

## Neck pain

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### ABSTRACT

**INTRODUCTION:** Non-specific neck pain has a postural or mechanical basis and affects about two thirds of people at some stage, especially in middle age. Acute neck pain resolves within days or weeks, but may become chronic in about 10% of people. Whiplash injuries follow sudden acceleration–deceleration of the neck, such as in road traffic or sporting accidents. Up to 40% of people continue to report symptoms 15 years after the accident, although this varies between countries. **METHODS AND OUTCOMES:** We conducted a systematic review and aimed to answer the following clinical questions: What are the effects of treatments for people with non-specific neck pain without severe neurological deficit? What are the effects of treatments for acute whiplash injury? What are the effects of treatments for chronic whiplash injury? What are the effects of treatments for neck pain with radiculopathy? We searched: Medline, Embase, The Cochrane Library, and other important databases up to May 2007 (BMJ Clinical Evidence reviews are updated periodically; please check our website for the most up-to-date version of this review). We included harms alerts from relevant organisations such as the US Food and Drug Administration (FDA) and the UK Medicines and Healthcare products Regulatory Agency (MHRA). **RESULTS:** We found 91 systematic reviews, RCTs, or observational studies that met our inclusion criteria. We performed a GRADE evaluation of the quality of the evidence for interventions. **CONCLUSIONS:** In this systematic review we present information relating to the effectiveness and safety of the following interventions: acupuncture, biofeedback, drug treatments (analgesics, antidepressants, epidural steroid injections, muscle relaxants, non-steroidal anti-inflammatory drugs [NSAIDs]), early mobilisation, early return to normal activity, exercise, heat or cold, manipulation (alone or plus exercise), mobilisation, multimodal treatment, patient education, percutaneous radiofrequency neurotomy, physical treatments, postural techniques (yoga, pilates, Alexander technique), pulsed electromagnetic field (PEMF) treatment, soft collars and special pillows, spray and stretch, surgery, traction, and transcutaneous electrical nerve stimulation (TENS).

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INTERVENTIONS	
<b>NON-SPECIFIC NECK PAIN</b>	
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<ul style="list-style-type: none"> <li> Unknown effectiveness</li> <li>Traction . . . . . 7</li> <li>PEMF treatment for non-specific neck pain . . . . . 8</li> <li>TENS . . . . . 10</li> <li>Heat or cold . . . . . 10</li> <li>Biofeedback . . . . . 11</li> <li>Spray and stretch . . . . . 11</li> <li>Different combinations of multimodal treatment for non-specific neck pain versus each other . . . . . 16</li> <li>Patient education . . . . . 17</li> <li>Soft collars and special pillows . . . . . 18</li> <li>Drug treatments (analgesics, antidepressants, epidural corticosteroids, epidural local anaesthetics, muscle relaxants, NSAIDs) for non-specific neck pain . . . . . 18</li> </ul>	<ul style="list-style-type: none"> <li><b>CHRONIC WHIPLASH</b></li> <li> Unknown effectiveness</li> <li>Percutaneous radiofrequency neurotomy . . . . . 24</li> <li>Multimodal treatment for chronic whiplash injury . . . . . 24</li> <li>Physical treatments . . . . . 25</li> </ul>
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<ul style="list-style-type: none"> <li> Likely to be beneficial</li> <li>Mobilisation (early) for acute whiplash injury . . . . . 19</li> </ul>	<ul style="list-style-type: none"> <li><b>NECK PAIN WITH RADICULOPATHY</b></li> <li> Unknown effectiveness</li> <li>Surgery versus conservative treatment . . . . . 26</li> <li>Drug treatments (analgesics, antidepressants, epidural corticosteroids, epidural local anaesthetics, muscle relaxants, NSAIDs) for neck pain with radiculopathy . . . . . 2</li> </ul>

**Key points**

- Non-specific neck pain has a postural or mechanical basis, and affects about two thirds of people at some stage, especially in middle age.
  - Acute neck pain resolves within days or weeks, but becomes chronic in about 10% of people.
  - Whiplash injuries follow sudden acceleration–deceleration of the neck, such as in road traffic or sporting accidents. Up to 40% of people continue to report symptoms 15 years after the accident.
- The evidence about the effects of individual interventions for neck pain is often contradictory because of poor quality RCTs, the tendency for interventions to be given in combination, and for RCTs to be conducted in diverse groups. This lack of consistency in study design makes it difficult to isolate which intervention may be of use in which type of neck pain.
- Stretching and strengthening **exercise** reduces chronic neck pain compared with usual care, either alone or in combination with manipulation, mobilisation, or infrared.
  - Manipulation** and **mobilisation** may reduce chronic pain more than usual care or less-active exercise. They seem likely to be as effective as each other or as exercise, and more effective than pulsed electromagnetic field (PEMF) treatment, or than heat treatment.
  - Acupuncture** may be more effective than some types of sham or inactive treatment at improving pain relief and quality of life at the end of treatment or in the short term.
- **Analgesics, NSAIDs, antidepressants, and muscle relaxants** are widely used to treat chronic neck pain, but we don't know whether they are effective.
- We don't know whether **traction, PEMF treatment, TENS, heat or cold, biofeedback, spray and stretch, multimodal treatment, patient education, soft collars**, or special pillows are better or worse than other treatments at reducing chronic neck pain.
- **Early mobilisation** may reduce pain in people with acute whiplash injury compared with immobilisation or rest with a collar.
  - We don't know whether **exercise, early return to normal activity, PEMF treatment, multimodal treatment, or drug treatment** can reduce pain in people with acute whiplash injury.
- We don't know whether **percutaneous radiofrequency neurotomy, multimodal treatment, or physical treatment** reduce pain in people with chronic whiplash injury.
- We don't know whether **surgery, analgesics, NSAIDs, muscle relaxants, or cervical epidural steroid injections** reduce pain in people with neck pain plus radiculopathy.

**DEFINITION**

In this review, we have differentiated non-specific (uncomplicated) neck pain from whiplash, although many studies, particularly in people with chronic pain (duration longer than 3 months), do not specify which types of pain are included. Most studies of acute pain (duration less than 3 months) are confined to whiplash. Non-specific neck pain is defined as pain with a postural or mechanical basis, often called cervical spondylosis. It does not include pain associated with fibromyalgia. Non-specific neck pain may include some people with a traumatic basis for their symptoms, but does not include people for whom pain is specifically stated to have followed sudden acceleration–deceleration injuries to the neck (whiplash). Whiplash is commonly seen in road traffic accidents and sports injuries. It is not accompanied by radiographic abnormalities or clinical signs of nerve root damage. Neck pain often occurs in combination with limited movement and poorly defined neurological symptoms affecting the upper limbs. The pain can be severe and intractable, and can occur with radiculopathy or myelopathy. We have included those studies involving people with predominantly radicular symptoms arising in the cervical spine under the section on neck pain with radiculopathy.

**INCIDENCE/  
PREVALENCE**

About two thirds of people will experience neck pain at some time.<sup>[1]</sup> <sup>[2]</sup> Prevalence is highest in middle age, with women being affected more than men.<sup>[3]</sup> The prevalence of neck pain varies widely between studies, with a mean point prevalence of 7.6% (range 5.9–38.7%) and mean lifetime prevalence of 48.5% (range 14.2–71.0%).<sup>[3]</sup> About 15% of hospital-based physiotherapy in the UK, and 30% of chiropractic referrals in Canada are for neck pain.<sup>[4]</sup> <sup>[5]</sup> In the Netherlands, neck pain accounts for up to 2% of general practitioner consultations.<sup>[6]</sup>

**AETIOLOGY/  
RISK FACTORS**

The aetiology of uncomplicated neck pain is unclear. Most uncomplicated neck pain is associated with poor posture, anxiety and depression, neck strain, occupational injuries, or sporting injuries. With chronic pain, mechanical and degenerative factors (often referred to as cervical spondylosis) are more likely. Some neck pain results from soft-tissue trauma, most typically seen in whiplash injuries. Rarely, disc prolapse and inflammatory, infective, or malignant conditions affect the cervical spine, and present with neck pain with or without neurological features.

**PROGNOSIS** Neck pain usually resolves within days or weeks, but can recur or become chronic. In some industries, neck-related disorders account for as much time off work as low back pain (see review on low back pain [acute]).<sup>[7]</sup> The proportion of people in whom neck pain becomes chronic depends on the cause, but is thought to be about 10%,<sup>[1]</sup> a similar proportion to low back pain. Neck pain causes severe disability in 5% of affected people.<sup>[2]</sup> The clinical course of neck pain in the absence of formal treatment is not well documented. One systematic review assessing the outcome of control groups in RCTs of conservative management for chronic neck pain (outcome intervals ranging from 1–52 weeks) found that the change in pain score (visual analogue scale) with placebo or with no treatment was small, and did not seem to increase in the long-term (mean change in pain with placebo 0.5 at 10 weeks, 0.33 at 12–24 weeks; mean change in pain with no treatment 0.18 at 10 weeks, 0.4 at 12–52 weeks; P value not reported, reported as not significant).<sup>[8]</sup> Whiplash injuries are more likely to cause disability compared with neck pain resulting from other causes: up to 40% of whiplash sufferers reported symptoms even after 15 years' follow-up.<sup>[9]</sup> Factors associated with a poor outcome after whiplash are not well defined.<sup>[10]</sup> The incidence of chronic disability after whiplash varies among countries, although reasons for this variation are unclear.<sup>[11]</sup>

**AIMS OF INTERVENTION** To recover from an acute episode within 4 weeks; to maintain activities of daily living and reduce absence from work; to prevent development of long-term symptoms; to minimise adverse effects of treatment.

**OUTCOMES** Pain; range of movement; function; return to work; level of disability (Neck Disability Index); adverse effects of treatment.<sup>[12]</sup>

**METHODS** *BMJ Clinical Evidence* search and appraisal May 2007. For this review, the following sources were used for the identification of studies: Medline 1966 to May 2007, Embase 1980 to May 2007, and the Cochrane Library 2007, Issue 2. Additional searches were carried out on the NHS Centre for Reviews and Dissemination (CRD), Database of Abstracts of Reviews of Effects (DARE), Health Technology Assessment (HTA), Turning Research into Practice (TRIP), and the NICE websites. Abstracts of studies retrieved in the search were assessed independently by two information specialists. Predetermined criteria were used to identify relevant studies for initial assessment by information specialists. Study design criteria included the following study types: systematic reviews and RCTs alone in any language (RCT criteria: open and blinded studies assessed); minimum number of individuals in each trial was 30 per group, except for RCTs on injection therapies, for which there was no minimum number; minimum size of follow-up was 80%; no minimum length of follow-up. Criteria for assessment of RCTs by the contributor were based on the 100-point Koes/Assendelft scale, which assesses study population, interventions, effects, data presentation, and analysis.<sup>[13]</sup> In the question on non-specific neck pain, the contributor has excluded RCTs if they scored less than 40 on the assessment scale, unless they were of injection treatments. The contributor has included smaller, weaker RCTs in the question on chronic whiplash because of the paucity of evidence in these people. We have performed a GRADE evaluation of the quality of evidence for interventions included in this review (see table, p 31).

