was optional; excluded referral for other treatment, median 2 (IQR 1-4) treatments</p> <p>CO-INTERVENTION: analgesics and antiinflammatories allowed in both groups, home exercise for all three groups</p> <p>Duration of Treatment: 6 weeks, 6 total sessions</p> <p>Duration of Follow-up: 1 year</p>
Outcomes	<p>PAIN (NRS, 0-10)</p> <p>Baseline Mean: MT 5.9, PT 5.7, GP 6.3</p> <p>Reported Results: significant favoring MT over PT</p> <p>Calculated Results:</p> <p>SMD (PT v MT): 0.41(95%CI:0.04 to 0.78)**</p> <p>SMD (PT v GP): 0.34 (95%CI:-0.02 to 0.70) (power 96%)</p> <p>FUNCTION (Neck Disability Index, 0-50)</p> <p>Reported Results: Significant favoring MT over PT</p> <p>Calculated Results:</p> <p>SMD (PT v MT): 0.12 (95% CI:-0.25 to 0.48) (power 17%)</p> <p>SMD (PT v GP): 0.28 (95% CI:-0.08 to 0.64)</p> <p>GLOBAL PERCEIVED EFFECT (perceived recovery, %)</p> <p>Reported Results: Significant favoring MT over PT</p> <p>Calculated Results:</p> <p>RR (PT v MT): 1.32 (95% CI:0.78 to 2.22) (power 14%)</p> <p>RR (PT v GP): 0.85 (95% CI:0.55 to 1.31) (power 21%)</p> <p>ADVERSE EVENTS: Benign and transient</p> <p>Calculated Results:</p> <p>Increased neck pain &gt; 2 days</p> <p>RR(MT v PT): 2.70(95%CI: 0.91 to 8.01)</p> <p>RR(PT v GP): 1.45(95%CI: 0.34 to 6.19)</p> <p>Increased headache</p> <p>RR(MT v PT): 0.88(95%CI: 0.51 to 1.52)</p> <p>RR(PT v GP): 1.87(95%CI: 0.98 to 3.60)</p> <p>Arm pain/pins &amp; needles</p> <p>RR(MT v PT): 0.87(95%CI: 0.36 to 2.11)</p> <p>RR(PT v GP): 2.44(95%CI: 0.79 to 7.51)</p> <p>Dizziness</p>

**Characteristics of included studies (Continued)**

RR(MT v PT): 0.84(95%CI: 0.30 to 2.36)  
 RR(PT v GP): 1.90(95%CI: 0.59 to 6.16)

COST OF CARE: Favors MT

Total costs  
 Results: Not significant  
 SMD(MT v PT): -0.34(95%CI:-0.70 to 0.02)  
 SMD(PT v GP):-0.02(95%CI:-0.38 to 0.33)

Total direct costs  
 Results: Significant favors MT v PT  
 SMD(MT v PT): -0.49(95%CI:-0.85 to -0.17)\*\*  
 SMD(PT v GP):0.21(95%CI:-0.15 to 0.56)

Total indirect costs  
 Results: Not significant  
 SMD(MT v PT): -0.28(95%CI:-0.64 to 0.08)  
 SMD(PT v GP):-0.07(95%CI:-0.43 to 0.28)

Duration off work  
 Results: Significant favor MT v GP

Calculated Results:  
 SMD(MT v PT): -0.29(95%CI:-0.71 to 0.12)  
 SMD(PT v GP):-0.10(95%CI:-0.51 to 0.32)

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Notes

Allocation concealment A – Adequate

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**Study Hoving 2002: PT v GP**

Methods See Hoving 2002

Participants

Interventions

Outcomes

Notes

Allocation concealment A – Adequate

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**Study Hoving 2002: PT v MT**

Methods See Hoving 2002

Participants

Interventions

Outcomes

Notes

Allocation concealment A – Adequate

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**Study Irnich 2001**

Methods RCT  
 Number Analyzed/Randomized: 165/177  
 Intention-to-treat Analysis: Conducted  
 Power Analysis: NR

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### Characteristics of included studies (Continued)

Participants	Subacute/chronic MND without radicular symptoms
Interventions	<p>INDEX TREATMENT:            Massage group [M]: Conventional Western massage [efflaurage, petrisage, friction, tapotment]</p> <p>COMPARISON TREATMENTS:            Acupuncture group [A]: Traditional Chinese approach [ear acupuncture and dry needling]            Sham laser group [S]: Laser pen that was inactivated by manufacturer Seirin International</p> <p>Treatment schedule: 30 minutes sessions, 3 times a week for total of 5 sessions            Duration of follow-up: Immediate, 3 months</p>
Outcomes	<p>PAIN (VAS; 100 mm)            Baseline Mean: Massage 54.71, Acupuncture 54.15, Sham laser acupuncture 57.15            Reported Results: Significant favoring acupuncture v massage group (P&lt;0.0052) (Dunnett's test) at one week post intervention; NS at 3 months</p> <p>Calculated Results:            SMD (M v S):-0.01(95%CI:-0.38 to 0.36)            SMD(M v A): 6.49 (95%CI:-3.42 to 16.40)</p> <p>ADVERSE EVENT: Slight pain or lowered blood pressure reported by 4 patients in massage group, 17 patients in the acupuncture group, 12 patients in sham acupuncture group.</p> <p>COST OF CARE: NR</p>
Notes	
Allocation concealment	B – Unclear

#### Study **Irnich 2001: M v A**

Methods	
Participants	
Interventions	
Outcomes	
Notes	
Allocation concealment	D – Not used

#### Study **Irnich 2001: M v S**

Methods	
Participants	
Interventions	
Outcomes	
Notes	
Allocation concealment	D – Not used

#### Study **Jordan 1998**

Methods	RCT Number Analyzed/Randomized: 102/119 Intention-to-treat Analysis: NR Power Analysis: NR
Participants	Chronic MND
Interventions	<p>INDEX TREATMENT:            Physiotherapy [PT] Group: massage, hot pack, continuous ultrasound, mobilisation [passive], manual traction, proprioceptive neuromuscular facilitation, education [neck school]</p> <p>Chiropractic [Chiro] Group: manipulation, manual traction, soft tissues treatments, education [neck school]</p>

## Characteristics of included studies (Continued)

### COMPARISON TREATMENTS:

Intensive training [Int] Group: group sessions, stationary bicycle, stretching, high tech strengthening, education [neck school]

### CO-INTERVENTION: NR

Treatment Schedule: 6 weeks, 12 sessions

Duration of Follow-up: 4 months, 1 year

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Outcomes	<p>PAIN (Three 11-point box scales): Baseline: NR Reported Results (PT v Int): not significant, P= 0.76 (PT v Chiro): not significant, P = 0.76</p> <p>Calculated Results: SMD(PT v CH):0.00(95%CI:-0.48 to 0.48) (power 11%) SMD(PT v INT):0.00(95%CI:-0.47 to 0.47) (power 11%)</p> <p>FUNCTION: (Self-report disability index, 30 point scale): Baseline: NR Reported Results: (PT v Int): Not significant, P= 0.66 (PT v Chiro): not significant, P= 0.66</p> <p>Calculated Results: SMD(PT v CH):0.00(95%CI:-0.48 to 0.48) (power 11%) SMD(PT v INT):-0.25(95%CI:-0.73 to 0.22) (power 18%)</p> <p>PATIENT PERCEIVED EFFECT (6-point scale):Baseline: NR Reported Results (PT v Int): not significant; (PT v Chiro): not significant, P= 0.66</p> <p>ADVERSE EVENT: Not reported for those analyzed; one patient in the manipulation group was excluded because one chiropractic treatment resulted in persistent acute pain.</p> <p>COST OF CARE: NR</p>
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### Notes

Allocation concealment A – Adequate

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### Study **Jordan 1998:PT v Int**

Methods See Jordan 1998

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Participants

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Interventions

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Outcomes

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Notes

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Allocation concealment A – Adequate

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### Study **Jordan1998: PT v CH**

Methods See Jordan 1998

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Participants

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Interventions

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Outcomes

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Notes

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Allocation concealment A – Adequate

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### Study **Karlberg 1996**

Methods RCT

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## Characteristics of included studies (Continued)

	Number Analyzed/Randomized: 17/17 Intention to Treat Analysis: N/R Power Analysis: N/R
Participants	disorder and neck disorder with headache , "recent onset", suspect "subacute"
Interventions	INDEX TREATMENT: Physiotherapy Treatment Group (G1): mobilization: passive and active, massage, exercises, relaxation, analgesics, education  COMPARISON TREATMENT: Delayed Treatment Group (G2): Wait period 8 weeks without treatment, then physiotherapy treatment  COINTERVENTION: NR  Treatment Schedule: Median 13 weeks (min 5, max 23) Follow-up: Immediate
Outcomes	PAIN (VAS; 100 mm) Baseline Mean (SD): G1 54 (23), G2 56 (15) Reported Results: Significant difference favoring G1 Calculated Results: SMD: -1.47 (95% CI -2.58 to -0.36) NNT: 2 Treatment Advantage: 40.8%  ADVERSE EVENT: NR COST OF CARE: NR
Notes	
Allocation concealment	B – Unclear

Study	Koes 1992
Methods	RCT Number Analyzed/Randomized: 58/64 Intention-to-treat Analysis: calculated Power Analysis: calculated, 50 subjects per group
Participants	Subacute and chronic MND
Interventions	INDEX TREATMENT Physiotherapy (PT): Massage, exercise, heat, electrotherapy  COMPARISON TREATMENT General practitioner (GP): Analgesics, non steroidal anti-inflammatory drugs, education (rest, exercise, modalities), mean single visit  Manual therapy (MT): Manipulation and mobilization: mean 5.4 (SD: 6) sessions over 8.9 (9) weeks  Placebo (PL): Detuned short-wave diathermy, detuned ultrasound 2 times per week for 6 weeks mean 11.1 (SD: 12) visits over 5.8 (6) weeks  Treatment Schedule: 9 weeks Duration of Follow-up: 3 weeks, 6 and 12 months (were not used due to significant loss of follow up and cross over)
Outcomes	SEVERITY OF MAIN COMPLAINT (10-point scale) Baseline Mean: PT 7.29; MT 7.15; GP 7.19; placebo 7.21 Reported Results: Not significant however SMD notes significant difference favors the placebo  Calculated Results:

