

## Acupuncture for neck disorders (Review)

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[Intervention Review]

## Acupuncture for neck disorders

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### ABSTRACT

#### Background

Neck pain is one of the three most frequently reported complaints of the musculoskeletal system. Treatments for neck pain are varied, as are the perceptions of benefits. Acupuncture has been used as an alternative to more traditional treatments for musculoskeletal pain. This review summarizes the most current scientific evidence on the effectiveness of acupuncture for acute, subacute and chronic neck pain.

#### Objectives

To determine the effects of acupuncture for individuals with neck pain.

#### Search strategy

We searched CENTRAL (2006, issue 1) and MEDLINE, EMBASE, MANTIS, CINAHL from their beginning to February 2006. We searched reference lists and the acupuncture database TCMLARS in China.

#### Selection criteria

Any published trial using randomized (RCT) or quasi-randomized (quasi-RCT) assignment to the intervention groups, either in full text or abstract form, were included.

#### Data collection and analysis

Two reviewers made independent decisions for each step of the review: article inclusion, data abstraction and assessment of trial methodological quality. Study quality was assessed using the Jadad criteria. Consensus was used to resolve disagreements. When clinical heterogeneity was absent, we combined studies using random-effects meta-analysis models.

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## Main results

We did not find any trials that examined the effects of acupuncture for acute or subacute pain, but we found 10 trials that examined acupuncture treatments for chronic neck pain. Overall, methodological quality had a mean of 2.3/5 on the Jadad Scale.

For chronic mechanical neck disorders, there was moderate evidence that acupuncture was more effective for pain relief than some types of sham controls, measured immediately post-treatment. There was moderate evidence that acupuncture was more effective than inactive, sham treatments measured immediately post-treatment and at short-term follow-up (pooled standardized mean difference (SMD) -0.37, 95% confidence interval (CI) -0.61 to -0.12). There was limited evidence that acupuncture was more effective than massage at short-term follow-up. For chronic neck disorders with radicular symptoms, there was moderate evidence that acupuncture was more effective than a wait-list control at short-term follow-up.

## Authors' conclusions

There is moderate evidence that acupuncture relieves pain better than some sham treatments, measured at the end of the treatment. There is moderate evidence that those who received acupuncture reported less pain at short term follow-up than those on a waiting list. There is also moderate evidence that acupuncture is more effective than inactive treatments for relieving pain post-treatment and this is maintained at short-term follow-up.

## PLAIN LANGUAGE SUMMARY

### Acupuncture for neck pain

Neck pain is one of the three most frequently reported complaints of the musculoskeletal system. Treatments for neck pain are varied, as are the perceptions of benefits. Acupuncture is sometimes used as an alternative to more traditional treatments for musculoskeletal pain. In this review it was defined as the stimulation of one or more specific points on the body, by the insertion of needles, to achieve a desirable effect. Acupuncture typically includes manual stimulation of needles, but there are commonly used variations, such as electrical stimulation or heat stimulation of the needles, which is called moxibustion [the moxa herb, *Artemisia vulgaris*, is burned at the handle end of the needle]. Injection acupuncture, in which herbal extracts are injected into acupuncture points, is occasionally used as well.

We included 10 trials (661 participants) in this review that examined the effects of acupuncture on neck pain for individuals with chronic neck pain (lasting for at least three months). One study also included individuals with neck pain that lasted for at least six weeks, but they considered it to be chronic. Acupuncture was compared to sham acupuncture, waiting list, other sham treatments (sham laser, sham TENS) or other treatments (mobilization, massage, traction). Acupuncture treatments appear to be safe and only minor, transient and benign adverse effects were reported in the trials.

The trials were of moderate methodological quality, but the number of participants in each trial was relatively low. There was a range of individuals studied, acupuncture techniques used and outcomes measured, so we could not combine the results of the trials to get an overall picture of the effectiveness of acupuncture. Therefore, we could only draw limited conclusions.

Individuals with chronic neck pain who received acupuncture reported, on average, better pain relief immediately after treatment and in the short-term than those who received sham treatments. Individuals with chronic neck pain with symptoms radiating to the arms who received acupuncture reported, on average, better pain relief in the short-term than those who were on a waiting list.

## BACKGROUND

Neck pain is one of the three most frequently reported complaints of the musculoskeletal system. A Canadian population-based study identified a point prevalence of 22% [Cote 2000]. The natural

history of neck pain is unclear. It is believed that neck pain is a benign and self-limited condition. Twenty-six to 71% of the adult population can recall experiencing an episode of neck pain

or stiffness in their lifetime [Brattberg 1989; Horal 1969; Hult 1954a; Hult 1954b]. In a cross-sectional survey of Norwegian adults, 10% of males and 17% of females reported they had neck pain that lasted longer than six months during the past year [Bovim 1994]. Thus, neck pain has a large impact on health care expenditure, attributed to visits to health care providers, sick leave, disability and the related loss of productivity [Borghouts 1999; Hoving 2001].

Treatments for neck pain are varied [Cote 2001], as are the perceptions of benefits [Rush 1994]. Acupuncture has been used as an alternative to more traditional treatments for musculoskeletal pain. It is defined as the stimulation of a certain point or points on the body, by the insertion of needles, to achieve a desirable effect. It is believed to prevent or modify the perception of pain or to alter physiological functions, including pain control for the treatment of certain diseases or dysfunctions of the body [Stux 1995]. Acupuncture typically includes manual stimulation of needles, but there are variations commonly used, such as electrical stimulation and heat stimulation of needles, which is called moxibustion [the moxa herb, *Artemisia vulgaris*, is burned at the handle end of the needle]. Injection acupuncture, in which herbal extracts are injected into acupuncture points, are occasionally used as well [Lao 1996]. It is unclear which type of acupuncture produces the most beneficial effect [Ezzo 2000]. A previous review by White, et al stated that “the hypothesis that acupuncture is efficacious in the treatment of neck pain is not based on the available evidence from sound clinical trials” [White 1999]. Since this review was published in 1999, there have been more studies published in this area. This review will summarize the most current scientific evidence on the effectiveness of acupuncture for acute, subacute and chronic neck pain.

## OBJECTIVES

To determine the effects of acupuncture for individuals with neck pain.

## METHODS

### Criteria for considering studies for this review

#### Types of studies

Any published randomized controlled trial (RCT), or controlled clinical trial (CCT) with quasi-randomization (quasi-RCT), either in full text or abstract form, were included. A quasi-RCT uses methods of allocation that are subject to bias in assignment, such as, odd-even numbers on day of week, patient record, or social security number.

#### Types of participants

The participants were adults (18 years or older) with the following neck disorders:

- Mechanical neck disorders (MND), including whiplash associated disorders (WAD) category 1 and 2 [Spitzer 1987; Spitzer 1995], myofascial neck pain, and degenerative changes (DC) [Schumacher 1993].
- Neck disorder with headache [Olesen 1988; Sjaastad 1990; Olesen 1997]; and
- Neck disorders with radicular symptoms (NDR), including WAD category III [Spitzer 1987, Spitzer 1995].

For the purpose of this review, symptom duration was defined as acute (less than 30 days), sub-acute (30 days to 90 days) or chronic (greater than or equal to 90 days).

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 [Schumacher 1993];
- neck pain related to neurological disease (e.g. spasmodic torticollis);
- neck pain related to fractures and dislocations;
- headache not of cervical origin;
- 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 interventions

Studies must have used acupuncture techniques involving insertion of needles. Stimulation of the needles may involve manual, electrical, heat, laser or other forms of stimulation. The control groups were treated with either sham acupuncture (some form of mock or pretend), wait-list control, active treatment control (e.g. ultrasound), or inactive treatment control (e.g. sham TENS)

#### Types of outcome measures

Pain relief (e.g. Visual Analog Scale (VAS), Numerical Rating Scale (NRS)), disability or functional measures (e.g. Neck Disability Index (NDI), Activity of Daily Living (ADL)), patient satisfaction and global perceived effect were the main outcomes of interest. When available, adverse effects and cost of treatments were also examined.

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

Computerized bibliographic databases were searched by a research librarian, without language restrictions, for medical, chiropractic, and allied health literature. The following databases were searched from their beginning to February 11, 2006: CENTRAL (The Cochrane Library 2006, issue 1), MEDLINE, EMBASE, Manual Alternative and Natural Therapy (Mantis), Cumulative Index to Nursing and Allied Health Literature (CINAHL), Index to Chiropractic Literature (ICL). We also screened references, communicated with the coordinator of the Cochrane Back Group, contacted identified content experts and reviewed our own personal files. The Chinese Cochrane Centre searched the Traditional Chinese Medical Literature Analysis and Retrieval System (TCMLARS) in China in September 2005. 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]. The MEDLINE and EMBASE search strategies are given in Appendix 1; Appendix 2. They were adapted as necessary for the different databases.

## Data collection and analysis

## Study Selection

At least two authors independently conducted citation identification, study selection, and data abstraction. Disagreements were resolved through consensus.

If additional information was required to assess the appropriateness of the study for selection, authors were written for clarification. If it was not forthcoming, a consensus process determined the selection status. If the article or citation posting was in a non-English language, one investigator and a translator with a health sciences background conducted study selection in an unblinded manner.

## Methodological Assessment

At least two authors independently assessed each selected study for methodological quality, based on the validated Jadad 1996 [Jadad 1996] criteria (maximum score five) and the Cochrane grading (A to D) for concealment of allocation. The intention-to-treat analysis criterion was added for the assessment of quality since it was expected by the van Tulder 2003 updated guidelines and was not part of the Jadad scale or the Cochrane grading system for quality of allocation concealment. A trial with a score of three or more on the Jadad scale was considered a high quality trial. Disagreements were resolved through consensus. See Table 1 for operationalization of the Jadad criteria and the Cochrane grading of allocation concealment.