**QUESTION** What are the effects of treatments for people with non-specific neck pain without severe neurological deficit?

**OPTION** EXERCISE AND POSTURAL TREATMENTS (PILATES, YOGA, ALEXANDER TECHNIQUE) FOR NON-SPECIFIC NECK PAIN

#### Symptom improvement

*Proprioceptive and strengthening exercise compared with usual care (analgesics, NSAIDs, or muscle relaxants)* A proprioceptive and strengthening exercise programme involving 15 individual sessions seems more effective at reducing pain at 10 weeks in people with chronic neck pain (*moderate-quality evidence*).

*Endurance or strengthening (isometric) exercise compared with no specific exercise programme* Endurance and strength exercises may be more effective at improving pain at 12 months in female office workers with chronic neck pain (*very low-quality evidence*).

*Exercise (strength training, endurance training, or coordination exercises) compared with stress management* Exercise (strength training, endurance training, or coordination exercises) may be more effective at reducing pain at 10–12 weeks in women with work-related neck pain of 1 year's duration, but not at reducing neck pain at 3 years (*very low-quality evidence*).

*Exercise (dynamic muscle training) compared with relaxation training or advice to continue with ordinary activity* We don't know whether exercise (dynamic muscle training) is more effective at improving pain, subjective work ability, or depression in women office workers with neck pain of 12 weeks' duration (low-quality evidence).

*Exercise plus infrared compared with TENS plus infrared or infrared alone* We don't know how effective exercise plus infrared, TENS plus infrared, and infrared alone are, compared with each other, at improving pain at 6 weeks or 6 months in people with chronic neck pain (low-quality evidence).

*Exercise compared with sleeping neck support (pillow) or exercise plus pillow or placebo (hot or cold packs plus massage)* Exercise plus a sleeping neck-support pillow may be more effective than control (hot or cold packs plus massage) at reducing pain in people with chronic neck pain, but we don't know whether exercise alone or pillow alone are more effective than the hot or cold pack plus massage control (very low-quality evidence).

*Exercise compared with mobilisation or usual care* Exercise and usual care may be less effective than mobilisation at improving treatment success at 7 and 26 weeks (but not at 1 year) in people with neck pain of more than 2 weeks' duration (low-quality evidence). We don't know whether exercise is more effective at 7 weeks than usual care at improving treatment success (defined as "much improved" or "completely recovered" on a 6-point scale) in people with neck pain of more than 2 weeks' duration.

*Exercise compared with manipulation or mobilisation* We don't know how effective exercise, mobilisation, or manipulation are, compared with each other, in improving pain at the end of treatment, or at 12 months, in people with neck pain of at least 3 months' duration (low-quality evidence).

*Exercise combined with other physical treatments compared with manipulation or mobilisation* Physical treatments (exercises plus massage with or without heat, PEMF treatment, ultrasound, or short-wave diathermy; treatment at the discretion of the physiotherapist), usual care (analgesics, advice, home exercise, and bed rest), and placebo (detuned short-wave diathermy or detuned ultrasound) may be less effective than manual treatment (manipulation, mobilisation, or both) at improving outcomes (not defined) at 1 year in people with chronic neck and back pain (very low-quality evidence).

*Exercise compared with McKenzie mobilisation or control* We don't know whether general exercise (neck and shoulder exercises intended to increase cervical movement and endurance and strength of cervical muscles through active movement) is more effective than McKenzie mobilisation or control (ultrasound at the lowest intensity possible) at improving pain at 6 months and at 1 year (very low-quality evidence).

*Advice plus exercise alone compared with manual therapy (manipulation, mobilisation) plus advice plus exercise or pulsed short-wave diathermy plus advice and exercise* We don't know whether advice plus exercise alone is more effective in improving pain at 6 weeks or 6 months in people with chronic neck pain (low-quality evidence).

*Strengthening exercises plus manipulation compared with either treatment alone* Low-technology exercises plus manipulation and high-technology exercises alone may be more effective than manipulation alone at improving people's satisfaction with treatment at 1 year, and at improving pain at 1 and 2 years in people with chronic neck pain. Low-technology exercises plus manipulation may be more effective than manipulation alone at improving people's satisfaction at 11 weeks, and may be more effective than manipulation alone or than high-technology exercises alone at improving people's satisfaction at 2 years, in people with chronic neck pain. We don't know how effective low-technology exercises plus manipulation, high-technology exercises alone, and manipulation alone are, compared with each other, at improving general health status or medication use at 1 or 2 years in people with chronic neck pain (low-quality evidence).

*Exercise compared with multimodal treatment* We don't know whether exercise plus behavioural modification is more effective at 6 months than exercise plus CBT at improving pain or time taken off work in people with chronic neck and shoulder pain (very low-quality evidence).

### Functional improvement

*Endurance or strengthening (isometric) exercise compared with no specific exercise programme* Endurance and strength exercises may be more effective at improving disability (measured by neck disability index) at 12 months in female office workers with chronic neck pain (very low-quality evidence).

*Exercise (dynamic muscle training) compared with relaxation training or advice to continue with ordinary activity* We don't know whether exercise (dynamic muscle training) is more effective at improving neck disability or range of movement in women office workers who had neck pain of 12 weeks duration (low-quality evidence).

*Exercise plus infrared compared with TENS plus infrared or infrared alone* We don't know how effective exercise plus infrared, TENS plus infrared, and infrared alone are, compared with each other, at improving isometric neck muscle strength (a 20% difference being regarded as clinically relevant) at 6 weeks or 6 months in people with chronic neck pain (low-quality evidence).

*Strengthening exercises plus manipulation compared with either treatment alone* Low-technology exercises plus manipulation may be more effective than manipulation alone at improving objective strength and range of movement at 11 weeks in people with chronic neck pain. We don't know how effective low-technology exercises plus manipulation, high-technology exercises alone, and manipulation alone are, compared with each other, at improving neck disability at 1 or 2 years in people with chronic neck pain (low-quality evidence).

**For GRADE evaluation of interventions for neck pain, see table, p 31 .**

**Benefits:** We found five systematic reviews (search dates 1993,<sup>[14]</sup> 1995,<sup>[15]</sup> 2000,<sup>[16]</sup> 2001,<sup>[17]</sup> 2003,<sup>[18]</sup> 2007<sup>[19]</sup>) on exercise, which identified three RCTs (5 published papers) of sufficient quality.<sup>[20]</sup><sup>[21]</sup> <sup>[22]</sup> <sup>[23]</sup> <sup>[24]</sup> We also found one systematic review of the efficacy of McKenzie mobilisation,<sup>[25]</sup> which identified one poor-quality RCT<sup>[26]</sup> comparing McKenzie mobilisation, general exercise, and control (ultrasound at the lowest intensity possible), and one systematic review<sup>[27]</sup> (search date 2002, 1 RCT<sup>[28]</sup>) of multimodal treatment including exercise in people with chronic neck pain. In addition, we found 6 subsequent RCTs (8 published papers)<sup>[29]</sup> <sup>[30]</sup> <sup>[31]</sup> <sup>[32]</sup> <sup>[33]</sup> <sup>[34]</sup> <sup>[35]</sup> and a long-term follow-up publication<sup>[36]</sup> of a previously reported RCT.<sup>[23]</sup> <sup>[24]</sup> One review considered only acute neck pain not caused by traumatic causes, but found no studies of sufficient quality.<sup>[18]</sup> None of the reviews could perform a meta-analysis because of heterogeneity among the RCTs in types of exercise and study designs. We found no systematic review or RCTs of postural techniques such as yoga, pilates, or the Alexander technique.

#### **Proprioceptive and strengthening exercise versus usual care:**

The systematic reviews identified one RCT.<sup>[20]</sup> The RCT (60 people with chronic neck pain, 37% with radiographic evidence of osteoarthritis) found that a proprioceptive and strengthening exercise programme significantly reduced pain at 10 weeks compared with usual care (pain measured on a 100 mm visual analogue scale [VAS; 0 mm = no pain; 100 mm = unbearable pain]: -21.8 with exercise v -4.3 with usual care; P less than 0.004).<sup>[20]</sup> The exercise programme involved 15 individual exercise sessions aimed at improving eye-neck coordination through passive and active movements of the head while maintaining gaze on a fixed or slow mobile target. Usual care was not fully specified, but included analgesics and NSAIDs.

#### **Endurance or strengthening (isometric) exercise versus no specific exercise programme:**

The reviews identified no RCTs, but we found one subsequent RCT (reported in 3 papers).<sup>[29]</sup> <sup>[30]</sup> <sup>[31]</sup> The RCT (180 female office workers with chronic neck pain) compared a programme of specific "strength" (isometric) or "endurance" (dynamic) exercise carried out three times a week for 1 year versus no specific exercise programme (control group). All participants were encouraged to undertake simple aerobic and stretching exercises. The RCT does not describe how randomisation was achieved, and it was assessor blinded. The RCT found that endurance and strength exercises significantly improved neck pain after 12 months of treatment compared with no specific exercise (pain assessed on a 100 mm VAS; median improvement in pain score: 40 with strength exercise v 35 with endurance exercise v 16 with no specific exercise; P less than 0.001 for exercise v no specific exercise).<sup>[29]</sup> Strength and endurance exercises also significantly improved disability after 12 months compared with no specific exercise (median improvement in Neck Disability Index: 9 with strength exercise v 8 with endurance exercise v 3 with no specific exercise; P less than 0.001 for exercise v no specific exercise). The training adherence was 86% for strength exercise, 93% for endurance exercise, and 65% no specific exercise. A secondary analysis of the same RCT found that the energy expenditure (metabolic equivalent task [MET] hours) of the training correlated negatively with pain scores and the disability index — patients with the highest pain scores benefiting most from the training (one MET-hour = 0.8 mm decrease in pain, 95% CI 0.5 to 1.1; one MET-hour = 0.5 mm decrease on the disability index, 95% CI 0.3 to 0.7).<sup>[30]</sup> A subsequent analysis of the same RCT (180 females with chronic neck pain) assessed the rate of change in neck strength, pain (VAS 0–100) and disability at 12 months.<sup>[31]</sup> The RCT found a significantly greater decrease in pain at 12 months with exercise compared with no specific exercise, with the greatest improvement in the first 2 months of treatment (pain decrease at 12 months: 69% for strength exercise, 61% for endurance exercise, 28% for no specific exercise, P less than 0.001 among groups). The RCT found that a significantly greater proportion of people were pain free or nearly pain free at 12 months with exercise compared with no specific exercise (pain free: 73% in strength exercise, 57% in endurance exercise, 20% in no specific exercise, absolute data not reported, P less than 0.001 among groups). Exercise resulted in a significantly greater reduction in neck and shoulder pain and disability index at 12 months compared with no specific exercise (absolute data not reported, reported as significant, P value not reported).<sup>[31]</sup>

#### **Exercise (strength training, endurance training, or coordination exercises) versus stress management:**

The reviews identified one RCT (2 published papers).<sup>[21]</sup> <sup>[22]</sup> The RCT (103 women with work-related neck pain for 1 year) compared three exercise regimens over 10 weeks (strength training, endurance training, and coordination exercises) versus stress management.<sup>[21]</sup> <sup>[22]</sup> It found that

any type of exercise significantly reduced pain after 10–12 weeks compared with stress management (P less than 0.05). It found no significant difference in outcomes among any of the exercise programmes. It also found no significant difference in neck pain among the four groups after 3 years' follow-up (AR for neck pain: 47% with strength training v 50% with endurance training v 58% with coordination exercises v 39% with stress management; reported as non-significant, no individual P values reported for exercise v stress management or between the exercise regimens).