### Characteristics of included studies (Continued)

SMD(PT v pl): 0.79(95%CI random: 0.04 to 1.53)\*\*  
SMD(PT v GP): 0.00(95%CI random:-0.70 to 0.69)  
SMD(PT v MT): 0.64(95%CI random:-0.08 to 1.35) (power 14%)

FUNCTION: (10-point scale),  
Baseline Mean: PT 5.61;MT 6.11; GP 5.29; placebo 5.71  
Reported Results: No significant difference between PT,GP, placebo

Calculated Results:  
SMD (PT v pl): 0.73 (95%CI random:-0.02 to 1.48) (power 7%)  
SMD (PT v GP): -0.16 (95%CI random:-1.86 To 0.55) (power 8%)  
SMD(PT v MT): 0.75(95%CI random: 0.00 to 1.50) (power 17%)

ADVERSE EVENT: NR  
COST OF CARE: NR

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Notes

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Allocation concealment A – Adequate

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#### Study **Koes 1992: PT v GP**

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Methods See Koes 1992

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Participants

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Interventions

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Outcomes

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Notes

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Allocation concealment A – Adequate

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#### Study **Koes 1992: PT v MT**

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Methods See Koes 1992

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Participants

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Interventions

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Outcomes

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Notes

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Allocation concealment A – Adequate

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#### Study **Koes 1992: PT v pl**

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Methods See Koes 1992

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Participants

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Interventions

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Outcomes

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Notes

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Allocation concealment A – Adequate

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#### Study **Kogstad 1978**

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Methods Quasi-RCT  
Number Analysed/Randomised: 50/50  
Intention-to-treat Analysis: NR  
Power Analysis: NR

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Participants MND of unknown duration with radicular symptoms

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### Characteristics of included studies (Continued)

Interventions	INDEX TREATMENT Manual Therapy Group (MT): Manipulation (described by Brodin), heat, soft tissue massage; 40-minute sessions, 2 sessions/week for 4 weeks  COMPARISON TREATMENT Conventional Therapy Group (CT): Heat, soft tissue massage, isometric exercises, home exercises and 15 minutes intermittent mechanical traction 60-minute sessions, 3 sessions/week for 5 weeks  Placebo Group (PL): Placebo tablets 3 times/day for 5 weeks  Treatment Schedule: 5 weeks, 8 sessions for MT; 12 sessions for CT  Duration of Follow-up: 18 months
Outcomes	GLOBAL PERCEIVED EFFECT (objective and subjective findings)  Reported Results: Not significant  Calculated Results: RR (MT v PL) 0.77(95%CI: 0.16 to 3.61) RR (MT v CT) 0.33(95%CI: 0.08 to 1.32)  ADVERSE EVENT: NR  COST OF CARE: NR

#### Notes

Allocation concealment B – Unclear

#### Study **Kogstad: CT v PL**

Methods See Kogstad 1978

Participants

Interventions

Outcomes

Notes

Allocation concealment B – Unclear

#### Study **Kogstad: MT v PL**

Methods See Kogstad 1978

Participants

Interventions

Outcomes

Notes

Allocation concealment B – Unclear

#### Study **Levoska 1993**

Methods RCT  
Number Analyzed/Randomized: 44/47  
Intention-to-treat Analysis: NR  
Power Analysis: NR

Participants MND of unknown duration

Interventions INDEX TREATMENT:  
Passive Exercise (PE) Group: Passive exercise (heat, massage/slight stretches, exercise)

COMPARISON TREATMENT:

## Characteristics of included studies (Continued)

	Active Exercise (AE) Group: Active exercise (strengthening low tech)
	Treatment Schedule: 5 weeks, 3 times per week (PE mean 10.9 visits; AE mean 13 visits)
	Duration of Follow-up: 1 year
Outcomes	PAIN (occurrence of pain symptoms) Baseline: NR  Reported Results: significant ( $P < 0.01$ ) favoring active exercise at short-term follow-up; not significant at 1 year.  Calculated Results: RR: 0.50 (95%CI 0.18 to 1.42) (power 15%)  ADVERSE EVENT: NR COST OF CARE: NR
Notes	Source of Reference: MEDLINE Publication Type: journal Peer Reviewed: yes Source of Funding: not specified Training of Primary Author: unknown Country: Scandinavia
Allocation concealment	B – Unclear

<b>Study</b>	<b>Nilsson 1997</b>
Methods	RCT Number Analyzed/Randomized: 53/54 Intention-to-treat Analysis: not applicable Power Analysis: yes
Participants	Chronic NDH
Interventions	INDEX TREATMENT Soft Tissue Group (ST): Massage, sham laser  COMPARISON TREATMENT Manipulation Group (manip): Frequency = 6 sessions over 3 weeks  Treatment Schedule: 3 weeks Follow-up: 1 week
Outcomes	HEADACHE INTENSITY per episode (VAS scale) Baseline Median: manipulation group 48, soft tissue group 37 Reported Results: Significant difference favors manipulation group  Calculated results: SMD: 0.45 (95%CI random: -0.10 to 0.99) (Power 95%)  ADVERSE EVENT: NR COST OF CARE: NR
Notes	
Allocation concealment	B – Unclear

<b>Study</b>	<b>Provinciali 1996</b>
Methods	RCT Number Analyzed/Randomized: 60/60 Intention-to-treat Analysis: NR Power Analysis: NR
Participants	Acute/subacute MND, WAD, NDH (63% Group A; 76% Group B), cervico-encephalic syndrome (fatigue, dizziness, poor concentration, disturbed accommodation and impaired adaptation to light intensity)
Interventions	INDEX TREATMENT:

**Characteristics of included studies (Continued)**

Group A: Mobilization (passive), massage, exercise (eye fixation), education (individualized : relaxation, postural exercise, psychological support)

COMPARISON TREATMENT:

Group B: Ultrasound, TENS, pulsed electromagnetic therapy

Treatment Schedule: 2 weeks, 10 one-hour total sessions

Duration of Follow-up: 6 months

Outcomes	<p>PAIN (VAS: 0 to 10): Baseline Median: A 6.8, B 7.4</p> <p>Reported Results: Not significant immediately post treatment; Significant at 6 months (<math>P &lt; 0.001</math>) (two-way Friedman test: time x treatment interaction) favoring group A</p> <p>Calculated Results: SMD -0.79 (95% CI -1.32, -0.26)* NNT: 6 favoring group A Treatment Advantage: 36.9% favoring group A</p> <p>FUNCTION: RETURN TO WORK (RTW) (time between injury and RTW: days): Baseline: NR Reported Results: Significant favoring group A Calculated Results: RR: -1.05 (95%CI random: -1.59 to -0.51)*</p> <p>SELF ASSESSMENT OF OUTCOME (ordinal scale: -3 to +3): Baseline Median: A 1, B 0 Reported Results: Not significant, <math>P &gt; 0.05</math> (two-way Friedman test)</p> <p>ADVERSE EVENT: NR COST OF CARE: NR</p>
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Notes

Allocation concealment B – Unclear

**Study Reginiussen 2000**

Methods	<p>RCT Number Analyzed/Randomized: ?/63 Intention-to-treat Analysis: NR Power Analysis: NR</p>
Participants	<p>NDH of unknown duration</p>
Interventions	<p>INDEX TREATMENT: Manual Therapy (MT): Mobilization, manipulation, soft tissue techniques, massage/stretch</p> <p>COMPARISON TREATMENT: Physiotherapy (PT): Exercise: stretches, shortwave diathermy</p> <p>Treatment Schedule: 3 weeks/6 total sessions Duration of Follow-up: 12 weeks</p>
Outcomes	<p>PAIN (headache and neck pain intensity) Baseline: NR Reported Results: Significant favoring MT immediately post treatment and at 3 months follow up Calculated Results: None</p> <p>FUNCTION (Neck Disability Index, 0-50) Baseline: NR Reported Results: Significant immediately post treatment. Not significant at 3 months follow up.</p>

## Characteristics of included studies (Continued)

Calculated Results: None

ADVERSE EVENT: NR

COST OF CARE: NR

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### Notes

Allocation concealment B – Unclear

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Study	Schnabel 2002
Methods	RCT Number Analyzed/Randomized: 124/168 Intention-to-treat Analysis: Calculated Power Analysis: Calculated
Participants	Acute WAD and NDH
Interventions	INDEX TREATMENT Physiotherapy: lymph drainage (10 min), hot pack (5 min), muscle function massage (10 min), exercises with and without Theraband (10 min) Soft collar: 2 days maximum and only as needed plus control  COMPARISON TREATMENT Standard therapy group: First 7 days. Soft collar by Ruthmer worn intentionally, Second seven days. Medication: Diclofenac 50 mg; Ranitidine 150  Treatment Schedule: 14 days Duration of Follow-up: 4 weeks
Outcomes	PAIN INTENSITY(NRS 0-10) Baseline Mean: Index 4.5, Control 4.75 Reported Results: Significant favoring PT  Calculated Results: SMD -0.51 (95% CI -0.84 to -0.18)*  FUNCTION: (NRS 0-10) Baseline Mean: Index 4.37, Control 4.76  Reported results: Significant (P<0.01) favoring PT Calculated Results: SMD -0.47 (95% CI -0.79 to -0.14)*  ADVERSE EVENT: NR COST OF CARE: NR

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### Notes

Allocation concealment D – Not used

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\* = significant favoring massage group

\*\* = significant favoring nonmassage group

RCT = Randomised controlled trial; CCT= controlled clinical trial; 95% CI = 95% Confidence Interval; WAD=whiplash-associated disorders; NDH= neck disorder with headache; MND=mechanical neck disorder; SMD=standardized mean difference; RR=relative risk; NR=Not reported; TENS = Transcutaneous electrical nerve stimulation; VAS = visual analog scale; Hz = hertz; IQR = interquartile range; NRS = numerical rating scale

Record of Personal Communications / Unpublished data:

- a) Allison 2001 provided an early manuscript and data clarification
- b) Brodin et al provided additional raw data to facilitate study selection and the calculation of effect measures.
- d) Coppieter 2001 provided two early manuscripts and raw data
- e) Hoving 2002 provided an early manuscript and clarification of data
- h) Koes 1992 provided additional raw data on the neck disorder subgroup to facilitate the calculation of effect measures.
- k) Irnich 2001 provided additional data on baseline measures and clarification on follow up.