**Table 1. Operationalization for Jadad Criteria & Cochrane Allocation Concealment**

Criteria
Jadad criteria for assessing methodological quality
1a. Randomization: Just asks if randomization was performed. No judgment here if it was done well enough. (Score 1)
1b. Asks about generation of allocation sequences. Adequate sequence generation (reported using random-number table, computer random-number generator, coin tossing, or shuffling). Asks about whether concealment was performed. Need some data to suggest that concealment was actually undertaken.
Adequately concealed trials - trials that were deemed to have taken adequate measures to conceal allocation (ie. central randomization; numbered or coded bottles or containers; drugs prepared by the pharmacy; serially numbered, opaque, sealed envelopes; or other descriptions that contained elements convincing of concealment) (Score: 1)
Unclearly concealed trials in which the author either did not report an allocation concealment approach at all or reported an approach that did not fall into one of the categories just named. This group undoubtedly contained a mixture of inadequately and adequately concealed trials, but with the latter probably in the minority. (Score: 0)
1c. Inadequately concealed trials - methods of allocation such as alternation or reference to case record numbers or to date of birth (Score -1).
2a. Double blinding: award point if stated double blinded or if trial did not state double blinding but stated that two of three of the following participants were blinded: patient, care provider, outcome assessor. (any two of three, Score 1)

**Table 1. Operationalization for Jadad Criteria & Cochrane Allocation Concealment** (Continued)

2b. Method is not described or is unclear. (Score 0)	
2c. Method is inappropriate. (Score -1)	
3. Withdrawals or dropouts: Trials giving the impression that no exclusions had taken place or the reasons for exclusions (when given) included protocol deviations, withdrawals, dropouts, and losses to follow-up. (Score 1)	
Unclear or no description of withdrawals. (Score 0)	
<hr/>	
The Cochrane Grading System for Quality of Allocation Concealment	
A. Adequate concealment of allocation - trials that were deemed to have taken adequate measures to conceal allocation (ie. central randomization; numbered or coded bottles or containers; drugs prepared by the pharmacy; serially numbered, opaque, sealed envelopes; or other descriptions that contained elements convincing of concealment	
B. Uncertainty about whether the allocation was adequately concealed - trials in which the author either did not report an allocation concealment approach	
C. The allocation was definitely not adequately concealed - trials used methods of allocation such as alternation or reference to case record numbers or to date of birth	
D. Not used - trials did not use randomization to assign participants to groups	

### Data Extraction

Two authors independently extracted raw data for demographics, descriptions of treatments and all outcomes from the full manuscripts onto pre-designed forms.

### Data Analysis

Descriptive statistics were used to provide a summary description of the groups, interventions, outcomes, adverse effect of treatments and cost of care. All results reported were based on the sample size analysed using 'intention-to-treat' principle, in other words, the sample entering the study.

Using the chi square test, we calculated agreement between investigators for study identification, selection and validity processes. This was performed prior to consensus. The Kappa statistic was used to measure agreement. Results less than zero reflect poor agreement, 0 to 0.20 slight agreement, 0.21 to 0.40 fair agreement, 0.41 to 0.60 moderate agreement, 0.61 to 0.80 substantial agreement and 0.81 to 1.00 almost perfect agreement [Landis 1977]. Using a random-effects model, standardized mean differences (SMD) and 95% confidence intervals (95% CI) were calculated for outcomes reported in a continuous data format. SMD was used because different measures are frequently used to address the

same clinical outcome. The effect size (SMD) is a unitless measure reported in standard deviation units. Generally, an effect size can be interpreted as small (-0.20), medium (-0.50) and large (-0.80), as defined by Cohen [Cohen 1988].

Using a random-effects model, the relative risk [RR], the outcome rate in the treated versus control group, was calculated. For undesirable outcomes, a relative risk less than one represents a beneficial treatment.

When neither continuous nor dichotomous data were available, the findings and the statistical significance as reported by the author(s) in the original study were extracted and were noted in "Table of Comparisons and data: Other data tables".

Clinical judgment was used to determine if the similarity of sample group, type of neck pain, intervention, duration of treatment, and outcomes used for assessment were adequate to allow pooling of results. Since the studies were too dissimilar in clinical features, only one meta-analysis was performed. For the rest of the review, a qualitative synthesis was performed as follows:

### Qualitative Analysis of Trial Results:

To reach final conclusions, qualitative analysis was carried out, using the levels of evidence described by Sackett 2000 and van Tulder 2003. It is detailed below.

- **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 findings in a single low-quality RCT.
- **Conflicting evidence** denoted inconsistent results in multiple RCTs.
- **No evidence** meant no studies were identified.

Power analyses were conducted for trials using single techniques and reporting non-significant findings. The desired level of significance was assumed at alpha equal to 0.05; adequate power was defined as at least 80%; at least a 20% change between means was required for outcomes to be considered clinically important [Dupont 1990]. Since we were unaware of other criteria available for neck-specific trials, we based the 20% change on criteria for clinically important changes in outcomes seen in rheumatoid arthritis trials [Goldsmith 1993]. Power levels greater than 80% were considered adequate, 50% to 80% were marginal, and less than 50% were poor. 'Consistent' was defined as 100% of the trials with adequate power and the same result.

## RESULTS

### Description of studies

See: [Characteristics of included studies](#); [Characteristics of excluded studies](#).

Because this review is one of a series on manual therapy interventions for mechanical neck pain, we identified and screened 758 citation postings and retrieved 196 RCTs for more detailed evaluation for all the reviews conducted by the cervical overview group. Seventy six met the Cervical Overview Group selection criteria. Of these, 19 were related to acupuncture and were separated out for this review. There were no RCTs identified in the Chinese language search.

**Table 2. Methodological Quality (Jadad Scale)**

Author	1a-randomized	1b-appropriate	1c-concealed	2a-double blind	2b-described	2c-appropriate	3-follow-up	Total Score
Birch 1998	1	0	0	0	0	0	1	2/5
Coan 1982	1	1	0	0	0	0	1	3/5
David 1998	1	1	0	0	0	0	1	3/5
Irnich 2001	1	0	0	0	0	0	1	2/5

We did not find any studies that included participants with acute or subacute neck pain. We included 10 acupuncture trials (661 participants) on chronic mechanical neck pain, one of which recruited patients with pain of at least six weeks duration (subacute by our definition), but considered them to be chronic (David 1998). One study included participants with chronic mechanical neck pain with radicular signs or symptoms (NDR) [Coan 1982]. See 'Characteristics of included studies' table for further details on study designs, number randomized/analyzed, treatments, co-interventions, absolute benefits, reported results, SMD, RR, intention-to-treat and power analyses, side effects and costs of care. Agreement between pairs of independent reviewers from diverse professional backgrounds on study selection for inclusion was excellent, with an estimated kappa (Chicchetti weights) of Kw = 0.76 (SD 0.09).

We excluded seven RCTs after reviewing the full report. Of these, four studies were based on the type of participant (one RCT included participants with a particular neck disorder i.e. ankylosing spondylitis [Emery 1986]; three RCTs included participants with pain from other areas as well, such as shoulder or back) [Gallacchi 1981; Gaw 1975; Kisiel 1996]. We excluded one study due to data abstraction reasons (i.e. abstract only and unable to obtain further information from author [Teng 1973]). We excluded one study because it was not randomized or quasi-randomized [Zhang 1996]. We excluded one study [Guanygue 2001] because the acupuncture effect could not be isolated. (See 'Characteristics of excluded studies' table). We are still waiting for further information from authors for two studies to determine eligibility, as we are not sure if there were separate data for mechanical neck pain.

### Risk of bias in included studies

Methodological quality was graded using two sets of criteria:

- the validated Jadad 1996 criteria (maximum score five, high quality trials score 3 or greater (See [Table 2](#) for individual trial results)

**Table 2. Methodological Quality (Jadad Scale) (Continued)**

Irnich 2002	1	1	0	1	1	0	1	5/5
Loy 1983	1	0	-1	0	0	0	0	0/5
Petrie 1983	1	0	0	0	0	0	1	2/5
Petrie 1986	1	0	0	0	0	0	1	2/5
White 2000	1	0	0	0	0	0	0	1/5
White 2004	1	0	0	1	0	0	1	3/5

- the Cochrane grading of allocation concealment which refers to how well treatment allocation was concealed (See 'Characteristics of included studies' table for results).

The Jadad criteria for trial quality varied from 0/5 to 5/5 with a mean score of 2.3/5. Therefore, the overall quality of these studies was not considered high, with only 40% of the studies (4/10) considered as high quality [Coan 1982; David 1998; Irnich 2002; White 2004]. All the studies were described as randomized. We found a large proportion of the studies fell short on the appropriateness of allocation concealment (7/10) and descriptions of double blinding (9/10). Only two of the 10 studies did not have an adequate description of withdrawals and drop outs. The four studies that reported or used intention-to-treat were all positive studies. (See Table 3)

**Table 3. Intention-to-Treat**

Study	1 = yes 0 = no
Birch 1998	0
Coan 1982	1
David 1998	0
Irnich 2001	1
Irnich 2002	1
Loy 1983	0
Petrie 1983	1
Petrie 1986	0

**Table 3. Intention-to-Treat** (Continued)

White 2000	0
White 2004	0

## Effects of interventions

### Acupuncture versus sham acupuncture

#### Pain intensity (VAS) post-treatment

There are two studies in this category. Both studies are low quality and positive. Both studied chronic MND [Birch 1998; White 2000]. One study is on Japanese style acupuncture with shal-

low needling over relevant points [Birch 1998] and the other on needling into tissues and muscles with electrical stimulation [White 2000]. The Birch et al's study involved a sham treatment over irrelevant points and the White et al's study involved a sham with minimal stimulation (MS) (insertion only with no stimulation) and another control with electrical stimulation over non-segmental area (ESNS). See Table 4 for numbers needed to treat (NNT) and treatment benefit values.

**Table 4. NNT and Treatment Benefit**

Control	Outcome	Study	NNT	Treatment Benefit
Sham acupuncture	Pain intensity (VAS) post-treatment	Birch 1998	5	29.8%
		White 2000 (MS)	3	29.0%
		White 2000 (ESNS)	3	25.0%
Inactive treatment	pain intensity (VAS) post-treatment	Irnich 2002 (NLA)	2	37.5%
	proportion pain relief post-treatment	Petrie 1983	2	85.9%
	pain intensity (VAS) at short term follow-up (< 3 months)	Irnich 2001	13	13.5%
		Petrie 1986	17	-10.6% (baseline differences account for this value)
		White 2004	12	15.6%
Wait-list control	pain intensity (VAS) at short term follow-up (< 3 months)	Coan 1982	3	40.6%

There is moderate evidence (2 trials, 114 participants) that acupuncture treatment is more effective for pain relief than some types of sham therapy for patients with chronic MND, measured at the end of the treatment.

## Acupuncture versus active treatment

### Pain intensity (VAS) post-treatment

There is one study in this category. This study compared acupuncture to mobilization [David 1998] and showed no differences between the two treatments. This study has inadequate power (See Table 5).