**Exercise (dynamic muscle training) versus relaxation training or advice to continue with ordinary activity:**

The reviews identified no RCTs, but we found one subsequent RCT.<sup>[32]</sup> The RCT (393 women office workers with neck pain for 12 weeks) compared three interventions for 12 weeks: dynamic muscle training, relaxation training, and advice to continue with ordinary activities. The main outcome measures were pain (measured on a scale from 0–10, where 0 = no pain and 10 = unbearable pain) and neck disability (measured on a scale from 0–80, based on 8 questions about pain) at 3, 6, and 12 months. Subjective work ability, range of movement, and depression were also assessed. The RCT found no significant difference in outcomes between exercise and control at any follow-up assessment, including at 12 months (pain at 12 months: 3.1 with exercise v 3.2 with control, WMD +0.5, 95% CI –0.1 to +1.0; neck disability at 12 months: 19 with exercise v 17 with control, WMD –0.1, 95% CI –3.0 to +3.1).<sup>[32]</sup> There was also no significant difference in the other assessed outcomes among treatment groups at any time. In the RCT, the average number of 30-minute training sessions completed by participants over 12 weeks for both treatment groups was only 40% of the maximum available; this low uptake might have been insufficient to have an effect.

**Exercise plus infrared versus TENS plus infrared versus infrared alone:**

The reviews identified no RCTs. We found one RCT (218 people with chronic neck pain) which compared the effects of twice-weekly therapy for 6 weeks using intensive exercise plus infrared (exercise group), TENS plus infrared (TENS group), and infrared alone (control group).<sup>[33]</sup> People in the control group received advice on neck care, and mild warmth on the back of the neck from an infrared lamp for 20 minutes. People were assessed at the end of the treatment period and at 6 months, with outcome measures being: mean verbal numerical pain score (scale 0–10), a validated Chinese version of the [Northwick Park Neck Pain Questionnaire](#) (NPQ), and isometric muscle strength (a 20% difference being regarded as clinically relevant). The RCT found that the addition of exercise or TENS significantly improved pain measured by mean NPQ score compared with infrared alone after 6 weeks, and that the effect of the addition of exercise continued at 6 months (6 weeks: exercise plus infrared v infrared alone, P = 0.02; TENS plus infrared v infrared alone, P = 0.034; 6 months: exercise plus infrared v infrared alone P = 0.019).<sup>[33]</sup> It found no significant difference between the groups in pain measured by verbal numerical pain score or in isometric neck muscle strength at 6 weeks or 6 months (between-group difference; verbal numerical pain score: 6 weeks, P = 0.119, 6 months, P = 0.122; neck muscle strength: 6 weeks, P = 0.36, 6 months, P = 0.268).<sup>[33]</sup>

**Exercise versus sleeping neck support (pillow) or versus exercise plus pillow or versus placebo (hot or cold packs plus massage):**

One RCT (151 people with chronic neck pain) compared four interventions: exercise alone, special (sleeping neck-support) pillow, exercise plus pillow, or placebo (hot or cold packs plus massage).<sup>[34]</sup> Participants were treated for 6 weeks, assessed at 12 weeks using the [NPQ 0–100](#), and followed up for 12 months. The NPQ score significantly decreased in all groups with time (NPQ: 31.1 at baseline v 18.6 at 12 weeks, P = 0.03). Exercise alone or pillow alone did not significantly reduce pain compared with placebo (pain: 17.18 with pillow v 19.94 with no pillow, P = 0.44; 17.09 with exercise v 20.02 with no exercise, P = 0.14). Exercise plus pillow reduced pain significantly compared with placebo (pain: P = 0.029, absolute data not reported). The lack of significant difference between groups may be because of the low overall baseline pain scores (mean NPQ 31.1) and 15% loss to follow-up.

**Exercise (strengthening isometric) versus traction or no treatment:**

The reviews identified no RCTs of sufficient quality.

**Exercise versus manipulation or mobilisation; exercise combined with other physical treatments versus manipulation or mobilisation:**

[See benefits of manipulation, p 13 .](#)

**Exercise versus mobilisation or usual care:**

[See benefits of mobilisation, p 11 .](#)

**Exercise versus manipulation or mobilisation:**

[See benefits of manipulation, p 13 .](#)

**Exercise as part of multimodal treatment:**

See benefits of multimodal treatment, p 16 .

**Exercise versus McKenzie mobilisation versus control:**

See benefits of mobilisation, p 11 .

**Advice plus exercise alone versus manual therapy (manipulation, mobilisation) plus advice plus exercise versus pulsed short-wave diathermy plus advice and exercise:**

See benefits of manipulation, p 13 .

**Strengthening exercises plus manipulation versus either treatment alone:**

See benefits of manipulation, p 13 .

**Harms:** We found no good data on harms in included studies. The incidence of serious adverse effects seems low for all physical treatments considered.

**Comment:** One high-quality systematic review (search date 2004) of exercise therapy for mechanical neck disorders also included whiplash and myofascial disorders.<sup>[37]</sup> It concluded that there is moderate evidence of efficacy for stretching and strengthening exercise in chronic mechanical neck disorders, and strong evidence for benefit favouring the combination of exercise plus mobilisation or manipulation in these people.<sup>[37]</sup> The evidence about the effects of individual interventions for neck pain is often contradictory because of the poor quality of the RCTs, the tendency for interventions to be given in combination, and for RCTs to be conducted in diverse groups. This lack of consistency in study design makes it difficult to isolate which intervention may be of use in which type of neck pain.

**OPTION****TRACTION****Symptom improvement**

*Compared with sham traction* We don't know whether traction is more effective at 4 weeks or 3 months at improving pain, sleep disturbance, social dysfunction, or activities of daily living ([low-quality evidence](#)).

*Traction compared with positioning, instruction in posture, neck collar, placebo tablets, or untuned short-wave diathermy* We don't know whether traction is more effective at improving the proportion of people cured (not defined), or at improving pain or the need for further treatment at 6 months in people with acute or chronic neck pain who all also received analgesics ([very low-quality evidence](#)).

**For GRADE evaluation of interventions for neck pain, see [table, p 31](#) .**

**Benefits:** We found four systematic reviews (search dates 1992,<sup>[38]</sup> 1993,<sup>[14]</sup> 1995,<sup>[15]</sup> and 2004<sup>[39]</sup>), which between them identified two RCTs<sup>[40]</sup> <sup>[41]</sup> of sufficient quality comparing traction versus sham traction, placebo tablets, exercise, acupuncture, heat, collar, or analgesics. The reviews found no consistent difference in pain between traction and any of the other interventions.

**Traction versus sham traction:**

The reviews identified one RCT.<sup>[40]</sup> The RCT (100 people with chronic neck pain, most with cervical spondylosis) found no significant difference between 4 weeks' traction and sham traction in pain, sleep disturbance, social dysfunction, and activities of daily living, either directly after treatment or at 3 months (at 3 months' follow-up, pain measured on a visual analogue scale from 0–10, where 0 = no pain: 2.78 with traction v 3.19 with placebo; P value not reported, reported as non-significant, CI not reported).<sup>[40]</sup>

**Traction versus positioning, instruction in posture, neck collar, placebo tablets, or untuned short-wave diathermy:**

The reviews identified one RCT.<sup>[41]</sup> The RCT (493 people with acute or chronic neck pain, 57% having first occurrence of pain, 19% having more than 5 previous occurrences) compared six interventions: traction (combined with gentle exercise and heat as determined by a physiotherapist), positioning, instruction in posture, neck collar, placebo tablets, and untuned short-wave diathermy.<sup>[41]</sup> All participants received analgesics. The RCT found no significant difference among groups in the proportion of people assessed by physicians as "cured" (21% with traction v 23% with positioning v 24% with collar v 12% with placebo tablets v 21% with untuned diathermy; P value not reported, reported as non-significant, CI not reported). It also found no significant difference in pain or the need for further treatment among groups at 6 months (P value not reported, reported as non-significant, CI not reported).

**Traction versus acupuncture:**

See benefits of acupuncture, p 8 .

**Traction versus exercise:**

The reviews identified no RCTs of sufficient quality.

**Harms:** We found no good data on harms in the included studies. The incidence of serious adverse events seems to be low for all physical treatments considered.

**Comment:** None.

<b>OPTION</b>	<b>PEMF TREATMENT FOR NON-SPECIFIC NECK PAIN</b>
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**Symptom improvement**

*Compared with sham PEMF treatment* PEMF treatment may be more effective at reducing pain and pain on passive motion (measurements not defined), but not in improving difficulties with activities of daily living, tenderness, self-assessment of improvement, or physicians' global assessment in people with neck pain and radiographic evidence of cervical osteoarthritis (*very low-quality evidence*).

*PEMF treatment combined with other physical treatment compared with manipulation or mobilisation* Physical treatments (consisting of exercises plus massage with or without heat, PEMF treatment, ultrasound, or short-wave diathermy; treatment at the discretion of the physiotherapist), usual care (analgesics, advice, home exercise, and bed rest), and placebo (detuned short-wave diathermy or detuned ultrasound) may be less effective than manual treatment (manipulation or mobilisation, or both) at improving outcomes (not defined) at 1 year in people with chronic neck and back pain (*very low-quality evidence*).

For GRADE evaluation of interventions for neck pain, see [table, p 31](#).