## Characteristics of included studies (Continued)

### Characteristics of excluded studies

Coppieters 2000	1. Intervention: Main mode of therapy was cervical joint mobilization using neural tension positioning as secondary part of the treatment. No distinction was made between the two modalities in data.
Durianova 1977	1. Outcome: the outcome measure used was not clearly stated
Fitz-Ritson 1994	1. Population: unsure, sample not adequately described [query whiplash associated neck disorder]. 2. Intervention: No soft tissue therapy was used
Gurumoorthy 2000	1. Intervention: No soft tissue therapy used
Jahanshahi 1991	1. Population: no sample with neck disorder meeting inclusion criteria [torticollis]
Konig 2003	1. Outcome: Range of motion is not one of the included outcomes
Leboeuf 1987	1. Population: no sample with neck disorder meeting inclusion criteria [repetitive strain injury of upper limb]
Mezaki 1995	1. Design: unsure RCT 2. Population: no subjects with neck disorder meeting inclusion criteria [spasmodic torticollis]
Parkin-Smith 1997	1. Intervention: Unclear how many subjects received "non therapeutic pre manipulative soft tissue massage" for muscle spasm
Persson 2001	1. Intervention: Use of massage varied between patients in PT group
Schenk 1994	1. Population: no sample with neck disorder meeting inclusion criteria [normal cervical spine]
Skargren 1998	1. Intervention: Only 36% of PT group received massage
Vasseljen 1995	1. Intervention: No soft tissue therapy used
Zylbergold 1985	1. Intervention: Not clear if the manual traction used a halter or was performed manually

### Characteristics of ongoing studies

Study	Guerrero 1997
Trial name or title	Comparative effects of manipulation and physical therapy on motion in the cervical spine
Participants	chronic neck pain
Interventions	*cervical spine manipulation v sham treatment v cervical spine manipulation, ischemic compression of myofascial trigger points , PNF, interferential therapy
Outcomes	cervical ROM
Starting date	
Contact information	Palmer Institute of Graduate Studies and Research, Davenport, Iowa.
Notes	

Study	Sherman
Trial name or title	Evaluating Therapeutic Massage for Chronic Neck Pain
Participants	chronic neck pain
Interventions	therapeutic massage v minimal self-care intervention
Outcomes	changes in symptoms, function, quality of life, and costs
Starting date	15-JUL-2003
Contact information	CENTER FOR HEALTH STUDIES 1730 MINOR AVE, STE 1600 SEATTLE, WA 98101 SHERMAN, KAREN J. sherman.k@ghc.edu
Notes	

## ADDITIONAL TABLES

**Table 01. Methodological quality scales: Criteria and scoring**

List	Criteria
The van Tulder et al. 2000 Criteria	<p>(Score: yes, no, don't know)</p> <p>A. Concealment of treatment allocation - Was the treatment allocation concealed? Assignment generated by an independent person not responsible for determining the eligibility of the patients. This person has no information about the persons included in the trial and has no influence on the assignment sequence or on the decision about eligibility of the patient.</p> <p>B. Withdrawal/dropout rate - Was the drop-out rate described and acceptable? The number of participants who were included in the study but did not complete the observation period or were not included in the analysis must be described and reasons given. If the percentage of withdrawals and drop-outs does not exceed 20% for immediate and short-term follow-ups, 30% for intermediate and long-term follow-ups and does not lead to substantial bias a "yes" is scored.</p> <p>C. Co-intervention avoided or equal - Were co-interventions avoided or similar? Co-interventions should either be avoided in the trial design or be similar between the index and control groups.</p> <p>D. Blinding of patients - Was the patient blinded to the intervention? The review author determines if enough information about the blinding is given in order to score a "yes."</p> <p>E. Blinding of observer - Was the outcome assessor blinded to the intervention? The review author determines if enough information about the blinding is given in order to score a "yes."</p> <p>F. Intention-to-treat analysis - Did the analysis include an intention-to-treat analysis? All randomized patients are reported/analyzed in the group they were allocated to by randomization for the most important moments of effect measurement (minus missing values) irrespective of noncompliance and co-interventions.</p> <p>G. Compliance - Was the compliance acceptable in all groups? The review author determines if the compliance to the interventions is acceptable, based on the reported intensity, duration, number and frequency of sessions for both the index intervention and control intervention(s).</p> <p>H. Similarity of baseline characteristics - Were the groups similar at baseline regarding the most important prognostic indicators? In order to receive a "yes," groups have to be similar at baseline regarding demographic factors, duration and severity of complaints, percentage of patients with neurologic symptoms, and value of main outcome measure(s).</p> <p>I. Blinding of care provider - Was the care provider blinded to the intervention? The review author determines if enough information about the blinding is given in order to score a "yes."</p> <p>J. Randomization adequate - Was the method of randomisation adequate? A random (unpredictable) assignment sequence. Examples of adequate methods are computer generated random number table and use of sealed opaque envelopes. Methods of allocation using date of birth, date of admission, hospital numbers, or alternation should not be regarded as appropriate.</p> <p>K. Timing of the outcomes assessment similar in all groups - Was the timing of the outcome assessment in all groups similar? Timing of outcome assessment should be identical for all intervention groups and for all important outcome assessments.</p>
The Jadad et al. 1996	<p>1a. Was the study described as randomised? (Score 1 if yes)</p> <p>1b and 1c. Was the method of randomisation described and appropriate to conceal allocation (Score 1 if appropriate and -1 if not appropriate);</p>

**Table 01. Methodological quality scales: Criteria and scoring** (Continued)

**List**

**Criteria**

- 2a. Was the study described as double-blinded? (Score 1 if yes)
- 2b and 2c. Was the method of double blinding described and appropriate to maintain double blinding (Score 1 if appropriate and -1 if not appropriate)
- 3. Was there a description of how withdrawals and dropouts were handled? (Score 1 if yes)

**Table 02. Assessment of trial applicability for massage therapy: questions****Questions**

The criteria listed under each question are intended to guide the reviewer's judgment and final decision. The score is based on the overall judgment by the reviewer and is not a sum of each part.

1. For the index and control interventions, was enough detail given about who delivered the intervention.
  - a. Professional
  - b. Referral Source
  - c. Treatment setting
2. For the index and control interventions, was enough detail given about their method of delivery to permit replication?
  - a. Dose
  - b. Frequency
  - c. Duration
  - d. Technique / Route
3. Was enough information provided about the characteristics of the study patients to permit us to relate them to the spectrum of patients with this problem?
  - a. Female/male
  - b. Age
  - c. Co-morbidities
  - d. Disorder
4. Was the main outcome(s) chosen client centered?
  - a. Pain
  - b. Function/disability
  - c. Satisfaction/global perceived effect
5. Based on the presented evidence, do authors balance efficacy and safety?
  - a. Are between-group statistics adequately reported according to CONSORT guidelines?  
 For continuous data: 1. n per group; 2. mean; 3. SD; 4. measure of effect (usually mean difference); 5. confidence interval  
 For dichotomous data: 1. n per group; 2. proportion having an event (or responding); 3. ----; 4. measure of effect (usually RR or OR); 5. confidence interval
  - b. Are between groups difference significant? (For mean difference, CI does not cross 0. For RR or OR, CI does not cross 1). Are efficacy results sufficient to guide clinical decisions/clinical applicability?
  - c. Are adverse effects reported? If yes to adverse effects, are they minimal? (Note: even if there are no adverse effects, it must be reported that there are no adverse effects. If adverse effects are not mentioned, it should be considered unclear).
6. Was the evaluation of the intervention sensible, given the mechanisms of action of the effect?
  - a. Timing of evaluation was reasonable

**Table 03. Assessment of trial applicability for massage therapy: scores**

Author	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Total scores
Ammer 1990	1	1	1	1	0	1	5/6
Brodin 1984	1	0	1	1	0	1	4/6
Brodin 1985	1	0	1	1	0	1	4/6
Cen 2003	0	1	1	1	0	1	4/6
Fialka 1989	1	0	1	1	0	1	4/6
Gam 1998	1	0	1	1	0	1	4/6
Hanten 1997	0	1	1	1	0	1	4/6



Hanten 2000	0	1	1	1	0	1	4/6
Hoving 2002	1	0	1	1	1	1	5/6
Hou 2002	0	1	1	1	0	1	4/6
Irnich 2001	0	1	1	1	1	1	5/6
Jordan 1998	1	0	1	1	0	1	4/6
Karlberg 1996	1	1	1	1	0	0	4/6
Kogstad 1978	0	0	1	1	0	0	2/6
Koes 1991	1	0	1	1	0	1	4/6
Koes 1992	1	0	1	1	0	1	4/6
Koes 1992	1	0	1	1	0	1	4/6
Koes 1993	1	0	0	1	0	1	3/6
Levoska 1993	1	0	1	1	0	1	4/6
Nilsson 1995	1	1	1	1	0	1	5/6
Nilsson 1996	1	1	1	0	0	1	4/6
Nilsson 1997	1	1	1	1	0	1	5/6
Provinciali 1996	0	0	1	1	0	1	3/6
Reginiussen 2000	0	0	0	1	0	1	2/6
Schnabel 2002	1	0	1	1	0	1	4/6

**Table 04. Methodological Quality: van Tulder scale**

<b>Author Total Score</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H/I</b>	<b>J/K</b>
Ammer 1990 TOTAL 4/11	0	1	0	0	0	1	0	1/0	0/1
Brodin 1983 TOTAL 3/11	0	1	0	0	0	0	0	0/0	1/1
Brodin 1985 TOTAL 5/11	1	1	0	0	0	0	0	1/0	1/1
Cen 2003 TOTAL 5/11	0	1	1	0	0	0	0	1/1	0/1
Fialka 1989 TOTAL 5/11	0	1	0	0	0	1	0	1/1	0/1
Gam 1998 TOTAL 8/11	1	1	1	1	1	0	0	0/1	1/1
Hanten 1997 TOTAL 6/11	0	1	1	0	1	1	1	0/0	0/1
Hanten 2000 TOTAL 5/11	0	0	0	0	1	1	1	1/0	0/1