**Table 5. Power Calculations**

Study	Power Calculated	Time Course
David 1998	12%	Post treatment
David 1998	12%	Short term
Irnich 2002 (DN group)	20%	Post treatment
Petrie 1986	12%	Post treatment
Petrie 1986	8%	Short term
White 2004 (VAS)	15%	Intermediate term
White 2004 (VAS)	15%	Long term
White 2004 (NDI)	52%	Short term
White 2004 (NDI)	29%	Intermediate term
White 2004 (NDI)	28%	Long term

### Pain intensity (VAS) at short term follow-up (less than three months)

There are two studies in this category that dealt with chronic MND. One study compared acupuncture to mobilization and showed no difference [David 1998]. The other study compared acupuncture to massage and showed that acupuncture was significantly better than massage [Irnich 2001].

There is limited evidence (1 trial, 177 participants) that acupuncture is more effective for pain relief than massage for patients with chronic MND, measured at short-term follow-up.

### Subjective improvement at short term follow-up

There is one low quality study in this category, showing that patients treated with acupuncture reported 87.2% improvement and

patients treated with traction reported 53.9% at six weeks [Loy 1983]. No P value was reported in this study.

## Acupuncture versus inactive treatment

### Pain intensity (VAS) post-treatment

There are two studies in this category examining chronic MND. One study comparing acupuncture to sham TENS showed no difference between the groups [Petrie 1986]. This study was underpowered. The other study compared two types of acupuncture treatments to sham laser [Irnich 2002]. There was no difference between DN (Direct needling over Ah Shi or trigger points) and sham laser, but the NLA (non-local acupuncture according to channels) group showed significant improvement over the sham laser. This study was also underpowered (See Table 5).

There is moderate evidence (1 trial, 36 participants) that acupuncture (non-local) is more effective for pain relief than inactive treatment for patients with chronic MND, measured at the end of treatment.

#### **Pain intensity (VAS) at short term follow-up**

There are three studies on chronic MND in this category. One under-powered study comparing acupuncture to sham TENS showed no difference [Petrie 1986, Table 5]. Another study comparing acupuncture to sham laser also did not show a difference [Irnich 2001]. However, re-analysis of this study by Vickers, using regression analysis and adjusting for baseline pain [Vickers 2004], showed that acupuncture resulted in a 9.4-point greater reduction in pain over sham laser (0.9 to 18.0 points;  $P = 0.031$ ). One study comparing acupuncture to sham electroacupuncture stimulator yielded positive results at one-week follow-up, but the results were not sustained at eight-week follow-up [White 2004]. Meta-analysis of these three studies found the results favoured acupuncture with a pooled SMD of -0.37 (95% CI -0.61 to -0.12). Statistical pooling was appropriate in this instance due to statistical homogeneity ( $P = 0.66$  and  $I^2 = 0\%$ ) (See Figure 03.03).

There is moderate evidence (3 trials, 338 participants) that acupuncture is more effective than inactive treatment for pain relief for patients with chronic MND, measured at short-term follow-up.

#### **Pain intensity (VAS) at intermediate follow-up (between three and twelve months) and long-term follow-up (longer than one year)**

There is one under-powered, high quality study in this category that compared acupuncture to sham electroacupuncture stimulator and showed no difference [White 2004, Table 5].

#### **Proportion pain relief post-treatment**

There is one low quality study in this category comparing acupuncture to sham TENS. The results showed significant difference in favour of acupuncture [Petrie 1983].

#### **Disability [NDI] at short-term, intermediate-term and long-term follow-up**

There is one under-powered study in this category that compared acupuncture to sham electroacupuncture stimulator. There was no significant difference in disability between the groups [White 2004, Table 5].

#### **Acupuncture v wait-list control**

##### **Pain intensity (VAS) at short-term follow-up**

There is one study in this category showing that acupuncture is more effective at pain relief than a wait-list control for patients with NDR [Coan 1982].

There is moderate evidence (1 trial, 30 participants) that acupuncture is more effective than a wait-list control at relief for patients with NDR, measured at short-term follow-up.

Adverse effects were reported in four studies [David 1998; Irnich 2001; Irnich 2002; White 2004] and included increased in pain, bruising and dizziness. (See 'Characteristics of included studies' table for full details). No life threatening adverse effects were noted by these studies. Cost of care was not discussed in any of the studies.

For a summary of the results, see Table 6 and Table 7.

**Table 6. Summary on Level of Evidence of Benefits for Chronic MND**

Level of Evidence	Sham Control	Active Treatment	Inactive Treatment	Wait List Control
Benefit				
Strong	NA	NA	NA	NA
Moderate	Pain intensity [VAS] post treatment	NA	Pain intensity [VAS] post treatment and short term.	Pain intensity [VAS] at short term. This study included Chronic NDR
Limited	NA	Pain intensity [VAS] short term over massage	Proportion pain relief post treatment	NA
Conflicting	NA	NA	NA	NA

**Table 6. Summary on Level of Evidence of Benefits for Chronic MND (Continued)**

No evidence	NA	NA	NA	NA
No Benefit				
Strong	NA	NA	NA	NA
Moderate	NA	NA	NA	NA
Limited	NA	NA	NA	NA
Conflicting	NA	NA	NA	NA
No evidence	NA	NA	NA	NA

**Table 7. Level of Evidence by Acupuncture Type for Pain**

Acupuncture Type	Strong Evidence	Moderate Evidence	Limited Evidence	Conflicting Evidence	No Evidence
Beneficial					
Japanese: Shallow needling over relevant points; diode stimulation (Birch 1998)			chronic MND post treatment		
Style not specified: Local standard points; manual (Petrie 1983)			chronic MND post treatment		
Style not specified: Needle to tissues and muscles by dermatomal distribution; electrical (White 2000)			chronic MND post treatment		
Traditional Chinese Medicine (TCM) : Classical Oriental Meridian theory; electrical (Coan 1982)		chronic MND and NDR short term			

**Table 7. Level of Evidence by Acupuncture Type for Pain** (Continued)

TCM: Dry needling of trigger points, ear acupuncture; manual (Irnich 2001)			chronic MND short term		
TCM: Individualized non-local needling per channels and ear acupuncture; manual (Irnich 2002)		chronic MND post treatment			
Western: Individualized combination of prescriptive tender, local and distal points; manual (White 2004)		chronic MND short term at 1 week			

## DISCUSSION

The results of this review found that the specific effects of acupuncture are short-term, but have important clinical treatment benefits (Mean treatment benefit = 29.6% and specific effect over sham or inactive control mean = 28.2%). This is consistent with other reviews on acupuncture for elbow pain [Trinh 2004] and back pain [Furlan 2005]. This may explain the reason that White et al [White 2004] did not see the 30% minimal clinical significance in their study. This is possible since the White et al study is graded as a high quality study and may not exaggerate the effects of the treatment as a lower quality study might [Jadad 1996]. The result is not surprising. In our reviews of other therapies for neck disorders, the results were disappointing. It appears that the effect size of treatments for neck disorders are small even in therapies (such as injections) believed to have a large effect clinically. It is likely that in a clinical setting, both the specific and the non-specific effects of the treatments are observed, whereas in a RCT, the nonspecific effect of treatments are observed in both the experimental and the control groups. Therefore, the difference is the specific effect of the treatment and this may be smaller than what is observed clinically.

The number of acupuncture treatment sessions was found to be associated with outcome (Ezzo 2000). Ideally, there should be at least six or more acupuncture sessions. One study (Irnich 2002) intentionally studied the effect of a single treatment. Otherwise, 8/9 of the remaining studies performed at least six sessions (mean = 9.8); the study by Irnich 2001 performed five sessions. Overall, these studies were adequately dosed, based on this variable alone.

The most difficult challenge faced in this review was clinical heterogeneity. The heterogeneity appeared at many levels, such as in the sample group, the acupuncture interventions and the outcomes measured. The acupuncture interventions and the sham therapies were quite varied. In the sham therapies, the treatment varied from a non-insertion type of inactivated TENS or laser to the insertion of needles at different locations or even depths. Using the qualitative method of synthesizing the evidence has its limitations. Consistency of evidence was determined by group consensus, but this method is sensitive to how studies are categorized, since meeting the criterion of a certain level of evidence depends on the number of studies present in a category.

Weaknesses of this review rest with limitations in the primary studies. We were unable to make many firm statements about the strength of the evidence, since few therapies have been replicated in large, high quality trials. Fortunately, the quality of acupuncture studies for neck pain seems to improve over time. The two studies identified in the latest update of our search were both classified as high quality by the Jadad criteria.

Our approach to summarizing the literature has several strengths. We used a comprehensive, librarian-assisted search of multiple databases. We used teams of health care professionals to decide on article relevance and assess quality. We had at least two people extracting data and the principal investigator verified data entry. We used a group consensus approach, coupled with the Sackett and van Tulder hierarchy on the strength of the evidence. We avoided any professional bias inherent in having a single profession evaluate its literature.

## AUTHORS' CONCLUSIONS

### Implications for practice

For mechanical neck disorders, there is moderate evidence that acupuncture is more effective than some types of sham controls for pain relief, measured at the end of the treatment. There is also moderate evidence that acupuncture is more effective than inactive treatment for pain relief, measured at the end of the treatment; this

effect is still seen at short-term follow-up. For neck disorders with radicular symptoms, there is moderate evidence that acupuncture is more effective than a wait-list control for pain relief at short-term follow-up. Acupuncture treatments appear to be relatively safe.

### Implications for research

There is a need for acupuncture trials with adequate sample size that addressing the long-term efficacy or effectiveness of acupuncture compared to sham acupuncture.