**Benefits:** **PEMF treatment versus sham PEMF treatment:**

We found three systematic reviews (search dates 1993,<sup>[14]</sup> 1995,<sup>[15]</sup> and 2003<sup>[42]</sup>), which between them identified one RCT of sufficient quality<sup>[43]</sup> comparing PEMF treatment versus sham PEMF treatment in people with chronic neck pain. The RCT (81 people with neck pain and radiographic evidence of cervical osteoarthritis and 86 people with osteoarthritis of the knee, all of whom had symptoms for at least 1 year; see comment below) compared true versus sham PEMF treatment.<sup>[43]</sup> Subgroup analysis in people with chronic neck pain found that PEMF treatment significantly reduced pain, and pain on passive motion, compared with sham PEMF treatment (pain: P less than 0.04; pain on passive motion: P = 0.03). The RCT found no significant difference between groups in difficulty with activities of daily living, tenderness, self-assessment of improvement, or physicians' global assessment after 18 episodes of treatment. However, it found that active compared with sham PEMF treatment significantly increased the proportion of people who had improved in at least three of six variables (pain, pain on passive motion, activities of daily living, tenderness, self-assessed improvement, physicians' global assessment; 57/82 [70%] with active treatment v 37/82 [45%] with sham treatment; RR 1.54, 95% CI 1.21 to 1.80; NNT 4, 95% CI 3 to 11). This benefit was sustained for up to 1 month.<sup>[43]</sup> Although randomisation was properly conducted in the RCT, baseline characteristics of treated and placebo groups were, by chance, different. People allocated to active treatment had higher pain scores, more tenderness, and more difficulty with the activities of daily living than people in the placebo group. The analysis in the RCT was based on changes from the baseline value, and it is not known how much of the observed effect was caused by bias introduced by the baseline differences.

**PEMF treatment combined with other physical treatment versus manipulation or mobilisation:**

See [benefits of manipulation, p 13](#).

**Harms:** We found no good data on harms. The incidence of serious adverse events seems to be low for all physical treatments considered.

**Comment:** **Clinical guide:** Although one poor-quality RCT suggested a slight benefit for PEMF treatment, this treatment is not widely available in clinical practice.

<b>OPTION</b>	<b>ACUPUNCTURE</b>
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**Symptom improvement**

*Compared with sham treatment, inactive treatment, or waiting list control* Acupuncture may be more effective than some types of sham treatment (not further defined) or inactive treatment (not further defined) at improving pain relief at the end of treatment or in the short term (less than 3 months), but not in the intermediate term (not defined) or in the long term (not defined) in people with chronic mechanical disorders. Acupuncture may be more effective than sham TENS at improving pain at 1 week after treatment, and at 6 months, in people with chronic neck pain. Needle



acupuncture may be more effective than no acupuncture at improving a composite outcome of neck pain and disability (not further defined) at 3 months in people with chronic neck pain ([very low-quality evidence](#)).

### Quality of life

*Compared with sham treatment, inactive treatment, or waiting list control* Needle acupuncture may be more effective than no acupuncture at improving quality of life (measured by SF-36) at 3 months in people with chronic neck pain ([very low-quality evidence](#)).

**For GRADE evaluation of interventions for neck pain, see [table, p 31](#).**

### Benefits:

We found five systematic reviews (search dates 1993, <sup>[14]</sup> 1995, <sup>[15]</sup> 1998, <sup>[44]</sup> <sup>[45]</sup> and 2006 <sup>[46]</sup>), and two subsequent RCTs. <sup>[47]</sup> <sup>[48]</sup> The systematic reviews between them identified 16 RCTs comparing needle or laser acupuncture versus different sham acupuncture, sham TENS, diazepam, traction, short-wave diathermy and [mobilisation](#) in people with acute or chronic neck pain. None of the reviews performed a meta-analysis. The RCTs identified by the reviews found no consistent differences between acupuncture and other treatments.

### Acupuncture versus sham treatment, inactive treatment, or waiting list control:

The fifth systematic review compared acupuncture versus sham treatment, inactive treatment, or waiting list control, and included patients with chronic mechanical disorders including whiplash injuries and radicular symptoms. <sup>[46]</sup> The review did not perform a meta-analysis. It found moderate evidence that acupuncture treatment is more effective than some types of sham treatment for pain relief in people with chronic mechanical disorders, measured at the end of the treatment (2 RCTs, 114 people). It found moderate evidence (1 RCT, 30 people) that acupuncture was more effective than a waiting list control at pain relief in people with neck pain with radicular symptoms, measured at 8-week follow-up. The review also found moderate evidence that acupuncture was more effective than inactive treatment for pain relief in people with chronic mechanical disorders, measured at the end of treatment (1 RCT, 36 participants), and at short-term follow-up of less than 3 months (3 RCTs, 338 people). However, it found no significant difference in pain relief at intermediate or long-term follow-up between acupuncture and inactive treatment (1 RCT, 63 people). Using the Jadad criteria for trial quality, the review found that only 4 RCTs were high quality, and concluded that there is a need for acupuncture trials with adequate sample size addressing the long-term efficacy of acupuncture. The first subsequent RCT (123 people with chronic neck pain) compared acupuncture versus sham TENS. Five treatments were given over 3 weeks. <sup>[47]</sup> The RCT found that, compared with sham TENS, 1 week after treatment acupuncture reduced pain intensity (measured on a visual analogue scale [VAS] 0–100 mm), pain (the Northwick Park neck pain questionnaire [NPQ, 0–100 scale]), and the active cervical mobility index, (intention-to-treat analysis; pain intensity [VAS]: 42.1 with acupuncture v 14.0 with sham TENS, mean difference 28.1, 95% CI 21.4 to 34.7,  $P = 0.001$ ; pain [NPQ]: 30.2 with acupuncture v 12.7 with sham TENS, mean difference 17.5, 95% CI 12.4 to 2.6,  $P = 0.001$ ; active cervical mobility score: 57.2° with acupuncture v 33.6° with sham TENS, mean difference 23.6, 95% CI 6.3 to 41.0,  $P = 0.008$ ). Acupuncture significantly reduced pain up to 6 months after treatment compared with sham TENS (41.1 with acupuncture v 26.8 with sham TENS, mean difference 14.4, 95% CI 2.9 to 25.8,  $P = 0.014$ ). <sup>[47]</sup> The second subsequent multicentre RCT (3,766 people with chronic neck pain) compared immediate needle acupuncture (mean 10 sessions during 3 months) versus acupuncture after a 3-month delay. <sup>[48]</sup> The primary outcome was a combined neck pain and disability (NPAD) scale, and the secondary outcome was the SF-36 component scale and its subscores to assess health-related quality of life. Immediate acupuncture significantly reduced neck pain and disability at 3 months compared with delayed acupuncture (NPAD reduction: 29%, 95% CI 27.6 to 30.2 with acupuncture v 6%, 95% CI 4.5 to 7.1 with delayed acupuncture;  $P$  less than 0.001). The acupuncture group had significantly improved in all 10 SF-36 subscales and component scores at 3 months compared with the delayed-acupuncture group ( $P$  less than 0.001). The acupuncture group continued to have a significantly greater reduction in neck pain and disability at 6 months compared with the delayed acupuncture group, although the difference between groups had decreased (NPAD reduction: 28%, 95% CI 26.5 to 29.4 with acupuncture v 25%, 95% CI 23.6 to 26.5 with delayed acupuncture,  $P = 0.006$ ). Self-referral, lack of blinding, and lack of clarity about the diagnosis may have biased the results, although the large size of the study is a strength. <sup>[48]</sup>

### Acupuncture versus mobilisation:

None of the systematic reviews identified RCTs of sufficient quality comparing mobilisation versus acupuncture. <sup>[14]</sup> <sup>[15]</sup> <sup>[44]</sup> <sup>[45]</sup> <sup>[46]</sup>

### Harms:

We found no good data on harms. The incidence of serious adverse events seems to be low for all physical treatments considered.

### Comment:

None.

OPTION	TENS
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**Symptom improvement**

*TENS plus infrared compared with exercise plus infrared or infrared alone* We don't know how effective TENS plus infrared, exercise plus infrared, and infrared alone are, compared with each other, at improving pain at 6 weeks or 6 months in people with chronic neck pain ([low-quality evidence](#)).

**Functional improvement**

*TENS plus infrared compared with exercise plus infrared or infrared alone* We don't know how effective TENS plus infrared, exercise plus infrared, and infrared alone are, compared with each other, at improving isometric neck muscle strength (a 20% difference being regarded as clinically relevant) at 6 weeks or 6 months in people with chronic neck pain ([low-quality evidence](#)).

**Note**

We found no direct information about whether TENS is better than no active treatment.

**For GRADE evaluation of interventions for neck pain, see [table, p 31](#) .**

**Benefits:****TENS versus mobilisation or neck collar:**

We found six systematic reviews (search dates 1990, <sup>[13]</sup> 1993, <sup>[14]</sup> 1995, <sup>[15]</sup> <sup>[49]</sup> 2000, <sup>[16]</sup> 2003 <sup>[42]</sup> ), which identified no RCTs of sufficient quality.

**TENS plus infrared versus exercise plus infrared versus infrared alone:**

See [benefits of exercise, p 3](#) .

**Harms:****TENS versus mobilisation or neck collar:**

We found no RCTs.

**TENS plus infrared versus exercise plus infrared versus infrared alone:**

The RCT gave no information on adverse effects. <sup>[33]</sup>

**Comment:**

None.

OPTION	HEAT OR COLD
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**Symptom improvement**

*Heat combined with other physical treatment versus manipulation or mobilisation* Physical treatments (consisting of exercises plus massage with or without heat, PEMF treatment, ultrasound, or short-wave diathermy; treatment at the discretion of the physiotherapist), usual care (analgesics, advice, home exercise, and bed rest), and placebo (detuned short-wave diathermy or detuned ultrasound) may be less effective than manual treatment (manipulation or mobilisation, or both) at improving outcomes (not defined) at 1 year in people with chronic neck and back pain ([very low-quality evidence](#)).

*Infrared alone compared with TENS plus infrared or exercise plus infrared* We don't know how effective infrared alone, TENS plus infrared, and exercise plus infrared are, compared with each other, at improving pain at 6 weeks or 6 months in people with chronic neck pain ([low-quality evidence](#)).

*Pulsed short-wave diathermy plus advice plus exercise compared with manual therapy (manipulation, mobilisation) plus advice plus exercise or advice plus exercise alone* We don't know whether pulsed short-wave diathermy plus advice plus exercise or manual therapy (including manipulation, mobilisation) plus advice plus exercise is more effective than advice plus exercise alone in improving pain at 6 weeks or 6 months in people with chronic neck pain ([low-quality evidence](#)).

**Functional improvement**

*Infrared alone compared with TENS plus infrared or exercise plus infrared* We don't know whether infrared alone is more effective than TENS plus infrared or exercise plus infrared at improving isometric neck muscle strength (a 20% difference being regarded as clinically relevant) at 6 weeks or 6 months in people with chronic neck pain ([low-quality evidence](#)).

**Note**

We found no direct information about whether heat or cold is better than no active treatment.