**Table 04. Methodological Quality: van Tulder scale** (Continued)

<b>Author Total Score</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H/I</b>	<b>J/K</b>
Hoving 2002 TOTAL 9/11	1	1	1	0	1	1	1	1/0	1/1
Hoving 01 Ch5 TOTAL 9/11	1	1	1	0	1	1	1	1/0	1/1
Hoving 01 Ch6 TOTAL 6/11	1	1	0	0	1	1	0	0/0	1/1
Hou 2002 TOTAL 4/11	0	1	0	0	0	1	0	1/0	0/1
Irnich 2001 TOTAL 6/11	0	1	1	0	1	1	0	1/0	0/1
Jordan 1998 TOTAL 4/11	1	1	0	0	0	0	0	0/0	1/1
Jordan 1998 TOTAL 7/11	1	1	1	0	0	0	1	1/0	1/1
Karlberg 1996 TOTAL 3/11	0	1	0	0	0	1	0	1/0	0/0
Koes 1991 TOTAL 6/11	1	1	0	0	1	1	0	0/0	1/1
Koes 1992a TOTAL 7/11	1	1	0	0	1	1	0	1/0	1/1
Koes 1992b TOTAL 7/11	1	1	0	0	1	1	0	1/0	1/1
Koes 1992c TOTAL 7/11	1	1	0	0	1	1	0	1/0	1/1
Koes 1992d TOTAL 6/11	1	0	0	0	1	1	0	1/0	1/1
Koes 1992e TOTAL 7/11	1	1	0	0	1	1	0	1/0	1/1
Koes 1993 TOTAL 5/11	1	0	0	0	1	0	0	1/0	1/1
Kogstad 1978 TOTAL 0/11	0	0	0	0	0	0	0	0/0	0/0
Levoska 1993 TOTAL 3/11	0	1	0	0	0	0	0	1/0	0/1
Nilsson 1995 TOTAL 4/11	0	1	0	0	1	0	0	1/0	0/1
Nilsson1996 TOTAL 4/11	0	1	0	0	1	0	0	1/0	0/1
Nilsson 1997 TOTAL 5/11	0	1	0	0	1	1	0	1/0	0/1
Provinciali 1996	0	1	0	0	1	1	0	1/0	0/1

**Table 04. Methodological Quality: van Tulder scale** (Continued)

Author Total Score	A	B	C	D	E	F	G	H/I	J/K
TOTAL 5/11									
Reginiussen 2000	0	0	0	0	1	0	0	1/0	0/1
TOTAL 3/11									
Schnabel 2002	0	1	0	1	1	1	1	1/0	0/1
TOTAL 7/11									

**Table 05. Methodological Quality Jadad scale**

Author	1a- randomised	1b- appropriate	1c- concealed	2a- double blind	2b- described	2c- appropriate	3- follow- up	Total Score
Ammer 1990	1	0	0	0	0	0	1	2/5
Brodin 1984	1	0	0	0	0	0	1	2/5
Brodin 1985	1	0	0	0	0	0	1	2/5
Cen 2003	1	0	0	0	0	0	1	2/5
Fialka 1989	1	0	0	0	0	0	1	2/5
Gam 1998	1	1	0	1	1	0	1	5/5
Hanten 1997	1	0	0	0	0	0	1	2/5
Hanten 2000	1	0	0	0	0	0	1	2/5
Hou 2002	1	0	0	0	0	0	1	2/5
Hoving 2002	1	1	0	0	0	0	1	3/5
Hoving 2001 Ch5	1	1	0	0	0	0	1	3/5
Hoving 2001 Ch6	1	1	0	0	0	0	1	3/5
Irnich 2001	1	0	0	0	0	0	1	2/5
Jordan 1998	1	1	0	0	0	0	1	3/5
Karlberg 1996	1	0	0	0	0	0	1	2/5
Koes 1991	1	1	0	0	0	0	0	2/5
Koes 1992a	1	1	0	1	0	0	1	4/5
Koes 1992b	1	1	0	0	0	0	1	3/5
Koes 1992c	1	1	0	1	0	0	1	4/5

**Table 05. Methodological Quality Jadad scale** (Continued)

Author	1a- randomised	1b- appropriate	1c- concealed	2a- double blind	2b- described	2c- appropriate	3- follow- up	Total Score
Koes 1992d	1	1	0	0	0	0	1	3/5
Koes 1992e	1	1	0	0	0	0	1	3/5
Koes 1993	1	1	0	0	0	0	1	3/5
Kogstad 1978	1	0	-1	0	0	0	0	0/5
Levoska 1993	1	0	0	0	0	0	1	2/5
Nilsson 1995	1	0	0	0	0	0	1	2/5
Nilsson 1996	1	0	0	0	0	0	1	2/5
Nilsson 1997	1	0	0	0	0	0	1	2/5
Provinciali 1996	1	0	0	0	0	0	1	2/5
Reginiussen 2000	1	0	0	0	0	0	0	1/5
Schnabel 2002	1	0	0	0	1	0	1	3/5

**Table 06. MEDLINE search strategy**

Database: Ovid MEDLINE(R), Ovid MEDLINE(R) Daily Update, Ovid MEDLINE(R) In-Process, Other Non-Indexed Citations  
Search Strategy:

-----  
1 neck/ (4898)  
2 neck muscles/ (1196)  
3 exp cervical plexus/ (1137)  
4 exp cervical vertebrae/ (6007)  
5 atlanto-axial joint/ (491)  
6 atlanto-occipital joint/ (199)  
7 axis/ (200)  
8 atlas/ (212)  
9 spinal nerve roots/ (1861)  
10 exp brachial plexus/ (4135)  
11 (odontoid: or cervical or occip: or atlant:).tw. (45450)  
12 exp arthritis/ (35018)  
13 exp myofascial pain syndromes/ (817)  
14 fibromyalgia/ (1618)  
15 spondylitis/ (479)  
16 exp spinal osteophytosis/ (763)  
17 spondylolisthesis/ (519)

**Table 06. MEDLINE search strategy** (Continued)

- 18 whiplash injuries/ (778)
- 19 cervical rib syndrome/ (23)
- 20 torticollis/ (535)
- 21 cervico-brachial neuralgia/ (199)
- 22 cervico-brachial neuralgia.ti,ab. (3)
- 23 exp radiculitis/ (739)
- 24 polyradiculitis/ (217)
- 25 polyradiculoneuritis/ (839)
- 26 thoracic outlet syndrome/ (331)
- 27 (monoradicul: or monoradicl:).tw. (33)
- 28 random:.ti,ab,sh. (198692)
- 29 randomized controlled trial.pt. (95682)
- 30 double-blind method/ (33848)
- 31 single-blind method/ (5696)
- 32 placebos/ (5819)
- 33 clinical trial.pt. (185247)
- 34 exp clinical trials/ (63751)
- 35 controlled clinical trial.pt. (21102)
- 36 (clin: adj25 trial:).ti,ab. (63089)
- 37 ((singl: or doubl: or trebl: or tripl:) adj25 (blind: or mask:)).ti,ab. (34301)
- 38 placebos/ (5819)
- 39 meta-analysis.sh. (3571)
- 40 meta-analysis.pt. (7224)
- 41 (meta-analy: or metaanaly:).tw. (9543)
- 42 ((systematic: or quantitativ:) adj5 (review: or overview:)).tw. (7851)
- 43 (cochrane or medline or cinahl or embase or scisearch or psychinfo or psycinfo or psychlit or psyclit or (national and library)).tw. (14752)
- 44 ((Handsearch: or search:) and (cochrane or medline or cinahl or embase or scisearch or psychinfo or psycinfo or psychlit or psyclit or (national and library) or (hand: or manual: or electronic: or bibliograph: or database:)).tw. (19484)
- 45 ((review or guideline).pt. or consensus.ti. or guideline.ti. or overview.ti. or review.ti.) and (43 or 44) (12373)
- 46 ((synthesis or overview or review or survey) and (systematic or critical or methodologic: or quantitative or qualitative or literature or evidence or evidence-based)).ti. (20271)
- 47 39 or 40 or 41 or 42 or 44 or 45 or 46 (51886)
- 48 47 not ((case: or report:).ti. or editorial.pt. or comment.pt. or letter.pt.) (39268)
- 49 or/1-11 (56655)
- 50 or/12-27 (41634)
- 51 or/28-38 (372063)
- 52 exp arthritis/rh, th (3599)
- 53 exp Myofascial Pain Syndromes/rh, th (259)
- 54 fibromyalgia/rh, th (388)
- 55 spondylitis/rh, th (58)
- 56 exp spinal osteophytosis/rh, th (69)
- 57 spondylolisthesis/rh, th (44)
- 58 exp headache/rh, th and cervic:.tw. (40)
- 59 whiplash injuries/rh, th (171)
- 60 cervical rib syndrome/rh, th (3)
- 61 thoracic outlet syndrome/rh, th (54)
- 62 torticollis/rh, th (78)
- 63 cervico-brachial neuralgia/rh, th (33)
- 64 exp radiculitis/rh, th (88)

**Table 06. MEDLINE search strategy** (Continued)

65 polyradiculitis/rh, th (20)  
 66 polyradiculoneuritis/rh, th (224)  
 67 or/52-66 (5006)  
 68 exp complementary therapies/ or alternative medicine.mp. (37501)  
 69 chiropractic/ or acupuncture/ (1034)  
 70 (acupunct: or biofeedback or chiropractic: or electric stimulation therapy or kinesiology or massage or traditional medicine or relaxation or therapeutic touch or touch therapy or effleurage or massotherapy or myofascial release or neuromuscular therapy or shiatsu or acupuncture or lymph drainage or bodywork or body work).tw. (28047)  
 71 or/68-70 (60860)  
 72 49 and 67 (352)  
 73 49 and 50 and 71 (82)  
 74 72 or 73 (371)  
 75 74 and 51 (90)  
 76 from 75 keep 1-90 (90)  
 77 74 and 48 (18)  
 78 (2004: or 2003:).ed. (1006350)  
 79 75 and 78 (20)  
 80 77 and 78 (3)  
 81 from 80 keep 3 (1)

## ANALYSES

### Comparison 01. Main Results: Massage v Control Treatments

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Pain Intensity			Standardised Mean Difference (Random) 95% CI	Totals not selected
02 Pain Intensity			Relative Risk (Random) 95% CI	Totals not selected
03 Physical Function			Standardised Mean Difference (Random) 95% CI	Totals not selected