## ACKNOWLEDGEMENTS

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\* Indicates the major publication for the study

## CHARACTERISTICS OF STUDIES

### Characteristics of included studies [ordered by study ID]

#### Birch 1998

Methods	<p>RCT</p> <p>Number Analyzed/Randomized: 36/46</p> <p>Intention-to-treat: NR</p> <p>Power Analysis: NR</p> <p>Funding Source: Intramural grant of the Anesthesia Department of Bingham and Woman's Hospital, Boston</p>	
Participants	<p>Myofascial neck pain lasting least six months</p> <p>Patients recruitment: From hospital based pain management centre, a neurology clinic and public announcement</p>	
Interventions	<p>INDEX TREATMENT:</p> <p>Group 1 - Relevant Acupuncture (believed to be effective for the condition treated)</p> <p>Predetermined relevant points, shallow needling (2-3 mm) used with copper wire containing silicone diode applied for stage 1 of session (10 minutes), infrared lamp also used over points during stage 2 of treatment (10 minutes). Treatment done without deqi by a licensed acupuncturist with 13 years of experience.</p> <p>COMPARISON TREATMENT 1:</p> <p>Group 2 - Irrelevant Acupuncture</p> <p>Same treatment dosage and duration as Group 1, using predetermined irrelevant points with copper wire attached but connections severed (stage 1) and placebo light (no heat during stage 2)</p> <p>COMPARISON TREATMENT 2:</p> <p>Group 3 - Medical Control</p> <p>NSAID- 500 mg OD Trilisate, no acupuncture</p> <p>CO-INTERVENTION: avoided</p> <p>Treatment Schedule: 14 sessions over 12 weeks, each session 30 minutes duration</p> <p>Duration of Follow-up: 12 weeks</p>	
Outcomes	<p>PAIN INTENSITY: (VAS 0-10 scale)</p> <p>Baseline mean: Relevant 4.8, Irrelevant 4.7, Control 4.9</p> <p>End of study mean: Relevant 1.87, Irrelevant 3.37, Control 4.73</p> <p>Absolute Benefit: Relevant 2.93, Irrelevant 1.33, Control 0.17</p> <p>Reported Results: Relevant acupuncture group had significantly lower pain scores, including hourly ratings SMD -2.52 (95% CI Random -3.49,-1.54)</p> <p>Reason for Dropouts: 2 moved, 6 not specified and 2 lost to contact</p> <p>Adverse Effects: NR</p> <p>Cost of Care: NR</p>	
Notes		
<i>Risk of bias</i>		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

**Coan 1982**

Methods	RCT Number Analyzed/Randomized: 30/30 Intention-to-treat: NR Power Analysis: NR Funding Source: NR	
Participants	Chronic mechanical neck disorder with radicular symptoms or signs Patients recruitment: From newspaper	
Interventions	INDEX TREATMENT: Acupuncture (treatment group) Technique according to classical oriental meridian theory healing by stimulating the energy flow in the body; acupuncture points varied between patients and varied day to day; electroacupuncture and moxibustion were used in some patients; other treatment parameters = not specified COMPARISON: Wait List (control group) Treatment Schedule: 4 weeks (3 to 4 times/week) Duration of Follow-up: 8 weeks following treatment CO-INTERVENTION: comparable between index and control groups	
Outcomes	PAIN (VAS scale 0 to 10) Baseline mean: acupuncture 6.0, control 5.3 End of study mean: acupuncture 3.6, control 5.4 Absolute Benefit: acupuncture 2.4, control -0.1 Reported Results: significant improvement in treatment group at 8 weeks follow-up for treatment group compared to follow-up at 8.8 weeks for control group Reason for Dropouts: NA Adverse Effects: NR Cost of Care: NR	
Notes		
<b><i>Risk of bias</i></b>		
<b>Item</b>	<b>Authors' judgement</b>	<b>Description</b>
Allocation concealment?	Unclear	B - Unclear

**David 1998**

Methods	RCT Number Analyzed/Randomized: 51/70 Intention-to-treat: NR Power Analysis: NR Funding Source: NR	
Participants	Chronic mechanical neck disorder and whiplash (defined by trialists as pain lasting at least 6 weeks) Patient Recruitment: Referred by general practitioners, orthopedic surgeons and rheumatologists	

David 1998 (Continued)

Interventions	<p>INDEX TREATMENT: Acupuncture          Local needling of trigger points with additional regional needling and LI4. Needles were inserted for 15 minutes and manually manipulated at 7 minutes by physician.          COMPARISON TREATMENT: Physiotherapy          Standard localized mobilization techniques described by Maitland          CO-INTERVENTION: avoided          Treatment Schedule: 6 sessions once/week for both groups          Duration of Follow-up: 6 months</p>	
Outcomes	<p>PAIN INTENSITY: (VAS % scale)          Baseline mean: Acupuncture 51(CI 95% 45,58), Physiotherapy 51(CI 95% 42,60)          Reported Results: not significant immediately post- treatment or at 6 month follow-up          SMD -0.32 [95% CI -0.85,0.21] post- treatment          Reason for Dropouts: NR          Adverse Effects: no side effects occurred for acupuncture group, NR for physiotherapy group          Cost of Care: NR</p>	
Notes		
<b>Risk of bias</b>		
<b>Item</b>	<b>Authors' judgement</b>	<b>Description</b>
Allocation concealment?	Yes	A - Adequate

Irnich 2001

Methods	<p>RCT          Number Analyzed/Randomized: 177/177          Intention-to-treat: reported          Power Analysis: NR          Funding Source: German Ministry for Education and Research. Manuscript preparation supported by German Medical Acupuncture Association.</p>	
Participants	<p>Chronic mechanical neck disorder          Patient Recruitment: Outpatient departments at the University of Munich</p>	
Interventions	<p>INDEX TREATMENT: Acupuncture          TCM plus ear acupuncture and dry needling of myofascial points. Local points - UB10, active myofascial trigger points were located predominantly in the trapezius (nearby GB20) and levator scapulae (nearby SI14). Distal points - SI3, UB60, Liv3, GB34, TW5, ear point (cervical spine).          COMPARISON TREATMENT 1: Massage          Conventional western massage          COMPARISON TREATMENT 2: Sham laser acupuncture (control)          Laser pen inactivated - each point treated for 2 minutes.          CO-INTERVENTION: Not reported          Treatment Schedule: 5 sessions over 3 weeks, each session 30 minutes duration.          Duration of Follow-up: 12 weeks</p>	

**Irnich 2001** (Continued)

Outcomes	<p>PAIN INTENSITY: (VAS 100-point scale) for motion-related pain            Baseline mean: Acupuncture 54.15, Massage 54.71, Sham laser acupuncture 57.15            End of study mean: Acupuncture 28.27, Massage 46.63, Sham laser acupuncture 40.82            Absolute Benefit: Acupuncture 25.88, Massage 8.08, Sham laser acupuncture 16.33            Reported Results: acupuncture significantly better than massage at one week follow-up, not significant at 3 months            SMD -0.58(95% CI Random -0.97 to -0.20) at 1 week follow-up            SMD -0.25(95% CI Random -0.62 to 0.13) at 3 months follow-up            Reason for Dropouts: withdrew, refused treatment, accident, diagnosed with other medical condition, lost to follow-up            Adverse Effects: for acupuncture and massage groups, complaints of slight pain and low blood pressure. For sham laser acupuncture, complaints of slight pain, low blood pressure and sweating            Cost of Care: NR</p>	
Notes		
<b>Risk of bias</b>		
<b>Item</b>	<b>Authors' judgement</b>	<b>Description</b>
Allocation concealment?	Unclear	B - Unclear

**Irnich 2002**

Methods	<p>RCT, crossover            Number Analyzed/Randomized: 34/36            Intention-to-treat: NA            Power Analysis: NR            Funding Source: German Ministry for Education and Research.</p>	
Participants	<p>Chronic neck disorder without radicular symptoms            Patient Recruitment: Out patients from the Department of Physical Medicine and Rehabilitation and the Interdisciplinary Pain Unit at the University of Munich.</p>	
Interventions	<p>INDEX TREATMENT 1: Non-local needle acupuncture (NLA) at distant points according to the theory of channels of TCM and varied individually by therapists with 8 years experience.            INDEX TREATMENT 2: Dry needling (DN) of local myofascial trigger points with strong manual stimulation of 'ah shi' points            COMPARISON TREATMENT: Sham laser acupuncture (SHAM)            CO-INTERVENTION: not reported            Treatment Schedule: each participant treated once with all interventions with a one week wash out period, each session 30 minutes duration            Duration of Follow-up: immediately following completion of each treatment</p>	
Outcomes	<p>PAIN INTENSITY:(VAS 100 mm scale) for motion related pain            Baseline mean: acupuncture (NLA) 35.0, (DN) 33.4, Sham laser acupuncture 30.4            End of study mean: acupuncture (NLA) 19.1, (DN) 29.2, sham 28.0            Absolute Benefit: acupuncture (NLA) 15.9, (DN) 4.2, Sham laser acupuncture 2.4</p>	

**Irnich 2002** (Continued)

	<p>Reported Results: NLA effective, DN not effective when compared to the sham  SMD -0.49 (95% CI Random -0.98, -0.01) NLA group  SMD 0.10 (95% CI Random -0.38, 0.58) DN group  RANGE OF MOTION:  Baseline mean: acupuncture (NLA) 46.7, (DN) 45.7, Sham laser acupuncture 47.1  End of study mean: acupuncture (NLA) 50.7, (DN) 48.1, Sham laser acupuncture 47.4  Reported Results: both acupuncture groups showed slight improvement in range of motion compared to sham  Reason for Dropouts: NA  Adverse Effects: no serious adverse effects however one subject had mild hypotonia and sweating  Cost of Care: NR</p>	
Notes		
<b>Risk of bias</b>		
<b>Item</b>	<b>Authors' judgement</b>	<b>Description</b>
Allocation concealment?	Yes	A - Adequate

**Loy 1983**

Methods	<p>quasi-RCT  Number Analyzed/Randomised: 53/60  Intention-to-treat: NR  Power Analysis: NR  Funding Source: NR</p>	
Participants	<p>Mechanical neck disorder with degenerative changes (duration of disorder not specified)  Patient Recruitment: Orthopedic clinic, University of Hong Kong.</p>	
Interventions	<p>INDEX TREATMENT:  Electroacupuncture [EAP] Group: electroacupuncture with 2 to 6 points for 30 to 40 minutes; 3 sessions/week.  COMPARISON TREATMENT:  Physiotherapy [PT] Group: Intermittent mechanized neck-halter traction for 20 minutes, shortwave diathermy  CO-INTERVENTION: avoided in trial design  Treatment Schedule: 6 weeks, 18 sessions  Duration of Follow-up: none</p>	
Outcomes	<p>PATIENT PERCEIVED EFFECT [symptomatic improvement (%)]:  Baseline: NR  Absolute Benefit: EAP 87.2%, PT 53.9% improvement;  Reported Results: significant favouring electroacupuncture  Reason for Dropouts: NR  Adverse Effects: NR  Cost of Care: NR</p>	