**For GRADE evaluation of interventions for neck pain, see [table, p 31](#) .**

**Benefits:****Heat combined with other physical treatment versus manipulation or mobilisation:**

See [benefits of manipulation, p 13](#) .

**Infrared alone versus TENS plus infrared versus exercise plus infrared:**

See [benefits of exercise](#), p 3 .

**Pulsed short-wave diathermy plus advice plus exercise versus manual therapy (manipulation, mobilisation) plus advice plus exercise versus advice plus exercise alone:**

See [benefits of manipulation](#), p 13 .

**Harms:** We found no good data on harms. The incidence of serious adverse events seems to be low for all physical treatments considered.

**Comment:** None.

**OPTION BIOFEEDBACK**

We found no direct information about biofeedback in the treatment of people with non-specific neck pain without severe neurological deficit.

For GRADE evaluation of interventions for neck pain, see [table, p 31](#) .

**Benefits:** We found three systematic reviews (search dates 1990, <sup>[13]</sup> 1993, <sup>[14]</sup> 1995 <sup>[15]</sup> ), which identified no RCTs of biofeedback in people with uncomplicated neck pain.

**Harms:** We found no RCTs.

**Comment:** None.

**OPTION SPRAY AND STRETCH****Symptom improvement**

*Compared with placebo* We don't know whether spray and stretch is more effective at reducing pain ([very low-quality evidence](#)).

For GRADE evaluation of interventions for neck pain, see [table, p 31](#) .

**Benefits:** **Spray and stretch versus placebo:**  
We found two systematic reviews (search dates 1990, <sup>[13]</sup> and 1993 <sup>[14]</sup> ), which identified one RCT (74 people with neck pain) comparing spray and stretch versus placebo. The RCT found no significant difference between both groups in pain after five treatments (SMD +0.1, 95% CI -0.6 to +0.8). <sup>[14]</sup>

**Harms:** **Spray and stretch versus placebo:**  
We found no good data on harms. The incidence of serious adverse events seems to be low for all physical treatments considered.

**Comment:** None.

**OPTION MOBILISATION****Symptom improvement**

*Mobilisation compared with exercise or usual care* Mobilisation may be more effective at improving treatment success (defined as "much improved" or "completely recovered" on a 6-point scale) at 7 and 26 weeks, but not at 1 year, in people with neck pain of more than 2 weeks' duration. We don't know whether exercise is more effective than usual care at improving treatment success at 7 weeks in people with neck pain of more than 2 weeks' duration ([low-quality evidence](#)).

*McKenzie mobilisation compared with general exercise or control* We don't know whether McKenzie mobilisation is more effective than general exercise (neck and shoulder exercises intended to increase cervical movement and endurance and strength of cervical muscles through active movement) or control (ultrasound at the lowest intensity possible) at improving pain at 6 months and 1 year ([very low-quality evidence](#)).

*McKenzie mobilisation compared with CBT* We don't know whether McKenzie mobilisation is more effective at improving pain in people with back and neck pain (the majority of whom had back pain) whether or not they also received an advice booklet ([very low-quality evidence](#)).

*Mobilisation compared with manipulation* We don't know whether mobilisation is more effective at improving pain in people with acute or chronic neck pain ([very low-quality evidence](#)).

*Mobilisation or manipulation compared with other physical treatments (exercises plus massage with or without heat, PEMF treatment, ultrasound, or short-wave diathermy) or usual care or placebo* Manual treatment (mobilisation or manipulation, or both) may be more effective than physical treatments (consisting of exercises plus massage with or without heat, PEMF treatment, ultrasound, or short-wave diathermy; treatment at the discretion of the physiotherapist), usual care (analgesics, advice, home exercise, and bed rest), or placebo (detuned short-wave diathermy or detuned ultrasound) at improving outcomes (not defined) at 1 year in people with chronic neck and back pain (very low-quality evidence).

*Mobilisation or manipulation compared with exercise* We don't know how effective mobilisation, manipulation, and exercise are, compared with each other, in improving pain at the end of treatment or at 12 months in people with neck pain of at least 3 months' duration (low-quality evidence).

*Manual therapy (mobilisation, manipulation) plus advice plus exercise compared with pulsed short-wave diathermy plus advice plus exercise or advice plus exercise alone* We don't know how effective manual therapy (including mobilisation, manipulation) plus advice plus exercise, pulsed short-wave diathermy plus advice plus exercise, and advice plus exercise alone are, compared with each other, at improving pain at 6 weeks or 6 months in people with chronic neck pain (low-quality evidence).

### Functional improvement

*Mobilisation compared with manipulation* We don't know whether mobilisation is more effective at improving range of movement or neck disability scores in people with acute or chronic neck pain (very low-quality evidence).

**For GRADE evaluation of interventions for neck pain, see table, p 31 .**

**Benefits:** We found 11 systematic reviews (search dates 1990,<sup>[13]</sup> 1993,<sup>[14]</sup> 1995,<sup>[15]</sup> [49] 1998,<sup>[44]</sup> [45] 2002,<sup>[50]</sup> [51] 2003,<sup>[52]</sup> [53] and 2007<sup>[19]</sup>), which between them identified five RCTs (6 publications)<sup>[23]</sup> [24] [54] [55] [56] [57] comparing mobilisation versus other treatments including manipulation, one of which had three arms and combined data comparing mobilisation and manipulation versus other treatments. The RCTs identified by the reviews found that mobilisation improved symptoms compared with a variety of control procedures. We also found one subsequent publication<sup>[36]</sup> of a previously published RCT, and one subsequent RCT comparing mobilisation versus manipulation.<sup>[58]</sup> We found one systematic review of the efficacy of McKenzie mobilisation (for spinal pain)<sup>[25]</sup> which identified one poor-quality RCT,<sup>[26]</sup> and we identified one subsequent RCT.<sup>[59]</sup>

#### Mobilisation versus exercise or usual care:

One systematic review<sup>[19]</sup> included two publications from the same RCT,<sup>[23]</sup> [24] and we found a subsequent publication of the same RCT.<sup>[36]</sup> The RCT (183 people with neck pain for greater than 2 weeks) compared three 6-week courses of treatment: mobilisation, exercise, or usual care (analgesics, education, and counselling).<sup>[23]</sup> Treatment success was assessed by participant rating on a 6-point scale from "much worse" to "completely recovered", and defined as "much improved" or "completely recovered". The RCT found that mobilisation slightly but significantly improved treatment success at 7 weeks compared with exercise or usual care (AR for success: 68% with mobilisation v 51% with exercise [ARI 17%, 95% CI 0.1% to 34.8%] v 36% with usual care [ARI 32%, 95% CI 16% to 49%]). The RCT found no significant difference in the success rate at 7 weeks between exercise and usual care (ARI +15%, 95% CI -2.4% to +32.3%).<sup>[23]</sup> Long-term follow-up of this RCT found that mobilisation significantly increased success rate compared with other treatments at 26 weeks, but not at 1 year (no figures reported for success at 26 weeks; AR for success at 1 year: 72% with mobilisation v 63% with active exercise [ARI +9.0%, 95% CI -7.9% to +25.8%] v 56% with usual care [ARI +16%, 95% CI -1.3% to +32.1%]).<sup>[24]</sup> [36] Although mobilisation speeded recovery in the short term, there were no significant long-term differences in perceived recovery.

#### McKenzie mobilisation versus general exercise versus control:

One systematic review of the efficacy of McKenzie mobilisation for spinal pain<sup>[25]</sup> identified one poor-quality RCT.<sup>[26]</sup> The small RCT (77 people) compared McKenzie mobilisation, general exercise (neck and shoulder exercises intended to increase cervical movement and endurance and strength of cervical muscles through active movement), and control (ultrasound at the lowest intensity possible).<sup>[26]</sup> The RCT found no significant difference in pain between groups at 6 months and 12 months.<sup>[26]</sup>

#### McKenzie mobilisation versus CBT:

We found one RCT comparing McKenzie mobilisation (mean 4.6 sessions) with CBT (mean 3.2 sessions) in 315 people, of whom 96 (30%) had neck pain and 219 people (70%) had back pain.<sup>[59]</sup> Both groups were further randomised to receive an educational booklet or not. There was no separate analysis reported for people with neck pain. The RCT found no significant difference in Northwick Park Neck Pain Questionnaire (NPQ, 0–36, 0 = best) between treatment groups, regard-

less of whether advice booklets were provided (difference between McKenzie mobilisation and CBT:  $-0.091$ , CI  $-0.287$  to  $+0.105$ ,  $P = 0.360$ ).<sup>[59]</sup>

**Mobilisation or manipulation versus other physical treatments (exercises plus massage with or without heat, PEMF treatment, ultrasound, or short-wave diathermy) versus usual care or placebo:**

See benefits of manipulation, p 13 .

**Mobilisation or manipulation versus exercise:**

See benefits of manipulation, p 13 .

**Mobilisation versus manipulation:**

See benefits of manipulation, p 13 .

**Mobilisation versus acupuncture:**

See benefits of acupuncture, p 8 .

**Mobilisation versus TENS or neck collar:**

See benefits of TENS, p 10 .

**Manual therapy (manipulation, mobilisation) plus advice plus exercise versus pulsed short-wave diathermy plus advice plus exercise versus advice plus exercise alone:**

See benefits of manipulation, p 13 .

#### Harms:

**Mobilisation versus exercise or usual care:**

The RCT found that more people receiving mobilisation than exercise or usual care had an increase in neck pain that lasted more than 2 days (18% with mobilisation v 7% with exercise v 5% with usual care; significance of difference among groups not assessed).<sup>[23]</sup> It found that, compared with usual care, more people receiving mobilisation or exercise had headache and arm pain/paraesthesia (headache: 28% with mobilisation v 32% with active exercise v 6% with usual care; arm pain: 13% with mobilisation v 12% with exercise v 6% with usual care; significance of difference among groups not assessed).

**Mobilisation versus manipulation:**

See harms of manipulation, p 13 .

**Manual therapy (manipulation, mobilisation) plus advice plus exercise versus pulsed short-wave diathermy plus advice plus exercise versus advice plus exercise alone:**

See harms of manipulation, p 13 .

#### Comment:

The incidence of serious adverse effects seems to be low for all physical treatments considered. We found one systematic review (search date 2002) examining mobilisation and manipulation for mechanical neck disorders.<sup>[53]</sup> It included people with many types of neck pain, including uncomplicated pain, whiplash, and neck pain with radiculopathy, and reported that trials were clinically heterogeneous. However, it did not provide a subgroup analysis in people with uncomplicated neck pain. When assessing any type of neck pain, it found the best evidence of efficacy for interventions that included mobilisation or manipulation plus exercise<sup>[60]</sup> when compared with any other treatments.