### Comparison 02. Main Results: Massage v Comparison Treatments (end point data)

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Pain Intensity: massage v acupuncture			Weighted Mean Difference (Fixed) 95% CI	Totals not selected
02 Pain Intensity: massage v MT			Standardised Mean Difference (Random) 95% CI	Totals not selected
03 Pain Intensity: massage v PMM			Standardised Mean Difference (Random) 95% CI	Totals not selected
04 Pain Intensity: massage v PMM			Odds Ratio (Fixed) 95% CI	Totals not selected
05 Pain Intensity: massage v PMM			Other data	No numeric data
06 Pain Intensity: massage v DT/ED			Standardised Mean Difference (Random) 95% CI	Totals not selected
07 Pain Intensity: massage v exercise			Standardised Mean Difference (Random) 95% CI	Totals not selected
08 Pain Intensity: massage v GP			Standardised Mean Difference (Random) 95% CI	Totals not selected

13 Physical Function: massage v MT	Standardised Mean Difference (Random) 95% CI	Totals not selected
14 Physical Function: massage v exercise	Standardised Mean Difference (Random) 95% CI	Totals not selected
15 Physical Function: massage v GP	Standardised Mean Difference (Random) 95% CI	Totals not selected
16 Physical Function: massage v PMM	Standardised Mean Difference (Random) 95% CI	Totals not selected
17 Physical Function: massage v DT/ED	Standardised Mean Difference (Random) 95% CI	Totals not selected
21 Patient Satisfaction: MT v PMM	Other data	No numeric data
25 Global Perceived Effect: massage v MT	Relative Risk (Random) 95% CI	Totals not selected
26 Global Perceived Effect: massage v GP	Relative Risk (Random) 95% CI	Totals not selected

### Comparison 03. Main Results: Side Effects

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 neck pain > 2 days			Relative Risk (Random) 95% CI	Totals not selected
02 headache			Relative Risk (Random) 95% CI	Totals not selected
03 pain and pins & needles in the arm			Relative Risk (Random) 95% CI	Totals not selected

### COVER SHEET

<b>Title</b>	Massage for mechanical neck disorders
<b>Authors</b>	Haraldsson BG, Gross AR, Myers CD, Ezzo JM, Morien A, Goldsmith C, Peloso PM, Bronfort G, Cervical Overview Group
<b>Contribution of author(s)</b>	This is one review of a series conducted by the Cervical Overview Group: Aker P, Bronfort G, Eddy A, Ezzo J, Goldsmith C, Graham N, Gross A, Haines T, Haraldsson B, Kay T, Kroeling P, Morien A, Myers C, Peloso P, Radylovick Z, Santaguada P, Trinh K Primary Reviewers for this review: B Haraldsson, A. Gross, CD Myers, J Ezzo, A Morien, P Peloso, G Brontford Statistician: C.H. Goldsmith Methodological quality assessment: CH Goldsmith, P Aker, K Trinh, T Haines, P Peloso Citation Identification, Study Selection: N Graham, A Gross, B Haraldsson, T Haines, J Hoving Cervical Overview Group Coordinator: A Gross Data Abstraction, Data Entry: B Haraldsson, A. Gross, C Myers, J Ezzo, A Morien Synthesis, Recommendations, Publication, Presentations: B Haraldsson, A Gross, C Myers, J Ezzo, A Morien, G Brontford Research librarian: A Eady
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<b>Review first published</b>	2006/3
<b>Date of most recent amendment</b>	24 May 2006
<b>Date of most recent SUBSTANTIVE amendment</b>	22 May 2006

<b>What's New</b>	Information not supplied by author
<b>Date new studies sought but none found</b>	Information not supplied by author
<b>Date new studies found but not yet included/excluded</b>	Information not supplied by author
<b>Date new studies found and included/excluded</b>	30 September 2004
<b>Date authors' conclusions section amended</b>	Information not supplied by author
<b>Contact address</b>	Bodhi Haraldsson Registered Massage Therapist North Surrey Massage Therapy Clinic 201-10366 136A Street Surrey BC V3T 5R3 CANADA E-mail: bodhigharaldsson@yahoo.ca Tel: (604) 930 8211 Fax: (604) 930-8211
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<b>Editorial group code</b>	HM-BACK