**Loy 1983** (Continued)

Notes		
<b>Risk of bias</b>		
<b>Item</b>	<b>Authors' judgement</b>	<b>Description</b>
Allocation concealment?	Unclear	B - Unclear

**Petrie 1983**

Methods	RCT Number Analyzed/Randomized: 13/13 Intention-to-treat: NR Power Analysis: NR Funding Source: NR	
Participants	Chronic mechanical neck disorder with radicular signs or symptoms Patient Recruitment: Out-patients from Addenbrooke's Hospital, Cambridge, UK	
Interventions	INDEX TREATMENT: Acupuncture group 5 standard points used - Du14, GB20 bilateral, GB 21 bilateral; 28 g needle used to achieve sensation of Teh Chi (deqi); needles manipulated 10 after insertion and on removal COMPARISON: Placebo TNS group Sham electrical stimulation with lead electrode applied to each side of the neck, 5 cm lateral to C7 CO-INTERVENTION: comparable between index and control groups Treatment Schedule: 4 weeks (2 times/week), each session 20 minutes Duration of Follow-up: none	
Outcomes	PAIN INTENSITY: pain relief score (5 point scale) Baseline mean: NR End of study mean: NR Reported Results: significant improvement favoring acupuncture Reason for Dropouts: NA Side Effects: NR Cost of Care: NR	
Notes		
<b>Risk of bias</b>		
<b>Item</b>	<b>Authors' judgement</b>	<b>Description</b>
Allocation concealment?	Unclear	B - Unclear

**Petrie 1986**

Methods	RCT Number Analyzed/Randomized: 25/26 Intention-to-treat: NR Power Analysis: NR Funding Source: NR	
Participants	Chronic mechanical neck disorder Patient Recruitment: Hospitalized patients from Queen Elizabeth Hospital, Palmersion North, New Zealand.	
Interventions	INDEX TREATMENT: Acupuncture group 5 predetermined acupuncture points - Du14, GB20 and GB21 bilaterally manually stimulated on insertion to Teh Chi (deqi) and at 5-minute intervals. COMPARISON TREATMENT: Sham TNS TNS electrodes placed at the base of the neck connected to an oscilloscope display without a current. Examiner re-entered the room at 5-minute intervals to check display. CO-INTERVENTION: Analgesics comparable between groups Treatment Schedule: 2 sessions/week for 4 weeks, each session 20 minutes duration Duration of Follow-up: 4 weeks	
Outcomes	PAIN INTENSITY:(4-item VAS scale) Baseline mean: Acupuncture 47.08, Sham TNS 31.67 End of study mean: Acupuncture 31.77, Sham TNS 24.72 at 4-week follow-up Absolute Benefit: Acupuncture 15.31, Sham TNS 6.95 Reported Results: no significance between groups SMD -0.17(95%CI Random -0.62,0.96) post treatment SMD -0.30(95%CI Random -1.09, 0.49) at 4 weeks follow-up Reason for dropouts: unrelated surgery, lost to follow-up Adverse Effects: NR Cost of Care: NR	
Notes		
<b><i>Risk of bias</i></b>		
<b>Item</b>	<b>Authors' judgement</b>	<b>Description</b>
Allocation concealment?	Unclear	B - Unclear

**White 2000**

Methods	RCT/crossover Number Analyzed/Randomized: 68/68 Intention-to-treat: NR Power Analysis: NR Funding Source: Forest Park Institute, the Ambulatory Anesthesia Research Foundation, the White Mountain Institute.	
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**White 2000** (Continued)

Participants	Chronic mechanical neck disorder, degenerative changes Patient Recruitment: Eugene McDermott Centre for Pain Management, Department of Anesthesiology and Pain Management, University of Texas Southwestern Medical Centre, Dallas, Texas	
Interventions	<p>INDEX TREATMENT 1: Local dermatomal stimulation 10 acupuncture-like needle probes inserted 2 to 4 cm into soft tissue/paraspinous muscles in the cervical region, alternating frequency of 15 Hz to 30 Hz to produce gentle tapping sensation without muscle contraction.</p> <p>COMPARISON TREATMENT 1: Remote dermatomal stimulation 10 acupuncture-like needle probes inserted into soft tissue/paraspinous muscle in the lower back region with identical electrical therapy characteristics of the local dermatomal stimulation group</p> <p>COMPARISON TREATMENT 2: Control needles only Needles inserted in the cervical region without electrical stimulation</p> <p>CO-INTERVENTION: Analgesics comparable between groups</p> <p>Treatment Schedule: 3 times/week for 3 consecutive weeks with 1 week off between each modality, each session 30 minutes duration</p> <p>Duration of Follow-up: 24 hours after completion of each 3 week treatment period</p>	
Outcomes	<p>PAIN INTENSITY:(10 cm VAS scale) Baseline mean: NR End of study mean: NR Reported Results: significant difference between groups favoring local dermatomal stimulation Reason for dropouts: NA Adverse effects: NR Cost of Care: NR</p>	
Notes		
<b>Risk of bias</b>		
<b>Item</b>	<b>Authors' judgement</b>	<b>Description</b>
Allocation concealment?	Unclear	B - Unclear

**White 2004**

Methods	<p>RCT Number Analyzed/Randomized: 124/135 Intention-to-treat: NR Power Analysis: calculated Funding Source: Henry Smiths Charity, Hospital Savings Association, Laing Foundation.</p>	
Participants	<p>Chronic mechanical neck disorder Patient Recruitment: Outpatient departments of Southampton General Hospital and Salisbury District Hospital, United Kingdom.</p>	

White 2004 (Continued)

Interventions	<p>INDEX TREATMENT: Acupuncture using single use needles, points based on individualized western acupuncture techniques previously reported as being effective in neck pain, 6 points on average, each session 20 minutes duration. Manual stimulation to deqi. 8 treatments over 4 weeks by physiotherapists with 7 years of experience.</p> <p>COMPARISON TREATMENT: Mock TENS electroacupuncture stimulator, up to 8 points could be stimulated at one time, session time not reported</p> <p>CO-INTERVENTION: comparable between index and control groups</p> <p>Treatment Schedule: both groups received 8 sessions over four weeks</p> <p>Duration of Follow-up: one and eight weeks, 6 and 12 months</p>	
Outcomes	<p>PAIN INTENSITY:(100 mm VAS scale)</p> <p>Baseline mean: 49.6 acupuncture, 54.1 mock TENS</p> <p>End of study mean: 20.39 acupuncture, 30.69 mock TENS at 1 week; 17.29 acupuncture, 23.19 mock TENS at 8 weeks; 19.21 acupuncture, 21.02 mock TENS at 6 months; 20.91 acupuncture, 24.36 mock TENS at 1 year</p> <p>Absolute Benefit: 29.21 acupuncture, 23.41 mock TENS at 1 week; 32.31 acupuncture, 30.91 mock TENS at 8 weeks;30.39 acupuncture, 33.08 mock TENS at 6 months; 28.69 acupuncture, 29.74 mock TENS at 1 year</p> <p>Reported Results: acupuncture reduced pain, not a clinically effective difference between groups</p> <p>SMD-0.48(95%CI Random -0.84,-0.13) at 1 week</p> <p>SMD-0.29(95%CI Random -0.66,0.07) at 8 weeks</p> <p>SMD-0.07(95%CI Random-0.45,0.30) at 6 months</p> <p>SMD-0.13(95% CI Random-0.51,0.25) at 1 year</p> <p>QUALITY OF LIFE AND FUNCTION:(SF-36 and NDI scores)</p> <p>Reported Results: significant improvement in both treatment groups</p> <p>Adverse Effects: acupuncture group included increase in symptoms, faintness, slight swelling of hand, bruise, mild headache, euphoria and enhanced vision, dizziness; placebo included discomfort during treatment, mild headache, tiredness, faintness, nausea, tingling in the thumb, dizziness, uncomfortable cold feeling of electrodes</p> <p>Cost of Care: NR</p>	
Notes		
<b>Risk of bias</b>		
<b>Item</b>	<b>Authors' judgement</b>	<b>Description</b>
Allocation concealment?	Unclear	B - Unclear

NR = not reported  
 NA = not applicable  
 cm = centimetre  
 mm = millimetre  
 mg = milligram  
 g = gauge  
 OD = daily  
 VAS = visual analog scale  
 SMD = standardized mean difference  
 CI = confidence interval  
 NDI = Neck Disability Index

**Characteristics of excluded studies** *[ordered by study ID]*

Emery 1986	1. Population = anklyosing spondylitis
Gallacchi 1981	1. Population = tendomyotonic cervical and lumbar syndrome; unable to separate data
Gaw 1975	1. Population = pain in many areas; unable to separate data
Guanygue 2001	1. Intervention included other treatments with acupuncture. The effect of acupuncture could not be isolated
Kisiel 1996	1. Population = neck and shoulder pain; cannot split data
Teng 1973	1. abstract only; unable to obtain further information
Zhang 1996	1. Population: Included myelopathy 2. Design: appeared to be before after study or case series report

## DATA AND ANALYSES

### Comparison 1. Acupuncture v sham treatment

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 pain intensity (VAS) post treatment	2		Std. Mean Difference (IV, Random, 95% CI)	Totals not selected
1.1 chronic MND 12 w treatment	1		Std. Mean Difference (IV, Random, 95% CI)	Not estimable
1.2 chronic MND MS 3w treatment	1		Std. Mean Difference (IV, Random, 95% CI)	Not estimable
1.3 chronic MND ESNS 3w treatment	1		Std. Mean Difference (IV, Random, 95% CI)	Not estimable

### Comparison 2. Acupuncture v active treatment

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 pain intensity (VAS) post treatment	1		Std. Mean Difference (IV, Random, 95% CI)	Totals not selected
1.1 v mobilization: subacute/chronic MND at 6w treatment	1		Std. Mean Difference (IV, Random, 95% CI)	Not estimable
2 pain intensity (VAS) at short term follow-up (<3m)	2		Std. Mean Difference (IV, Random, 95% CI)	Totals not selected
2.1 v Mobilization: subacute/chronic at 6w treatment + 18w follow-up	1		Std. Mean Difference (IV, Random, 95% CI)	Not estimable
2.2 v Massage: chronic at 2w treatment + 1w follow-up	1		Std. Mean Difference (IV, Random, 95% CI)	Not estimable
3 subjective improvement (% symptoms)			Other data	No numeric data
3.1 v Traction: chronic MND/DC at 6w treatment			Other data	No numeric data