### OPTION MANIPULATION (WITH OR WITHOUT EXERCISE OR ADVICE)

#### Symptom improvement

*Manipulation compared with muscle relaxants, NSAIDs, or usual care* We don't know whether manipulation is more effective than diazepam, azapropazone, or usual care at improving pain at 3 weeks in people with subacute or chronic neck or back pain (*very low-quality evidence*).

*Manipulation compared with mobilisation* We don't know whether manipulation is more effective at improving pain in people with acute or chronic neck pain (*very low-quality evidence*).

*Manipulation or mobilisation compared with exercise* We don't know how effective manipulation, mobilisation, or exercise are, compared with each other, in improving pain at the end of treatment or at 12 months in people with neck pain of at least 3 months' duration (*low-quality evidence*).

*Manipulation or mobilisation compared with other physical treatments (exercises plus massage with or without heat, PEMF treatment, ultrasound, or short-wave diathermy), usual care, or placebo* Manual treatment (manipulation, mobilisation, or both) may be more effective than physical treatments (consisting of exercises plus massage with or without heat, PEMF treatment, ultrasound, or short-wave diathermy; treatment at the discretion of the physiotherapist),

usual care (analgesics, advice, home exercise, and bed rest), or placebo (detuned short-wave diathermy or detuned ultrasound) at improving outcomes (not defined) at 1 year in people with chronic neck and back pain (very low-quality evidence).

*Manipulation plus strengthening exercises compared with either treatment alone* Manipulation plus low-technology exercises and high-technology exercises alone may be more effective than manipulation alone at improving people's satisfaction with treatment at 1 year, and at improving pain at 1 and 2 years in people with chronic neck pain. Manipulation plus low-technology exercises may be more effective than manipulation alone at improving people's satisfaction at 11 weeks, and may be more effective than manipulation alone or than high-technology exercises alone at improving people's satisfaction at 2 years in people with chronic neck pain. We don't know how effective manipulation plus low-technology exercises, high-technology exercises alone, or manipulation alone compare with each other in improving general health status or medication use at 1 or 2 years in people with chronic neck pain (low-quality evidence).

*Manual therapy (manipulation, mobilisation) plus advice plus exercise compared with pulsed short-wave diathermy plus advice plus exercise or advice plus exercise alone* We don't know how effective manual therapy (including manipulation, mobilisation) plus advice plus exercise, pulsed short-wave diathermy plus advice plus exercise, and advice plus exercise alone are, compared with each other, at improving pain at 6 weeks or 6 months in people with chronic neck pain (low-quality evidence).

### Functional improvement

*Manipulation compared with mobilisation* We don't know whether manipulation is more effective at improving range of movement or neck disability scores in people with acute or chronic neck pain (very low-quality evidence).

*Manipulation plus strengthening exercises compared with either treatment alone* Manipulation plus low-technology exercises may be more effective than manipulation alone at improving objective strength and range of movement at 11 weeks in people with chronic neck pain. We don't know how effective manipulation plus low-technology exercises, high technology exercises alone, and manipulation alone are, compared with each other, at improving neck disability at 1 or 2 years in people with chronic neck pain (low-quality evidence).

**For GRADE evaluation of interventions for neck pain, see [table, p 31](#) .**

### Benefits:

We found 11 systematic reviews (search dates 1990, <sup>[13]</sup> 1993, <sup>[14]</sup> 1995, <sup>[15]</sup> <sup>[49]</sup> 2002, <sup>[50]</sup> <sup>[51]</sup> 2003, <sup>[18]</sup> <sup>[52]</sup> <sup>[61]</sup> 2004, <sup>[62]</sup> and 2007 <sup>[19]</sup> ) which between them identified seven RCTs (8 published reports) <sup>[60]</sup> <sup>[54]</sup> <sup>[55]</sup> <sup>[63]</sup> <sup>[64]</sup> <sup>[56]</sup> <sup>[65]</sup> <sup>[57]</sup> comparing **manipulation** versus other treatments, and we found two subsequent RCTs. <sup>[35]</sup> <sup>[58]</sup> Only two reviews considered acute neck pain not due to whiplash. <sup>[18]</sup> <sup>[62]</sup> One included RCT had three arms and combined data comparing manipulation and mobilisation versus other treatments. One systematic review performed a meta-analysis which found no significant difference between manipulation and usual care or drug treatment; but individual RCTs identified by several reviews found that manipulation or mobilisation improved symptoms compared with a variety of other physical treatments.

### Manipulation versus muscle relaxants, NSAIDs, or usual care:

One systematic review <sup>[49]</sup> performed a meta-analysis (3 RCTs, <sup>[55]</sup> <sup>[63]</sup> <sup>[64]</sup> 155 people with sub-acute or chronic pain, primarily chronic neck pain, but people in 1 RCT <sup>[55]</sup> had chronic neck and back pain) comparing manipulation versus a muscle relaxant (diazepam), an NSAID (azapropazone), or usual care. It found no significant difference in improvement in pain at 3 weeks between manipulation and other treatments, although all treatments improved pain (difference on a 100 mm visual analogue scale between manipulation and other treatments: +12.6 mm, 95% CI -0.15 mm to +25.5 mm). <sup>[49]</sup> The meta-analysis may have been underpowered to detect a clinically important difference. One of the RCTs included in the meta-analysis compared four treatment groups (see below); the meta-analysis included data only from the manipulation and the usual-care treatment arms. <sup>[55]</sup>

### Manipulation versus mobilisation:

The reviews identified two RCTs, <sup>[56]</sup> <sup>[57]</sup> and we found one subsequent RCT. <sup>[58]</sup> The first RCT (100 people with acute or chronic neck pain) identified by the reviews compared a single manipulation treatment versus a single mobilisation treatment. <sup>[56]</sup> It found no significant difference between treatments in immediate improvement in pain (85% with manipulation v 69% with mobilisation; RR of improvement in pain 1.23, CI not reported; P = 0.16 after adjusting for pretreatment differences between groups). It also found that people in the manipulation group had improved range of movement, but the result was not significant (5.1 ° with manipulation v 3.9 ° with mobilisation; P = 0.5). <sup>[56]</sup> The second RCT (336 people with acute or chronic neck pain) found no significant difference after 6 months between manipulation and mobilisation in average pain, severe pain (average and severe pain measured on a 0 to 10 point index: 0 = no pain; 10 = unbearable pain), and neck disability scores (**Neck Disability Index** measured on a 0 to 50-point index: 0 = no disability; 50 = most severe disability) between a variable number of chiropractic mobilisations and a variable number of manipulations (severe pain difference from manipulation v mobilisation: -0.02

points, 95% CI -0.69 points to +0.65 points; average pain from manipulation v mobilisation: +0.01 points, 95% CI -0.52 points to +0.54 points; difference in neck disability scores: +0.46 points, 95% CI -0.89 points to +1.82 points).<sup>[57]</sup> In this RCT, only 336/960 (35%) eligible people agreed to participate.<sup>[57]</sup> This may reduce the external validity of the study. The first subsequent RCT (70 people with chronic neck pain) compared high-velocity low-amplitude manipulation versus a manual mobilisation procedure, with assessment before the treatment and 5 minutes after treatment).<sup>[58]</sup> The manipulation group had a significantly greater improvement (pre-post scores) in neck pain at rest and in the range of movement compared with the manual-mobilisation group (neck pain at rest: 3.5 with manipulation v 0.4 with manual mobilisation, P less than 0.001; cervical flexion: 7.0 with manipulation v 1.5 with manual mobilisation, P less than 0.001; cervical extension: 8.0 with manipulation v 1.4 with manual mobilisation, P less than 0.001; left lateral flexion: 5.0 with manipulation v 0.8 with manual mobilisation, P less than 0.001; right lateral flexion: 5.0 with manipulation v 0.8 with manual mobilisation, P less than 0.001; left rotation: 9.0 with manipulation v 0.3 with manual mobilisation, P less than 0.001; right rotation: 10.0 with manipulation v 0.4 with manual mobilisation, P less than 0.001). The RCT found that the greater the increase in neck mobility, the lesser the neck pain at rest. The study was limited by a lack of blinding, short-term follow-up, and small study population.<sup>[58]</sup>

**Manipulation or mobilisation versus other physical treatments (exercises plus massage with or without heat, PEMF treatment, ultrasound, or short-wave diathermy) versus usual care or placebo:**

The reviews identified one RCT.<sup>[55]</sup> The RCT (256 people [144 people with back pain, 64 people with neck pain, 48 people with back and neck pain]) compared four treatment groups: manual treatment (mobilisation, manipulation, or both); physical treatments (consisting of exercises plus massage with or without heat, PEMF treatment, ultrasound, or short-wave diathermy; treatment at the discretion of the physiotherapist); usual care (analgesics, advice, home exercise, and bed rest); and placebo (detuned short-wave diathermy or detuned ultrasound).<sup>[55]</sup> It found that manual treatment (mobilisation or manipulation) significantly improved outcomes after 12 months compared with all of the other treatments (statistical analysis specifically for people with neck pain was not reported). However, it was not possible to directly compare the effects of mobilisation versus manipulation, and more people received manipulation.

**Manipulation or mobilisation versus exercise:**

The reviews identified one RCT.<sup>[54]</sup> The RCT (119 people with neck pain for at least 3 months) compared three treatments: mobilisation, manipulation, and intensive exercise training.<sup>[54]</sup> It found no significant difference in pain among groups by the end of treatment (P = 0.44) or after 12 months (P = 0.76), although pain score improved from baseline in all groups (median pain score on a 30-point scale improved from 13 to 6 with manipulation v from 12 to 6 with intensive training or mobilisation).

**Manipulation plus strengthening exercises versus either treatment alone:**

The reviews identified one RCT (2 published reports).<sup>[60] [65]</sup> The RCT (191 people with chronic neck pain who received training about a home exercise programme and were able to use proprietary medication) compared three treatments: low-technology exercises plus manipulation (combined treatment), high-technology MedX exercises, and manipulation alone.<sup>[60]</sup> Low-technology exercises involved a short aerobic warm-up followed by supervised progressive strengthening exercises for the neck and upper body. High-technology exercises involved one-to-one sessions of stretching and upper body strengthening using the MedX cervical extension rotation machines plus aerobic exercise using a stationary bicycle. The duration of each treatment episode was the same (1 hour). The RCT found that combined treatment significantly improved participant satisfaction (P = 0.03), objective strength, and range of movement (P less than 0.05 for both outcomes) compared with manipulation alone after 11 weeks. The RCT also found that both combined treatment and high-technology strengthening exercises significantly improved pain (P = 0.02) and patient satisfaction (P = 0.002) after 1 year compared with manipulation alone, although it found no significant difference among treatments in health status, neck disability, or medication use. The 2-year follow-up to this RCT<sup>[60]</sup> (data available for 145/191 [76%] original participants who completed the 11-week treatment period) found that combined treatment or high-technology strengthening exercises significantly improved participant-rated pain compared with manipulation alone (P = 0.04).<sup>[65]</sup> It found that combined treatment significantly improved patient satisfaction at 2 years compared with either other treatment (P less than 0.001 for combined treatment v manipulation alone; P = 0.02 for combined treatment v high-technology exercises).<sup>[65]</sup> The 2-year follow-up found no significant differences in neck disability and general health status among the three groups.