## GRAPHS AND OTHER TABLES

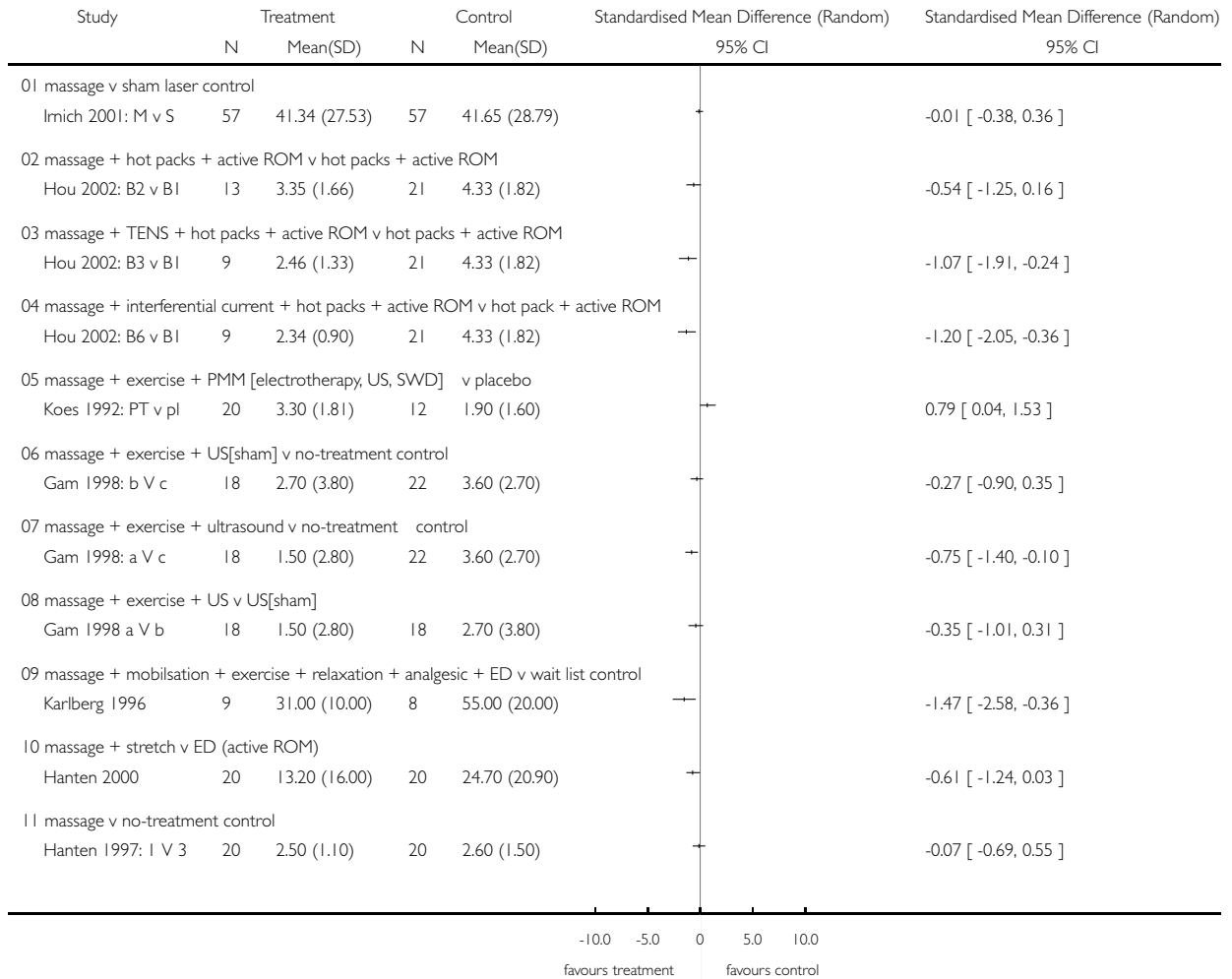


### Analysis 01.01. Comparison 01 Main Results: Massage v Control Treatments, Outcome 01 Pain Intensity

Review: Massage for mechanical neck disorders

Comparison: 01 Main Results: Massage v Control Treatments

Outcome: 01 Pain Intensity

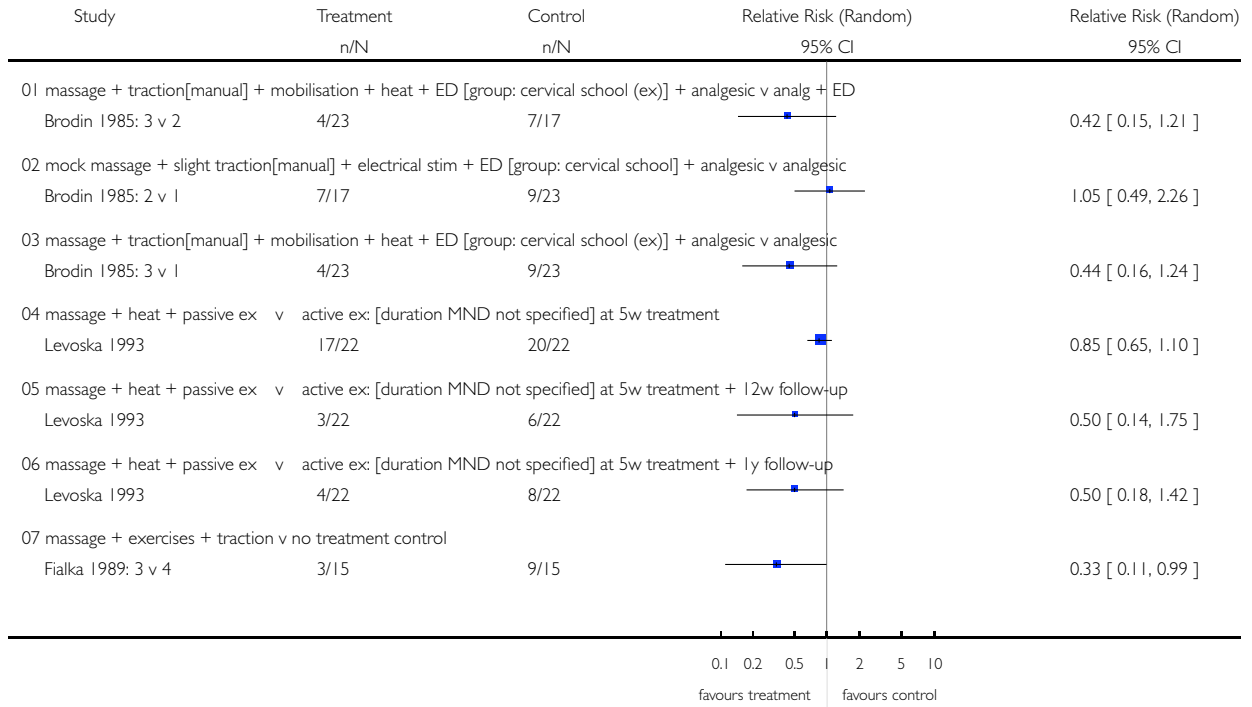


### Analysis 01.02. Comparison 01 Main Results: Massage v Control Treatments, Outcome 02 Pain Intensity

Review: Massage for mechanical neck disorders

Comparison: 01 Main Results: Massage v Control Treatments

Outcome: 02 Pain Intensity

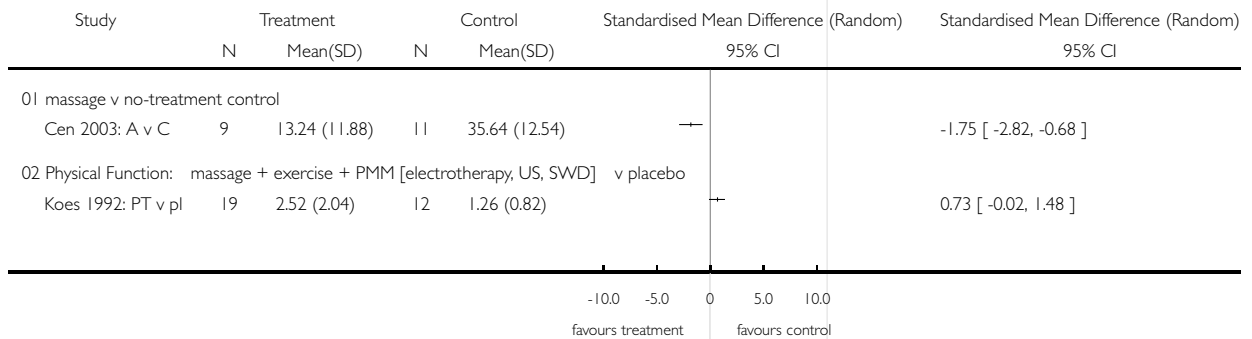


### Analysis 01.03. Comparison 01 Main Results: Massage v Control Treatments, Outcome 03 Physical Function

Review: Massage for mechanical neck disorders

Comparison: 01 Main Results: Massage v Control Treatments

Outcome: 03 Physical Function

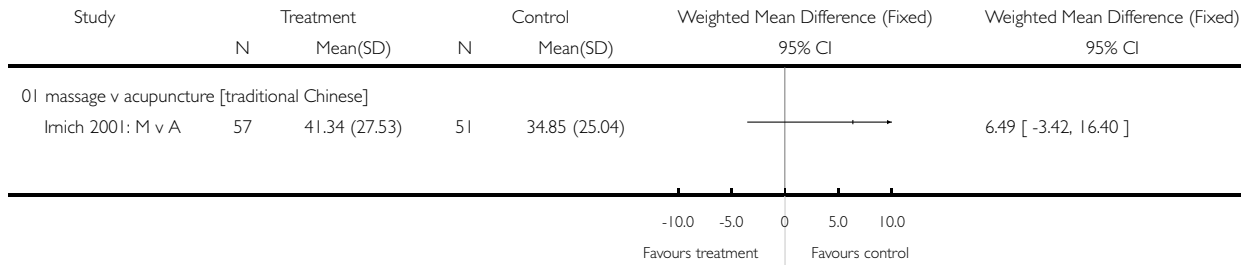


**Analysis 02.01. Comparison 02 Main Results: Massage v Comparison Treatments (end point data), Outcome 01 Pain Intensity: massage v acupuncture**

Review: Massage for mechanical neck disorders

Comparison: 02 Main Results: Massage v Comparison Treatments (end point data)

Outcome: 01 Pain Intensity: massage v acupuncture

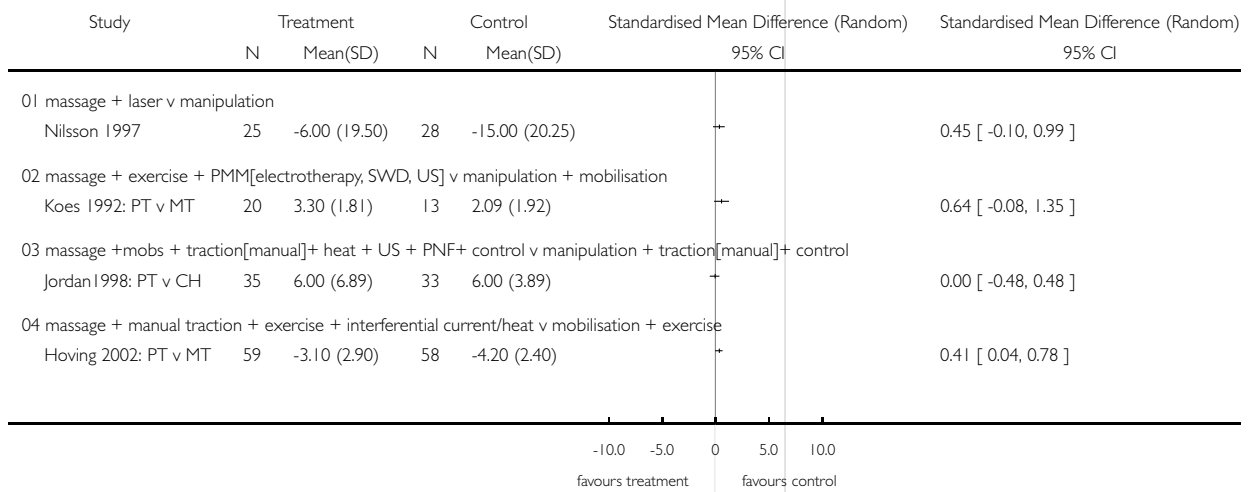


**Analysis 02.02. Comparison 02 Main Results: Massage v Comparison Treatments (end point data), Outcome 02 Pain Intensity: massage v MT**

Review: Massage for mechanical neck disorders

Comparison: 02 Main Results: Massage v Comparison Treatments (end point data)

Outcome: 02 Pain Intensity: massage v MT

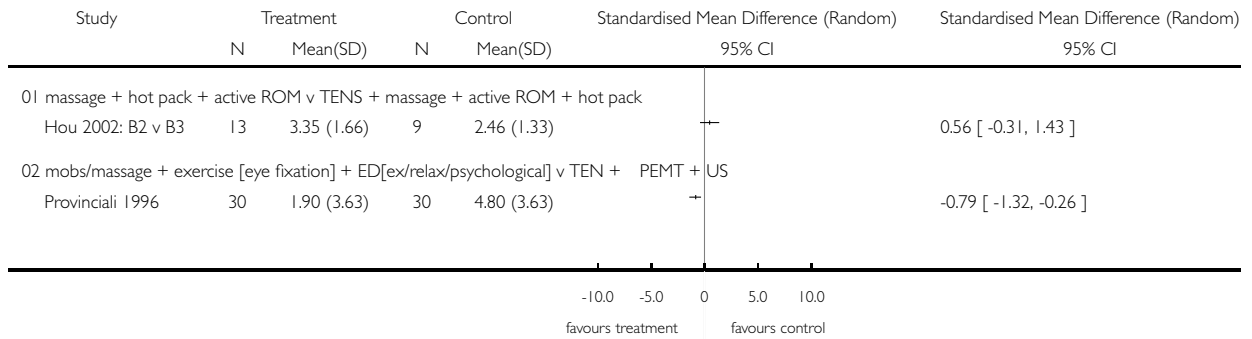


**Analysis 02.03. Comparison 02 Main Results: Massage v Comparison Treatments (end point data), Outcome 03 Pain Intensity: massage v PMM**

Review: Massage for mechanical neck disorders

Comparison: 02 Main Results: Massage v Comparison Treatments (end point data)

Outcome: 03 Pain Intensity: massage v PMM

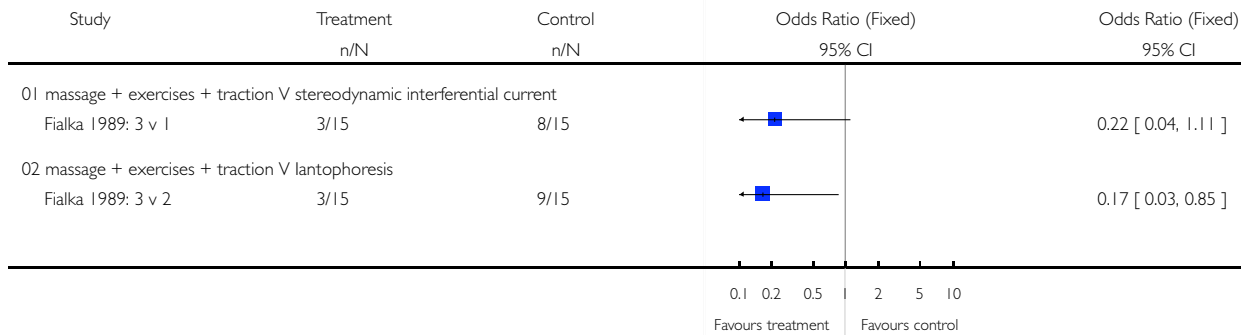


**Analysis 02.04. Comparison 02 Main Results: Massage v Comparison Treatments (end point data), Outcome 04 Pain Intensity: massage v PMM**

Review: Massage for mechanical neck disorders

Comparison: 02 Main Results: Massage v Comparison Treatments (end point data)

Outcome: 04 Pain Intensity: massage v PMM



**Analysis 02.05. Comparison 02 Main Results: Massage v Comparison Treatments (end point data), Outcome 05 Pain Intensity: massage v PMM**