### Comparison 3. Acupuncture v inactive control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 pain intensity (VAS) post treatment	2		Std. Mean Difference (IV, Random, 95% CI)	Totals not selected
1.1 chronic MND DN group 1 treatment	1		Std. Mean Difference (IV, Random, 95% CI)	Not estimable
1.2 chronic MND NLA group 1 treatment	1		Std. Mean Difference (IV, Random, 95% CI)	Not estimable
1.3 chronic MND 4w treatment	1		Std. Mean Difference (IV, Random, 95% CI)	Not estimable
2 proportion pain relief post treatment	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
3 pain intensity (VAS) at short term follow-up (<3m)	3		Std. Mean Difference (IV, Random, 95% CI)	Totals not selected
3.1 chronic at 4w treatment + 4w follow-up	1		Std. Mean Difference (IV, Random, 95% CI)	Not estimable
3.2 chronic at 4w treatment + 1w follow-up	1		Std. Mean Difference (IV, Random, 95% CI)	Not estimable
3.3 chronic at 2w treatment + 1 w follow-up	1		Std. Mean Difference (IV, Random, 95% CI)	Not estimable
4 pain intensity (VAS) at short term follow up (<3m) White 8w	1		Std. Mean Difference (IV, Random, 95% CI)	Totals not selected
4.1 chronic at 4w treatment + 8w follow up	1		Std. Mean Difference (IV, Random, 95% CI)	Not estimable
5 pain intensity (VAS) at intermediate term follow-up (>3m and <1y)	1		Std. Mean Difference (IV, Random, 95% CI)	Totals not selected
5.1 chronic at 4w treatment + 6m follow-up	1		Std. Mean Difference (IV, Random, 95% CI)	Not estimable
6 pain intensity (VAS) at long term follow-up (>1y)	1		Std. Mean Difference (IV, Random, 95% CI)	Totals not selected
6.1 chronic at 4w treatment + 12m follow-up	1		Std. Mean Difference (IV, Random, 95% CI)	Not estimable
7 disability (NDI) at short term follow-up (<3m)	1		Std. Mean Difference (IV, Random, 95% CI)	Totals not selected
7.1 chronic at 4w treatment + 1w follow-up	1		Std. Mean Difference (IV, Random, 95% CI)	Not estimable
7.2 chronic at 4w treatment + 8w follow-up	1		Std. Mean Difference (IV, Random, 95% CI)	Not estimable
8 disability (NDI) at intermediate follow-up (3m and <1y)	1		Std. Mean Difference (IV, Random, 95% CI)	Totals not selected
8.1 chronic at 4w treatment + 6m follow-up	1		Std. Mean Difference (IV, Random, 95% CI)	Not estimable
9 disability (NDI) at long term follow-up (>1y)	1		Std. Mean Difference (IV, Random, 95% CI)	Totals not selected

9.1 chronic at 4w treatment + 12m follow-up

1

Std. Mean Difference (IV, Random, 95% CI)

Not estimable

#### Comparison 4. Acupuncture v wait-list

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 pain intensity (VAS) at short term follow-up (<3 m)	1		Std. Mean Difference (IV, Random, 95% CI)	Totals not selected
1.1 v wait list: chronic NDR at 4w treatment + 8w follow-up	1		Std. Mean Difference (IV, Random, 95% CI)	Not estimable

#### Analysis 1.1. Comparison 1 Acupuncture v sham treatment, Outcome 1 pain intensity (VAS) post treatment.

Review: Acupuncture for neck disorders

Comparison: 1 Acupuncture v sham treatment

Outcome: 1 pain intensity (VAS) post treatment

Study or subgroup	Treatment		Control		Std. Mean Difference IV,Random,95% CI	Std. Mean Difference IV,Random,95% CI
	N	Mean(SD)	N	Mean(SD)		
1 chronic MND 12 w treatment						
Birch 1998	15	1.87 (1.9)	16	3.37 (2.14)	-	-0.72 [ -1.45, 0.01 ]
2 chronic MND MS 3w treatment						
White 2000	23	-38 (17)	23	-9 (16)	-	-1.73 [ -2.41, -1.04 ]
3 chronic MND ESNS 3w treatment						
White 2000	23	-38 (17)	23	-13 (18)	-	-1.40 [ -2.05, -0.75 ]

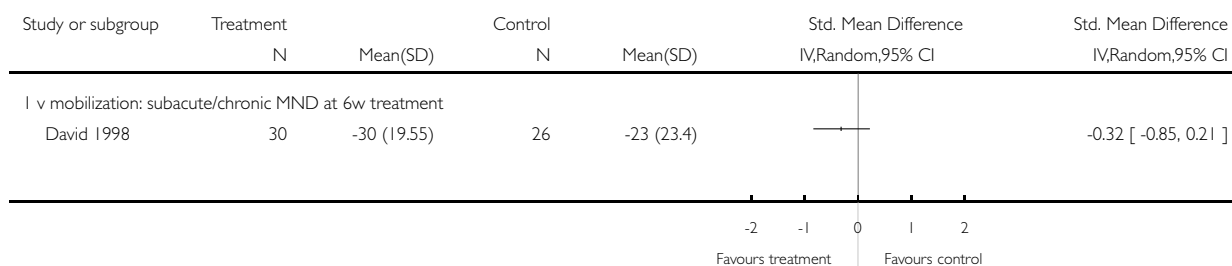
-4 -2 0 2 4  
Favours treatment Favours control

**Analysis 2.1. Comparison 2 Acupuncture v active treatment, Outcome 1 pain intensity (VAS) post treatment.**

Review: Acupuncture for neck disorders

Comparison: 2 Acupuncture v active treatment

Outcome: 1 pain intensity (VAS) post treatment

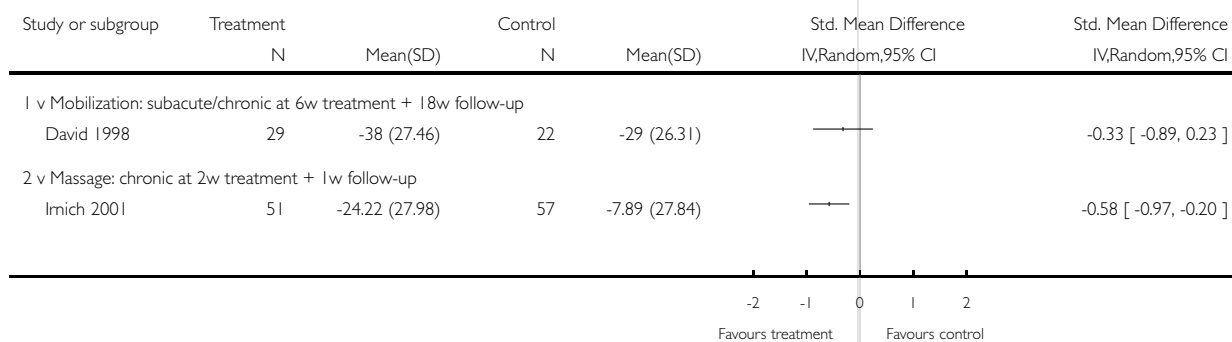


**Analysis 2.2. Comparison 2 Acupuncture v active treatment, Outcome 2 pain intensity (VAS) at short term follow-up (<3m).**

Review: Acupuncture for neck disorders

Comparison: 2 Acupuncture v active treatment

Outcome: 2 pain intensity (VAS) at short term follow-up (<3m)



**Analysis 2.3. Comparison 2 Acupuncture v active treatment, Outcome 3 subjective improvement (% symptoms).**

subjective improvement (% symptoms)

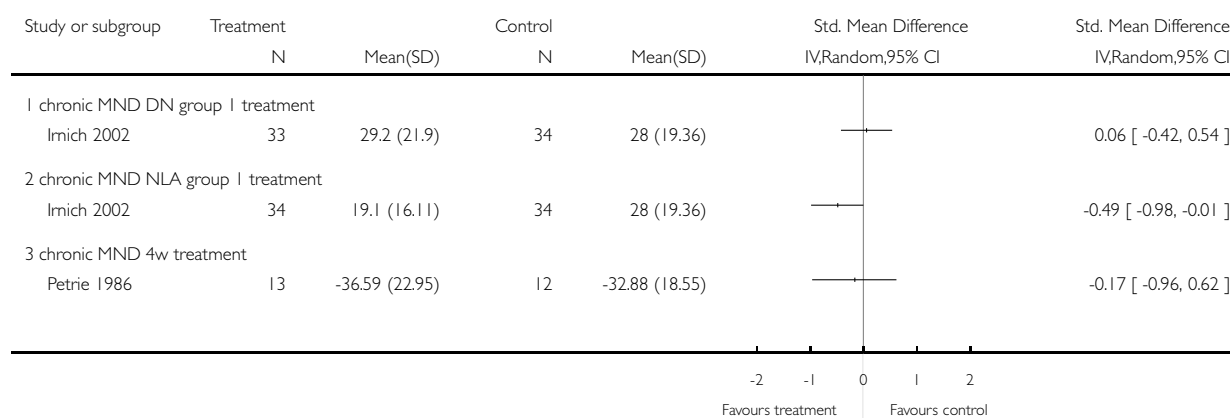
v Traction: chronic MND/DC at 6w treatment

**subjective improvement (% symptoms)** (Continued)

Loy 1983	EAP 87.2 % improvement, PT 53.9% improvement
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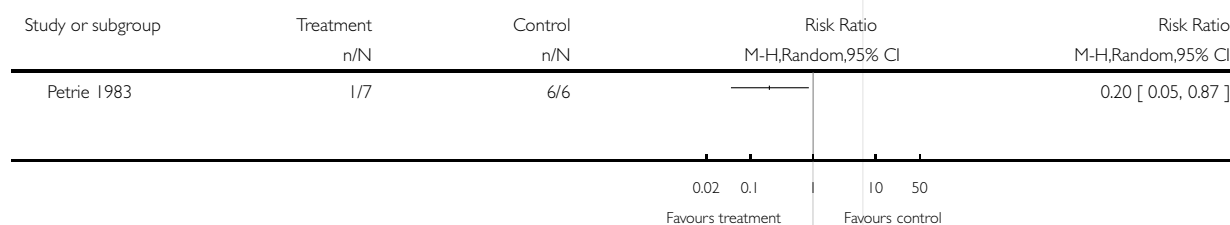
**Analysis 3.1. Comparison 3 Acupuncture v inactive control, Outcome 1 pain intensity (VAS) post treatment.**