**Manual therapy (manipulation, mobilisation) plus advice plus exercise versus pulsed short-wave diathermy plus advice plus exercise versus advice plus exercise alone:**

One subsequent pragmatic multicentre RCT (350 people with chronic neck pain) assessed whether adding manual therapy (hands-on, passive, or active assisted movements, mobilisations, or manip-

ulations; 63% had mobilisation physiotherapy) or pulsed short-wave diathermy over 6 weeks to advice plus exercise was more effective than advice plus exercise alone. [35] The primary outcome measure was pain as measured by the Northwick Park Neck Pain Questionnaire (NPQ). The RCT found no significant difference in pain at 6 weeks or 6 months between adding manual therapy to advice plus exercise and advice plus exercise alone (6 months, difference in mean NPQ change scores: +1.4, 95% CI -2.8 to +5.5). [35] It also found no significant difference in pain at 6 weeks or 6 months between adding pulsed short-wave diathermy to advice plus exercise and advice plus exercise alone (6 months, difference in mean NPQ change scores: +1.3, 95% -2.9 to +5.5). [35]

**Harms:****Manipulation versus diazepam, anti-inflammatory drugs, or usual care:**

One RCT found that two people, both receiving manipulation, reported "new discomfort in their necks". [63] The other two RCTs gave no information on adverse effects. [55] [64]

**Manipulation versus mobilisation:**

The first RCT found that 5% of people receiving manipulation and 6% receiving mobilisation had worse pain after treatment. [56] The second RCT [57] (336 people with acute or chronic neck pain) carried out a follow-up questionnaire [66] of adverse effects at 2 weeks. It found that 30% of the 280 people who responded reported at least one minor adverse effect, such as increased pain or headache associated with manipulation or mobilisation. [66] The questionnaire found that people receiving manipulation had more adverse effects compared with people receiving mobilisation, although the difference was not significant (adjusted OR 1.44, 95% CI 0.85 to 2.43; absolute numbers not reported). It also found that people who reported adverse events were less satisfied with their care and less likely to achieve meaningful improvement in pain and disability, although, again, the difference was not significant. [66]

**Manipulation or mobilisation versus exercise:**

The RCT gave no information on adverse effects. [54]

**Manipulation plus strengthening exercises versus either treatment alone:**

The RCT found no significant difference in adverse effects among manipulation plus exercise, manipulation alone, and exercise alone ( $P = 0.49$ ), although 6–10 people in each group had increased neck pain or headache after treatment. [60]

**Manual therapy (manipulation, mobilisation) plus advice plus exercise versus pulsed short-wave diathermy plus advice plus exercise versus advice plus exercise alone:**

The RCT reported that no serious adverse effects were reported in any of the intervention groups. [35]

**Observational data assessing adverse effects of manipulation:**

The estimated risk from case reports of cerebrovascular accident is 1–3/million manipulations, [67] and estimated risk of all serious adverse effects (such as death or disc herniation) is 5–10/10 million manipulations. [49] One systematic review identified 31 published case reports relating to serious adverse events occurring between 1995 and 2001 after cervical spine manipulation. [68] Most had been treated by chiropractors. The review highlighted the limitations of the available data (including lack of details of the case, nature of the causal relationship between the intervention and the clinical event, and under-reporting of adverse events), and suggested that existing estimates must be viewed in light of this, and that there was a need for large prospective studies to define risks accurately. [68]

**Comment:** None.

<b>OPTION</b>	<b>DIFFERENT COMBINATIONS OF MULTIMODAL TREATMENT FOR NON-SPECIFIC NECK PAIN VERSUS EACH OTHER</b>
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**Symptom improvement**

*Exercise plus behavioural modification compared with exercise plus CBT* We don't know whether exercise plus behavioural modification is more effective at 6 months at improving pain or time taken off work in people with chronic neck and shoulder pain (*very low-quality evidence*).

*CBT plus physiotherapy compared with CBT or minimal treatment* CBT plus physiotherapy (physical training tailored to people's particular needs) may be more effective than minimal treatment (medical examination, activity encouraged, 16-page booklet on managing neck and back pain) at reducing the risk of being off work for 15 or more days, but we don't know whether CBT plus physiotherapy is more effective than CBT alone at reducing sick leave in people with non-specific neck pain, back pain, or both (*very low-quality evidence*).

**For GRADE evaluation of interventions for neck pain, see table, p 31 .**



**Benefits:** We found one systematic review <sup>[27]</sup> (search date 2002, 1 RCT <sup>[28]</sup>) of multimodal treatment in people with chronic neck pain, and one subsequent RCT. <sup>[69]</sup>

**Exercise plus behavioural modification versus exercise plus CBT:**

The review identified one RCT comparing two types of multimodal treatment. <sup>[28]</sup> The RCT (66 people with chronic neck and shoulder pain) identified by the review compared exercise plus behavioural modification (including patient-education lectures and advice, with a psychologist acting as an advisor to other staff) versus exercise plus CBT (with CBT administered directly by a psychologist). It found no significant difference in pain or time off work after 6 months between interventions (proportion with improved pain: 32% with multimodal CBT v 26% with exercise plus behavioural modification, reported as non-significant, P value not reported; time off work: P = 0.82; absolute results presented graphically). <sup>[28]</sup>

**CBT plus physiotherapy versus CBT versus minimal treatment:**

The subsequent RCT (185 people with non-specific neck pain [87%], back pain [91%], or both) compared three interventions: minimal therapy (medical examination, activity encouraged, 16-page booklet on managing neck and back pain), CBT (same regimen as minimal-treatment group, plus 6 sessions of structured CBT), and CBT plus physiotherapy (same regimen as CBT group, plus physical training tailored to peoples' particular needs). <sup>[69]</sup> The RCT found that minimal treatment significantly increased the risk of being off work for at least 15 days compared with CBT plus physical training (logistic regression analysis, OR 4.80, 95% CI 1.19 to 19.32). It found no significant difference in sick leave between CBT and CBT plus physiotherapy (logistic regression analysis, OR 1.27, 95% CI 0.25 to 5.56). However, the RCT included people with neck pain, back pain, or both, and did not separately report results for those with neck pain only. <sup>[69]</sup>

**Harms:** **Exercise plus behavioural modification versus exercise plus CBT:**  
The RCT gave no information on adverse effects. <sup>[28]</sup>

**CBT plus physiotherapy versus CBT versus minimal treatment:**  
The RCT gave no information on adverse effects. <sup>[69]</sup>

**Comment:** None.

## OPTION PATIENT EDUCATION

### Symptom improvement

*Patient education or patient education plus exercise versus no treatment, CBT, or stress management* We don't know how effective an educational pamphlet, a more extensive information programme, and CBT are, compared with each other, at improving pain in people with neck and back pain, or how effective an individualised education and exercise programme, no treatment, and stress management are, compared with each other, in improving pain in people with neck, shoulder, or back pain (very low-quality evidence).

For GRADE evaluation of interventions for neck pain, see [table, p 31](#).

**Benefits:** **Patient education or patient education plus exercise versus no treatment, CBT, or stress management:**  
We found two RCTs. <sup>[70]</sup> <sup>[71]</sup> The first RCT (243 people with neck and back pain) compared three interventions: an educational pamphlet, a more extensive information programme, and CBT (6 sessions). <sup>[70]</sup> The duration of pain was unspecified, but recruitment into the study was based on self-perception that participants were "at risk of developing a chronic problem". The RCT found no significant difference among treatments in pain (worst pain on a 0–10 scale in an Outcome Evaluation Questionnaire: 6.1 with a pamphlet v 6.5 with information programme v 5.7 with CBT; reported as non-significant, P value not reported). *Post hoc* analysis suggested that CBT significantly reduced time off work compared with an educational pamphlet (AR for sick leave of more than 30 days in 6 months: 1% with CBT v 10% with educational pamphlets; P less than 0.05). The second RCT (282 nursing aides with neck, shoulder, or back pain in the preceding 12 months) compared three interventions: an individualised education and exercise programme, stress management, and no intervention. <sup>[71]</sup> The RCT found no significant difference in pain among the groups immediately after treatment, or at 12 and 18 months (people with improved pain at 12 months: 8/41 [20%] with individualised education v 19/57 [33%] with stress management v 18/57 [32%] with no intervention).

**Harms:** The RCTs gave no information on adverse effects. <sup>[70]</sup> <sup>[71]</sup>

**Comment:** None.

**OPTION SOFT COLLARS AND SPECIAL PILLOWS****Symptom improvement**

*Sleeping neck support (pillow) compared with exercise or exercise plus pillow or placebo control (hot or cold packs plus massage)* A sleeping neck-support pillow plus exercise may be more effective than control (hot or cold packs plus massage) at reducing pain (measured by a validated pain questionnaire) in people with chronic neck pain, but we don't know whether pillow alone or exercise alone are more effective than the hot or cold pack plus massage control at reducing pain ([very low-quality evidence](#)).

For GRADE evaluation of interventions for neck pain, see [table, p 31](#).

**Benefits:** **Sleeping neck support (pillow) versus exercise versus exercise plus pillow versus placebo control (hot or cold packs plus massage):**  
See [benefits of exercise and postural treatments, p 3](#).

**Harms:** The RCT did not report any harms.

**Comment:** One cross-over study of 52 people with chronic neck pain (31 with associated sleep disturbance) assessed 4 different pillows. Forty of 52 patients (77%) found that the pillows had a positive effect on pain, and 24/31 patients (77%) found that they had a positive effect on sleep compared with their own pillow. However, there was no difference for "special neck pillows" compared with a "normal pillow".<sup>[72]</sup>

**OPTION DRUG TREATMENTS (ANALGESICS, ANTIDEPRESSANTS, EPIDURAL CORTICOSTEROIDS, EPIDURAL LOCAL ANAESTHETICS, MUSCLE RELAXANTS, NSAIDS) FOR NON-SPECIFIC NECK PAIN****Symptom improvement**

*Muscle relaxants compared with placebo* Cyclobenzaprine may be more effective at improving overall symptoms (not defined) after 2 weeks than diazepam or placebo, but we don't know whether it is more effective at reducing pain; the studies also included people with musculoskeletal disorders other than neck pain (numbers not reported). Eperisone may be more effective than placebo at improving pain at 6 weeks in people with chronic neck pain ([very low-quality evidence](#)).