**massage + munaripack v manipulation + galvanic current [pulsed]**

**Study** **Reported Results** **Median Scores**

Ammer 1990: 3 v 1

not significant

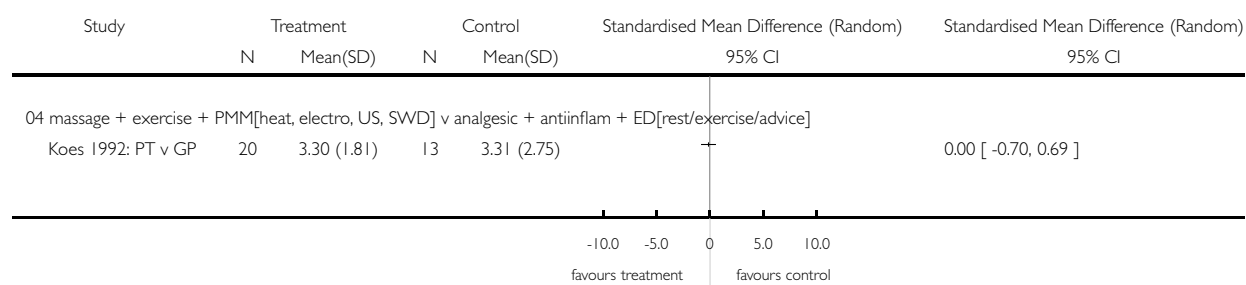
no p value reported, alpha set equal to 0.01

**massage/mobs + exercise [eye fixation] + ED[exercise, relaxation, psychological] v TENS + PEMT + US]**

Study	Reported Results	Median Scores
Provinciali 1996	significant p< 0.001 (two-way Friedman test: time x treatment interaction)	T0: Group A median = 6.8mm T0: Group B median = 7.4mm T3: Group A median = 1.9mm T3: Group B median = 4.8mm

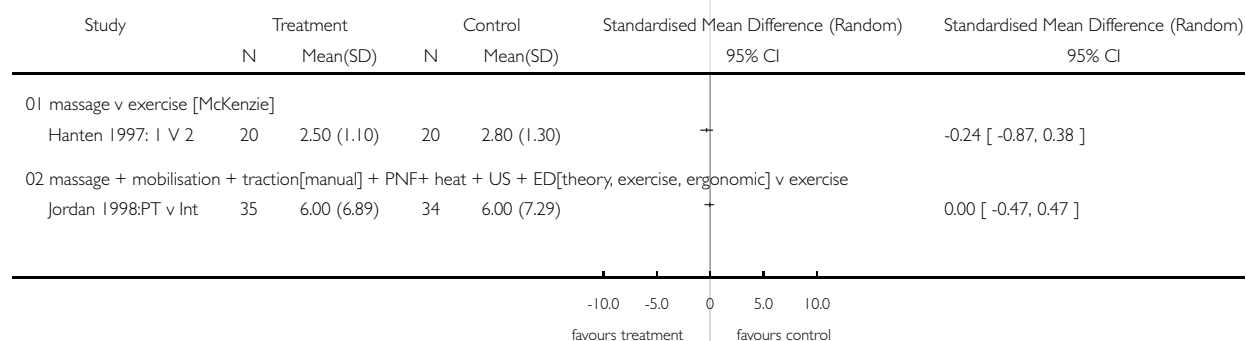
**Analysis 02.06. Comparison 02 Main Results: Massage v Comparison Treatments (end point data), Outcome 06 Pain Intensity: massage v DT/ED**

Review: Massage for mechanical neck disorders  
 Comparison: 02 Main Results: Massage v Comparison Treatments (end point data)  
 Outcome: 06 Pain Intensity: massage v DT/ED



**Analysis 02.07. Comparison 02 Main Results: Massage v Comparison Treatments (end point data), Outcome 07 Pain Intensity: massage v exercise**

Review: Massage for mechanical neck disorders  
 Comparison: 02 Main Results: Massage v Comparison Treatments (end point data)  
 Outcome: 07 Pain Intensity: massage v exercise

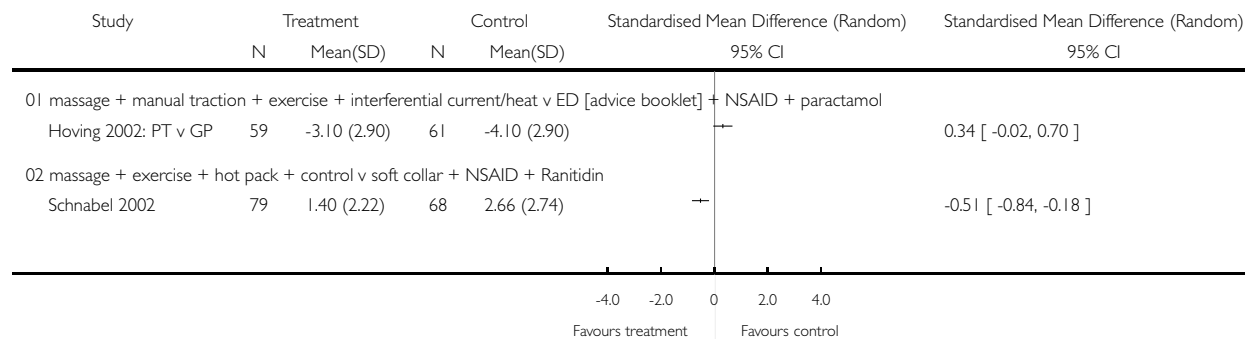


**Analysis 02.08. Comparison 02 Main Results: Massage v Comparison Treatments (end point data), Outcome 08 Pain Intensity: massage v GP**

Review: Massage for mechanical neck disorders

Comparison: 02 Main Results: Massage v Comparison Treatments (end point data)

Outcome: 08 Pain Intensity: massage v GP

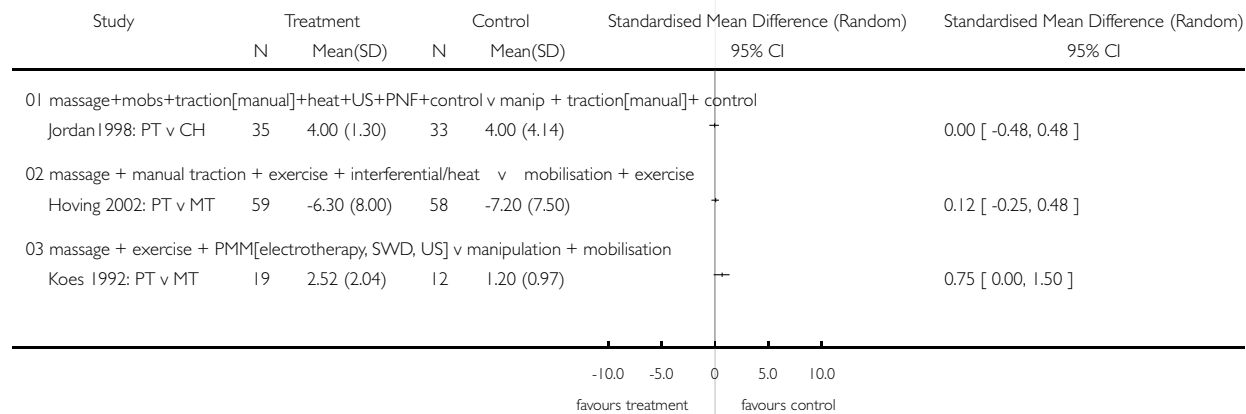


**Analysis 02.13. Comparison 02 Main Results: Massage v Comparison Treatments (end point data), Outcome 13 Physical Function: massage v MT**

Review: Massage for mechanical neck disorders

Comparison: 02 Main Results: Massage v Comparison Treatments (end point data)

Outcome: 13 Physical Function: massage v MT

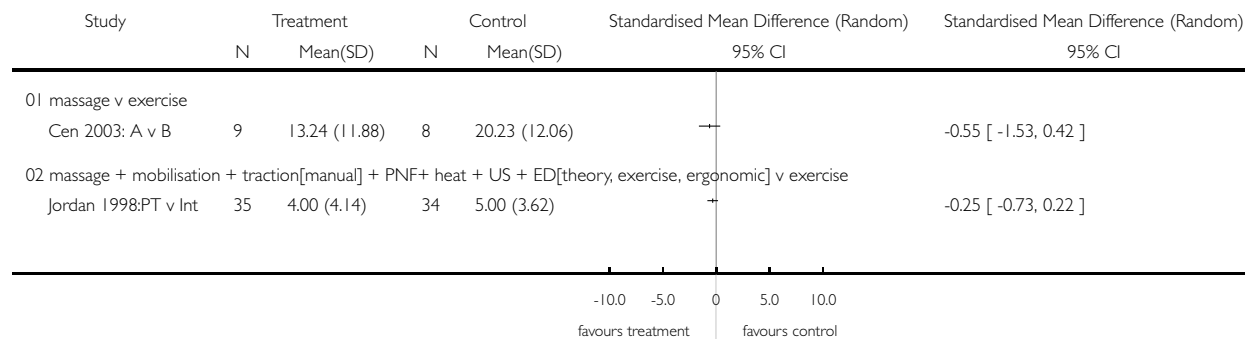


**Analysis 02.14. Comparison 02 Main Results: Massage v Comparison Treatments (end point data), Outcome 14 Physical Function: massage v exercise**

Review: Massage for mechanical neck disorders

Comparison: 02 Main Results: Massage v Comparison Treatments (end point data)

Outcome: 14 Physical Function: massage v exercise

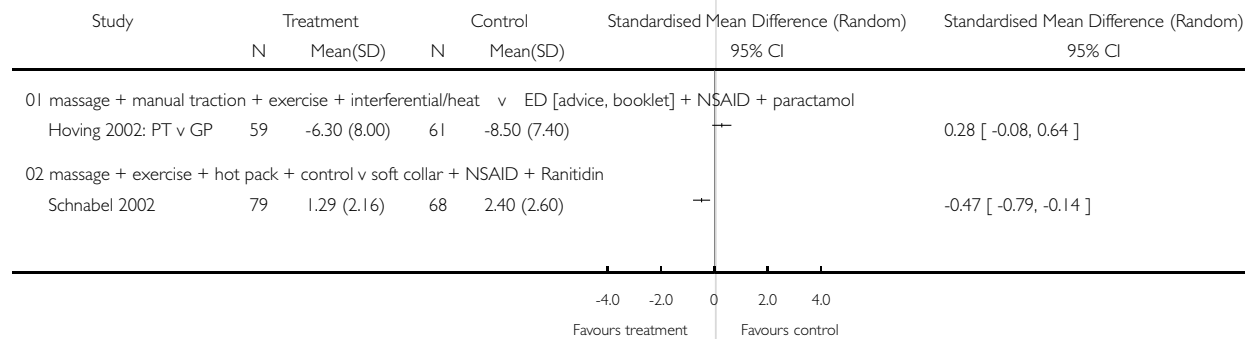


**Analysis 02.15. Comparison 02 Main Results: Massage v Comparison Treatments (end point data), Outcome 15 Physical Function: massage v GP**