Review: Acupuncture for neck disorders  
 Comparison: 3 Acupuncture v inactive control  
 Outcome: 1 pain intensity (VAS) post treatment



**Analysis 3.2. Comparison 3 Acupuncture v inactive control, Outcome 2 proportion pain relief post treatment.**

Review: Acupuncture for neck disorders  
 Comparison: 3 Acupuncture v inactive control  
 Outcome: 2 proportion pain relief post treatment

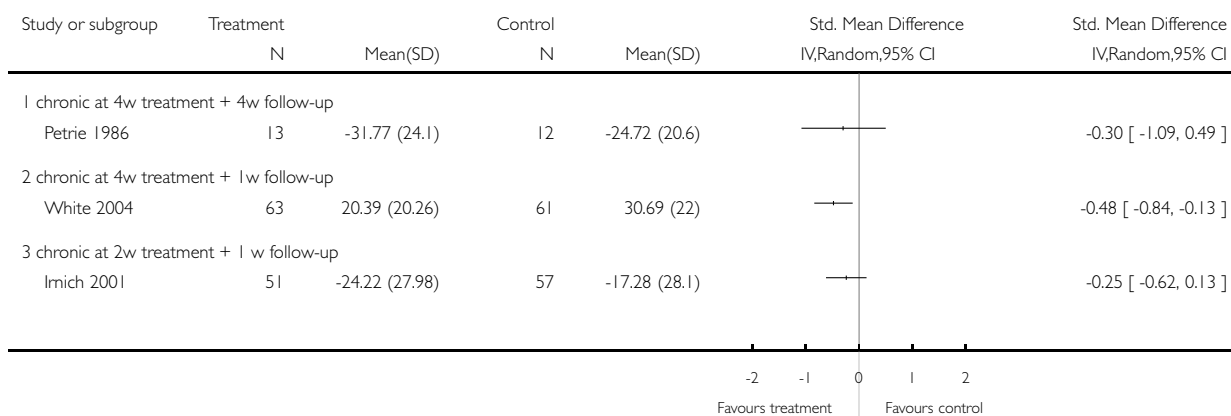


**Analysis 3.3. Comparison 3 Acupuncture v inactive control, Outcome 3 pain intensity (VAS) at short term follow-up (<3m).**

Review: Acupuncture for neck disorders

Comparison: 3 Acupuncture v inactive control

Outcome: 3 pain intensity (VAS) at short term follow-up (<3m)

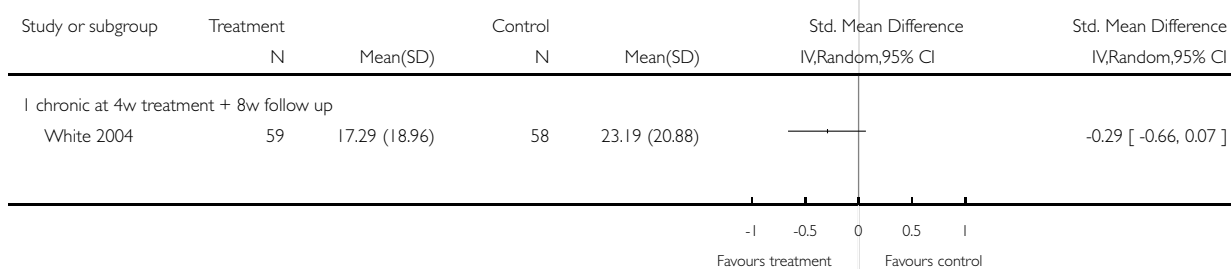


**Analysis 3.4. Comparison 3 Acupuncture v inactive control, Outcome 4 pain intensity (VAS) at short term follow up (<3m) White 8w.**

Review: Acupuncture for neck disorders

Comparison: 3 Acupuncture v inactive control

Outcome: 4 pain intensity (VAS) at short term follow up (<3m) White 8w

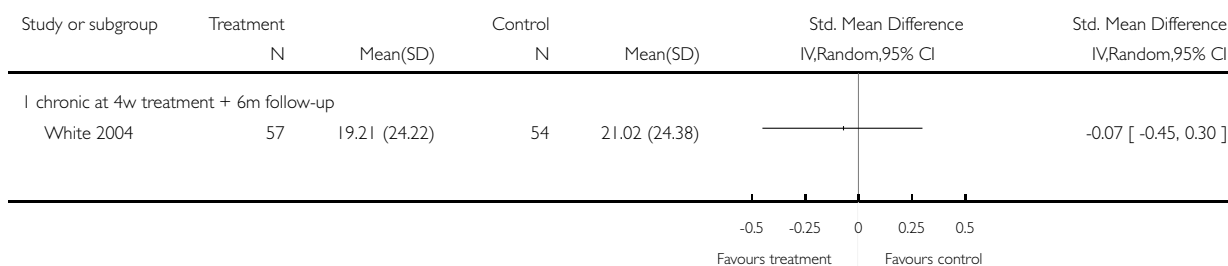


**Analysis 3.5. Comparison 3 Acupuncture v inactive control, Outcome 5 pain intensity (VAS) at intermediate term follow-up (>3m and <1y).**

Review: Acupuncture for neck disorders

Comparison: 3 Acupuncture v inactive control

Outcome: 5 pain intensity (VAS) at intermediate term follow-up (>3m and <1y)

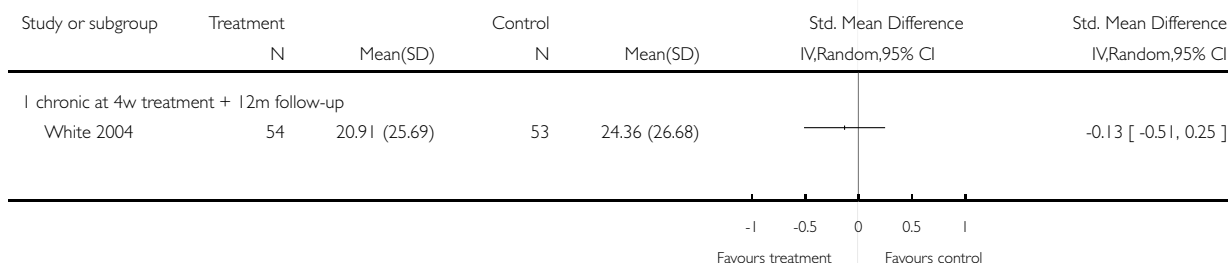


**Analysis 3.6. Comparison 3 Acupuncture v inactive control, Outcome 6 pain intensity (VAS) at long term follow-up (>1y).**

Review: Acupuncture for neck disorders

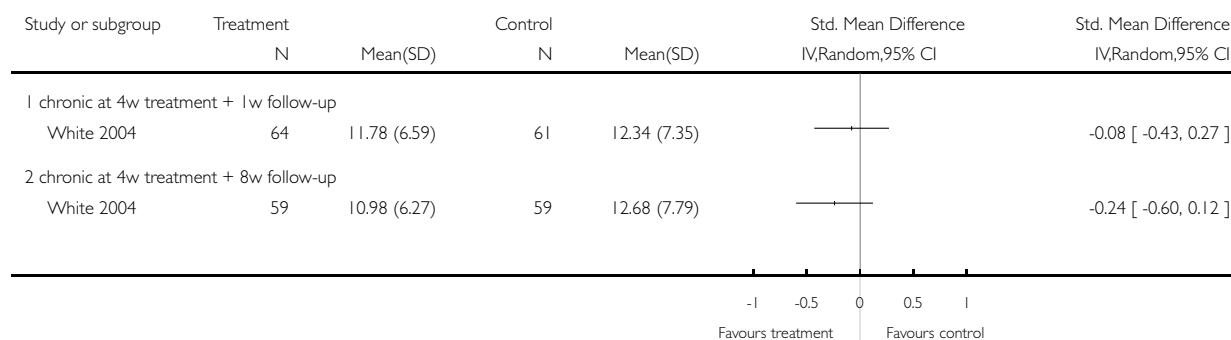
Comparison: 3 Acupuncture v inactive control

Outcome: 6 pain intensity (VAS) at long term follow-up (>1y)



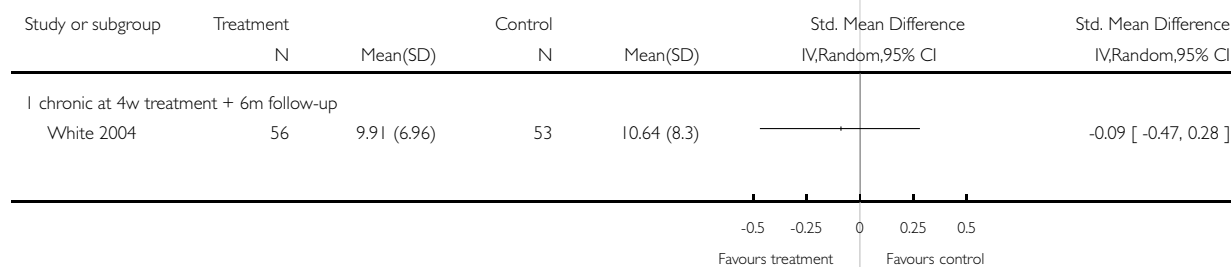
**Analysis 3.7. Comparison 3 Acupuncture v inactive control, Outcome 7 disability (NDI) at short term follow-up (<3m).**

Review: Acupuncture for neck disorders  
 Comparison: 3 Acupuncture v inactive control  
 Outcome: 7 disability (NDI) at short term follow-up (<3m)



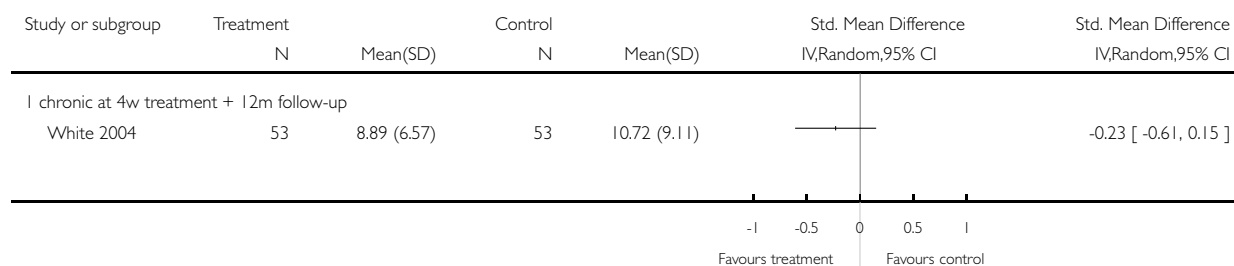
**Analysis 3.8. Comparison 3 Acupuncture v inactive control, Outcome 8 disability (NDI) at intermediate follow-up (3m and <1y).**