Review: Massage for mechanical neck disorders

Comparison: 02 Main Results: Massage v Comparison Treatments (end point data)

Outcome: 15 Physical Function: massage v GP

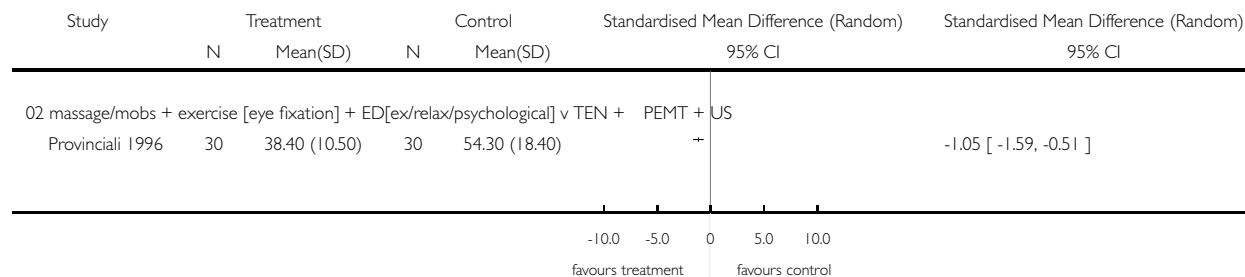


**Analysis 02.16. Comparison 02 Main Results: Massage v Comparison Treatments (end point data), Outcome 16 Physical Function: massage v PMM**

Review: Massage for mechanical neck disorders

Comparison: 02 Main Results: Massage v Comparison Treatments (end point data)

Outcome: 16 Physical Function: massage v PMM

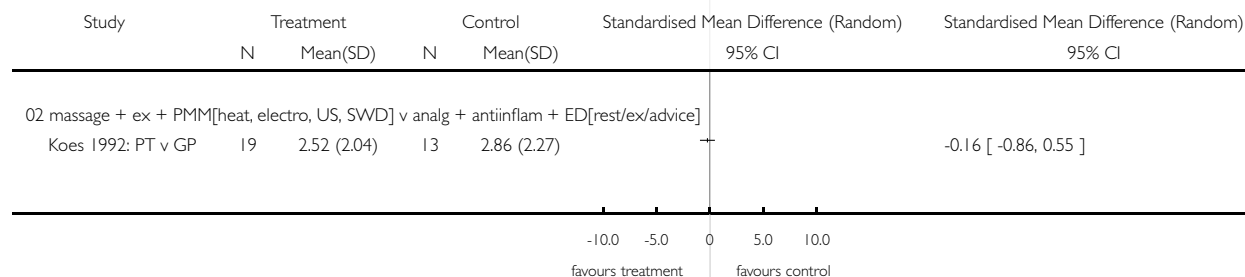


**Analysis 02.17. Comparison 02 Main Results: Massage v Comparison Treatments (end point data), Outcome 17 Physical Function: massage v DT/ED**

Review: Massage for mechanical neck disorders

Comparison: 02 Main Results: Massage v Comparison Treatments (end point data)

Outcome: 17 Physical Function: massage v DT/ED



**Analysis 02.21. Comparison 02 Main Results: Massage v Comparison Treatments (end point data), Outcome 21 Patient Satisfaction: MT v PMM**

**massage/mobs + exercise [eye fixation] + ED[ex/relax/psychological] v TEN + PEMT + US**

Study	Reported Results	Median Score
Provinciali 1996	significant p<0.001 [analysis of contingency tables]	T1: Group A median = 1 T1: Group B median = 0 T3: Group A median = 2 T3: Group B median = -1

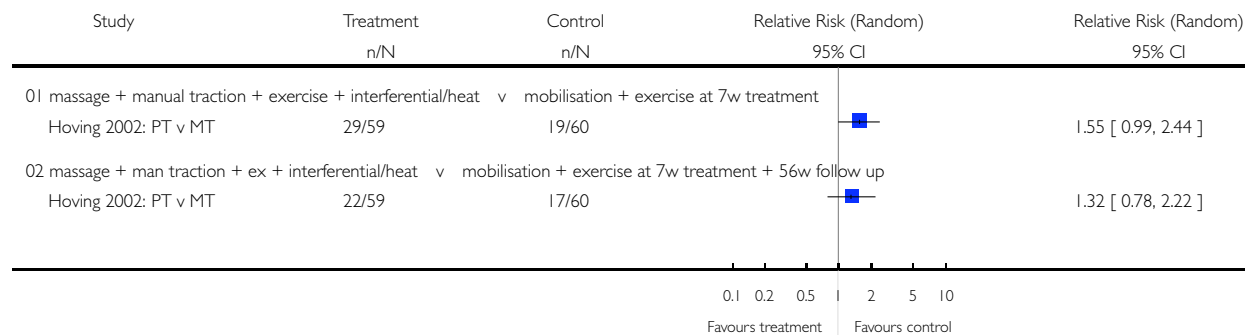


**Analysis 02.25. Comparison 02 Main Results: Massage v Comparison Treatments (end point data), Outcome 25 Global Perceived Effect: massage v MT**

Review: Massage for mechanical neck disorders

Comparison: 02 Main Results: Massage v Comparison Treatments (end point data)

Outcome: 25 Global Perceived Effect: massage v MT

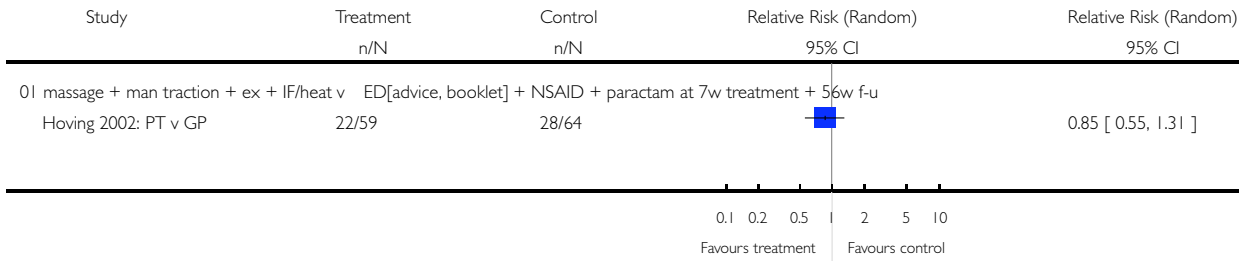


**Analysis 02.26. Comparison 02 Main Results: Massage v Comparison Treatments (end point data), Outcome 26 Global Perceived Effect: massage v GP**

Review: Massage for mechanical neck disorders

Comparison: 02 Main Results: Massage v Comparison Treatments (end point data)

Outcome: 26 Global Perceived Effect: massage v GP

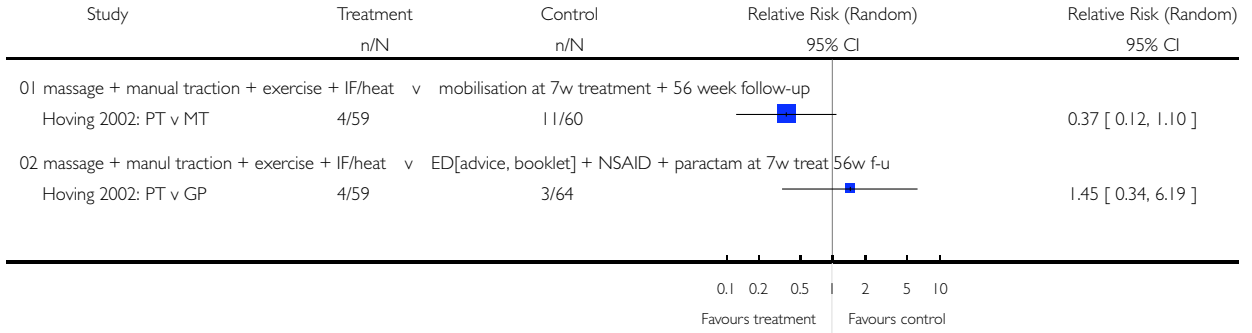


**Analysis 03.01. Comparison 03 Main Results: Side Effects, Outcome 01 neck pain > 2 days**

Review: Massage for mechanical neck disorders

Comparison: 03 Main Results: Side Effects

Outcome: 01 neck pain > 2 days

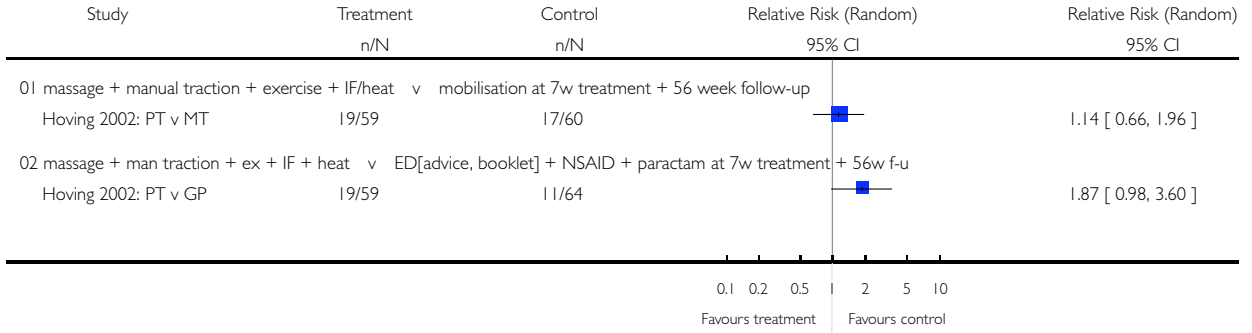


### Analysis 03.02. Comparison 03 Main Results: Side Effects, Outcome 02 headache

Review: Massage for mechanical neck disorders

Comparison: 03 Main Results: Side Effects

Outcome: 02 headache



**Analysis 03.03. Comparison 03 Main Results: Side Effects, Outcome 03 pain and pins & needles in the arm**

Review: Massage for mechanical neck disorders

Comparison: 03 Main Results: Side Effects

Outcome: 03 pain and pins % needles in the arm