Review: Acupuncture for neck disorders  
 Comparison: 3 Acupuncture v inactive control  
 Outcome: 8 disability (NDI) at intermediate follow-up (3m and <1y)



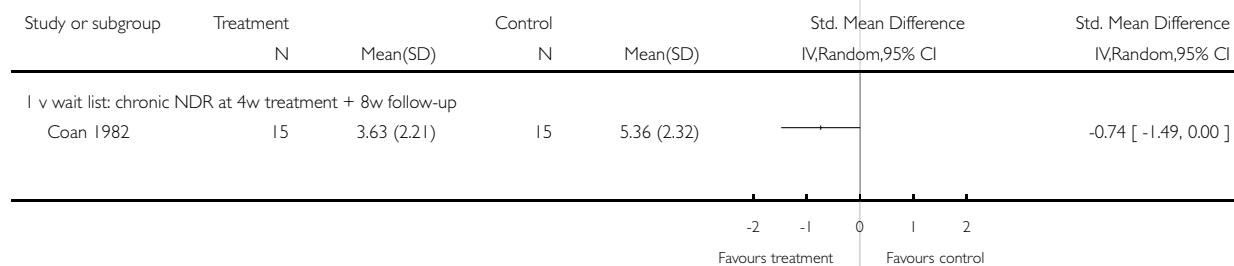
**Analysis 3.9. Comparison 3 Acupuncture v inactive control, Outcome 9 disability (NDI) at long term follow-up (>1y).**

Review: Acupuncture for neck disorders  
 Comparison: 3 Acupuncture v inactive control  
 Outcome: 9 disability (NDI) at long term follow-up (>1y)



**Analysis 4.1. Comparison 4 Acupuncture v wait-list, Outcome 1 pain intensity (VAS) at short term follow-up (<3 m).**

Review: Acupuncture for neck disorders  
 Comparison: 4 Acupuncture v wait-list  
 Outcome: 1 pain intensity (VAS) at short term follow-up (<3 m)



## APPENDICES

### Appendix 1. MEDLINE search strategy

1. neck/ or neck muscles/ or exp cervical plexus/ or exp cervical vertebrae/ or Atlanto-Axial Joint/ or atlanto-occipital joint/ or axis/ or atlas/ or spinal nerve roots/ or exp brachial plexus/
2. (odontoid or cervical or occip: or atlant:).tw.
3. 1 or 2
4. exp arthritis/ or exp myofascial pain syndromes/ or fibromyalgia/ or spondylitis/ or exp spinal osteophytosis/ or spondylolisthesis/
5. exp headache/ and cervic:.tw.
6. whiplash injuries/ or cervical rib syndrome/ or torticollis/ or cervico-brachial neuralgia.ti,ab,sh. or exp radiculitis/ or polyradiculitis/ or polyradiculoneuritis/ or thoracic outlet syndrome/
7. (monoradicul: or monoradicl:).tw.
8. 4 or 5 or 6 or 7
9. random:.ti,ab,sh.
10. randomized controlled trial.pt.
11. double-blind method/
12. single blind method/
13. placebos/
14. clinical trial.pt.
15. exp clinical trials/
16. controlled clinical trial.pt.
17. (clin\$ adj25 trial\$).ti,ab.
18. ((singl\$ or doubl\$ or trebl\$) adj25 (blind\$ or mask\$)).ti,ab.
19. placebo\$.ti,ab.
20. or/9-19
21. exp arthritis/rh,th or exp myofascial pain syndromes/rh,th or fibromyalgia/rh,th or spondylitis/rh,th or exp spinal osteophytosis/ rh,th or spondylosis/rh,th or spondylolisthesis/rh,th
22. exp headache/rh,th and cervic:.tw.
23. whiplash injuries/rh,th or cervical rib syndrome/rh,th or thoracic outlet syndrome/rh,th or torticollis/rh,th or cervico-brachial neuralgia/rh,th or exp radiculitis/rh,th or polyradiculitis/rh,th or polyradiculoneuritis/rh,th
24. or/21-23
25. exp alternative medicine/ or Acupuncture/
26. (acupunct: or traditional medicine).tw.
27. or/25-26
28. 3 and 24
29. 3 and 8 and 27
30. 28 or 29
31. 20 and 30

### Appendix 2. EMBASE search strategy

- 1 exp neck/
- 2 exp Cervical Plexus/
- 3 exp Cervical Spine/
- 4 Atlantoaxial Joint/
- 5 Atlantooccipital Joint/
- 6 AXIS/
- 7 ATLAS/
- 8 "Spinal Root"/
- 9 exp Brachial Plexus/
- 10 (odontoid or cervical or occip: or atlant:).tw.
- 11 or/1-10
- 12 exp ARTHRITIS/

13 exp myofascial pain syndromes/  
 14 fibromyalgia/  
 15 spondylitis/  
 16 exp spinal osteophytosis/  
 17 spondylolisthesis/  
 18 exp headache/ and cervic:.tw.  
 19 whiplash injuries/  
 20 cervical rib syndrome/  
 21 torticollis/  
 22 cervico-brachial neuralgia.mp.  
 23 exp radiculitis/  
 24 POLYRADICULITIS/  
 25 polyradiculoneuritis/  
 26 thoracic outlet syndrome/  
 27 (monoradicul: or monoradicl:).tw.  
 28 or/12-27  
 29 random:.tw,sh.  
 30 double-blind method/  
 31 Single Blind Procedure/  
 32 placebos/  
 33 exp clinical trials/  
 34 (clin: adj25 trial:).tw.  
 35 ((singl: or doubl: or trebl: or tripl:).tw. or (blind: or mask:).tw.  
 36 placebo:.tw.  
 37 or/29-36  
 38 meta-analysis.sh,pt. or meta-analy:.tw. or metaanal:.mp.  
 39 ((systematic: or quantitativ:) adj (review: or overview:)).tw.  
 40 (cochrane or medline or cinahl or embase or scisearch or psycinfo or psyclit or (national and library)).tw.  
 41 ((handsearch: or search:) and (cochrane or medline or cinahl or embase or scisearch or psycinfo or psyclit or psyclit or (national and library) or (hand: or manual: or electronic: or bibliograph: or database:))).tw.  
 42 ((review or guideline).pt. or consensus.ti. or guideline:.ti. or literature.ti. or overview.ti. or review.ti.) and (40 or 41)  
 43 ((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.  
 44 38 or 39 or 41 or 42 or 43  
 45 44 not ((case: or report:).ti. or editorial.pt. or comment.pt. or letter.pt.)  
 46 exp alternative medicine/  
 47 massage/  
 48 feedback system/  
 49 electrostimulation therapy/  
 50 kinesiology/  
 51 manipulative medicine/  
 52 exp traditional medicine/  
 53 (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 accupressure or lymph drainage or bodywork or body work).tw.  
 54 or/46-53  
 55 exp ARTHRITIS/rh, th  
 56 exp myofascial pain syndromes/rh, th  
 57 fibromyalgia/rh, th  
 58 spondylitis/rh, th  
 59 exp spinal osteophytosis/rh, th  
 60 spondylolisthesis/rh, th  
 61 exp headache/rh, th and cervic:.tw.

62 whiplash injuries/rh, th  
63 cervical rib syndrome/rh, th  
64 torticollis/rh, th  
65 exp radiculitis/rh, th  
66 POLYRADICULITIS/rh, th  
67 polyradiculoneuritis/rh, th  
68 thoracic outlet syndrome/rh, th  
69 or/55-68  
70 11 and 28 and 54  
71 11 and 69  
72 70 or 71  
73 72 and 37  
74 ((2003: or 2004:) not (200301: or 200302:)).em.  
75 73 and 74  
76 from 75 keep 1-17  
77 73 and 45 and 74  
78 from 77 keep 1-2  
79 from 78 keep 2

## WHAT'S NEW

Last assessed as up-to-date: 21 May 2006.

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17 February 2010	Amended	contact details updated
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## HISTORY

Protocol first published: Issue 3, 2004

Review first published: Issue 3, 2006

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19 June 2008	Amended	Converted to new review format.
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## CONTRIBUTIONS OF AUTHORS

This is one review of a series conducted by the Cervical Overview Group: Aker P, Bronfort G, Cameron ID, Eddy A, Goldsmith C, Graham N, Gross A, Haines T, Haraldsson B, Kay T, Kroeling P, Peloso P, Radylovick Z, Santaguida P, Trinh KV, Wang E

Primary Reviewers for this review - Trinh KV, Graham N, Gross AR, Goldsmith CH, Wang E, Cameron ID, Kay T

Statistician - Goldsmith CH

Methodological Quality Assessment - Goldsmith CH, Aker P, Trinh KV, Haines T, Bronfort G, Peloso P

Study Identification and Selection - Graham N, Gross A, Trinh KV, Haraldsson B, Haines T, Hoving J

Research Librarian - Eddy A

Data Abstraction, Synthesis, Manuscript Preparation, Public Responsibility, Grants, Administration - primary reviewers

Grant Writing - Gross A, Kay T

Final Synthesis - full Cervical Overview Group

## DECLARATIONS OF INTEREST

The use of raters from diverse professional backgrounds [sport medicine physician, rheumatologist, occupational health physician, physiatrist, statistician, physiotherapist, manual therapist, chiropractor, massage therapist] should serve to limit any conflict of interest during the review process.

## SOURCES OF SUPPORT

### Internal sources

- McMaster University, School of Medicine, Canada.
- Sunnybrook and Women's College Health Sciences Centre, Muller and Trauma Programs, Canada.
- University of Iowa Health Care, USA.
- Immicom Computers, Burlington, ON, Canada.
- University of Sydney, Australia.

### External sources

- Consortial Center for Chiropractic Research, USA.
- Hamilton Hospital Association, Canada.

## INDEX TERMS

**Medical Subject Headings (MeSH)**

\*Acupuncture Therapy; Chronic Disease; Neck Pain [\*therapy]; Randomized Controlled Trials as Topic; Treatment Outcome

**MeSH check words**

Humans