*Muscle relaxants, NSAIDs, or usual care compared with manipulation* We don't know whether diazepam, azapropazone, or usual care are more effective than manipulation at improving pain at 3 weeks in people with subacute or chronic neck or back pain ([very low-quality evidence](#)).

**Note**

We found no direct information about whether analgesics (paracetamol, opioids), NSAIDs, antidepressants, epidural corticosteroids, or epidural local anaesthetics are better than no active treatment.

For GRADE evaluation of interventions for neck pain, see [table, p 31](#).

**Benefits:** We found two systematic reviews (search dates 1993,<sup>[14]</sup> and 2003,<sup>[73]</sup>) and one additional RCT.<sup>[74]</sup>

**Analgesics:**

The reviews identified no RCTs.<sup>[14] [73]</sup>

**Antidepressants:**

The reviews found no RCTs in people with uncomplicated neck pain (see comment below).<sup>[14] [73]</sup>

**Epidural corticosteroids, and epidural local anaesthetics:**

The reviews identified no RCTs of corticosteroids or local anaesthetics via the epidural route of administration.<sup>[14] [73]</sup>

**Muscle relaxants (cyclobenzaprine, diazepam, or eperisone) versus placebo:**

We found no RCTs solely in people with neck pain. The systematic reviews identified two RCTs (159 people with chronic neck or back pain with acute spasm) which compared three treatments: cyclobenzaprine, diazepam, and placebo.<sup>[75] [76]</sup> The RCTs identified by the reviews found that cyclobenzaprine significantly improved overall symptoms after 2 weeks compared with diazepam and placebo (P less than 0.05 in each RCT), but pain data could not be extracted.<sup>[75] [76]</sup> Applicability of results may be limited in people with uncomplicated neck pain because people with other musculoskeletal disorders were included in the studies. The additional RCT (157 people with

chronic neck pain) found that eperisone (a muscle relaxant) significantly improved pain control after 6 weeks compared with placebo (P less than 0.05).<sup>[74]</sup>

**Muscle relaxants (diazepam) or NSAIDs versus manipulation:**

See [benefits of manipulation](#), p 13 .

**Harms:**

**Analgesics:**

The reviews identified no RCTs.<sup>[14] [73]</sup>

**Antidepressants:**

The reviews identified no RCTs.<sup>[14] [73]</sup> See harms of antidepressants in review on generalised anxiety disorder.

**Epidural corticosteroids, and epidural local anaesthetics:**

The reviews identified no RCTs.<sup>[14] [73]</sup>

**Muscle relaxants versus placebo:**

The RCTs found minor adverse effects, including weakness, dizziness, drowsiness, and gastrointestinal problems occurring in 4% of people treated with muscle relaxants.<sup>[14] [74]</sup>

**Muscle relaxants (diazepam) or NSAIDs versus manipulation:**

See [harms of manipulation](#), p 13 .

**NSAIDs:**

One systematic review that assessed adverse effects only found no direct comparisons of harms of [manipulation](#) and NSAIDs.<sup>[67]</sup> Calculations based on indirect comparisons found that the risk of an adverse effect with NSAIDs was considerably greater than for manipulation. See also harms of NSAIDs in review on NSAIDs.

**Comment:**

Applicability of results in people with uncomplicated neck pain may be limited, because many of the RCTs included people with other musculoskeletal disorders, including back pain, and acute whiplash.

**QUESTION**

What are the effects of treatments for acute whiplash injury?

**OPTION**

MOBILISATION (EARLY) FOR ACUTE WHIPLASH INJURY

**Symptom improvement**

*Early mobilisation (including exercises) compared with immobilisation or early return to normal activity* Early mobilisation may be more effective than immobilisation in a collar plus rest for 14 days at improving pain relief at 4 and 8 weeks in people with acute whiplash who all also received analgesics. Advice on early mobilisation may be more effective than physical treatments (heat and cold, PEMF treatment, hydrotherapy, traction, or active and passive repetitive movements) or rest for 7–14 days at reducing the proportion of people with symptoms (not defined) at 2 years in people with acute whiplash who were also given a soft collar and analgesics. Mobilisation may be more effective than rest plus a neck collar at improving pain at 6 months, but not if mobilisation is delayed by more than 96 hours; and mobilisation may also be more effective at reducing pain and sick leave at 3 years regardless of whether mobilisation is delayed. We don't know how effective active mobilisation from the start, advice to "act as usual", and immobilisation in a rigid collar are, compared with each other, at reducing neck pain, worsening of pain, or headache, in people within 10 days of a whiplash injury ([very low-quality evidence](#)).

**Functional improvement**

*Early mobilisation (including exercises) compared with immobilisation or less active treatment* Early mobilisation may be more effective than immobilisation in a collar plus rest for 14 days at improving range of movement at 4 and 8 weeks in people with acute whiplash who all also received analgesics. We don't know how effective active mobilisation from the start, advice to "act as usual", and immobilisation in a rigid collar are, compared with each other, at reducing neck disability in people within 10 days of a whiplash injury ([very low-quality evidence](#)).

For GRADE evaluation of interventions for neck pain, see [table, p 31](#) .

**Benefits:**

**Early mobilisation (including exercises) versus immobilisation, early return to normal activity or less active treatment:**

We found four systematic reviews (search dates 1993,<sup>[10]</sup> 2003,<sup>[77] [78]</sup> and 2006<sup>[79]</sup> ), which between them identified four RCTs of sufficient quality,<sup>[80] [81] [82] [83]</sup> and we found one subsequent RCT.<sup>[84]</sup> The first RCT (61 people with acute whiplash) identified by the reviews compared two treatments: early [mobilisation](#) (including Maitland joint mobilisation plus home exercises) versus immobilisation in a collar plus rest for 14 days followed by gradual mobilisation.<sup>[80]</sup> All participants received analgesics. It found that early mobilisation significantly increased pain relief and improved

range of movement after 4 and 8 weeks compared with immobilisation plus less active treatment (P less than 0.01). The second RCT (247 people with acute whiplash) identified by the reviews compared three interventions: advice on early mobilisation, physical treatments (heat and cold, PEMF treatment, hydrotherapy, traction, or active and passive repetitive movements), or rest for 7–14 days followed by gentle mobilisation.<sup>[81]</sup> All participants were given a soft collar and analgesics. Follow-up at 2 years of 167 people responding to a questionnaire found that advice on early mobilisation significantly reduced the proportion of people who still had symptoms compared with physical treatments or rest (11/48 [23%] with advice on early mobilisation v 22/54 [41%] with physical treatments v 12/26 [46%] with rest; P = 0.02 for early mobilisation v other treatments). The difference remained significant when the 44 people who were not reviewed were assumed to have the same rate of continuing symptoms as the people who rested. The third RCT (97 people with acute whiplash) identified by the reviews found that mobilisation (home exercises based on McKenzie principles) significantly improved pain compared with rest plus a neck collar (P less than 0.001), but only if mobilisation was started immediately after injury.<sup>[82]</sup> If mobilisation was delayed by more than 96 hours, there was no significant difference between treatments after 6 months. However, follow-up of this RCT found that, at 3 years, mobilisation significantly reduced pain and sick leave (P less than 0.05) compared with rest plus a neck collar, even if it was delayed for 2 weeks, although only people who had received active intervention within 96 hours had a total cervical range similar to matched controls.<sup>[85]</sup> The fourth RCT (97 people with acute whiplash) identified by the reviews found early benefits in pain relief and movement with early mobilisation compared with immobilisation in a collar (proportion with neck pain at 6 weeks: 11% with mobilisation v 62% with collar; neck stiffness: 2% with mobilisation v 38% with collar), but similar pain relief after 12 weeks (proportion with neck pain: 2% with mobilisation v 16% with collar).<sup>[83]</sup> The RCT did not assess the significance of the difference between groups. The subsequent RCT (458 people within 10 days of a whiplash injury) compared three interventions: early mobilisation, immobilisation in a rigid collar followed by mobilisation, and early return to normal activity (advice to "act as usual"), with assessment at 3, 6, and 12 months.<sup>[84]</sup> Outcomes improved from baseline in all three groups at 1 year (proportion who reported 'an improvement' (not defined): 40% with mobilisation, 38% with collar, 33% with early return to normal activity, significance not reported). The RCT found no significant difference in neck pain and headache scores (0–10, 0 = no pain, 10 = worst pain), and in neck disability (Copenhagen neck functional disability scale, 0 = no disability, 30 = extreme disability) among groups (data at 12 months, median neck pain score: 3 with early mobilisation v 3 with collar v 4.5 with early return to normal activity, P among groups = 0.1; median headache score: 2 with early mobilisation v 4 with collar v 3.5 with early return to normal activity, P among groups = 0.3; median neck disability score: 7 with early mobilisation v 9 with neck collar v 8 with early return to normal activity, P among groups = 0.4). There was no significant difference in worsening of pain among the groups (10% with early mobilisation v 12% with collar v 17% with early mobilisation, P among groups = 0.6). Notably, 6% of people randomised to early mobilisation and 26% of people randomised to a neck collar showed poor compliance (significance not reported). A total of 121/327 participants (37%) available for follow-up at 6 months received other neck interventions in addition to those prescribed by the RCT (32% in early-mobilisation group v 35% with collar group v 44% with early mobilisation, P among groups = 0.2).

**Harms:** The reviews and RCTs did not consistently report adverse effects.<sup>[10] [79] [80] [81] [82] [83] [84]</sup>

**Comment:** The third systematic review (23 RCTs, 2344 participants),<sup>[79]</sup> found the overall quality of the RCTs poor, with heterogenous results and insufficient evidence to support any clearly effective treatment. It found limited evidence that active and passive interventions seemed more effective than no treatment, but less convincing evidence about the effects of active compared with passive interventions. suggested that it could no longer justify the conclusion of the previous version of the review that "rest makes rusty". We found one systematic review (search date 2002) examining mobilisation and manipulation for mechanical neck disorders.<sup>[53]</sup> It included people with many types of neck pain, including uncomplicated pain, whiplash, and neck pain with radiculopathy, and reported that trials were clinically heterogeneous. However, it did not provide a subgroup analysis in people with whiplash. When assessing any type of neck pain, it found the best evidence of efficacy for interventions that included mobilisation or manipulation plus exercise,<sup>[60]</sup> when compared with any other treatments.

## OPTION EARLY RETURN TO NORMAL ACTIVITY

### Symptom improvement

*Compared with immobilisation or early mobilisation* Advice to "act as usual" plus NSAIDs may be more effective than immobilisation plus 14 days' sick leave plus NSAIDs at improving symptoms (including pain during daily activities, memory, concentration, and headache) at 6 months in people with acute whiplash, but not at improving length of sick leave or severe symptoms of neck pain. We don't know how effective advice to "act as usual", active mobilisation

from the start, and immobilisation in a rigid collar are, compared with each other, at reducing neck pain, worsening of pain, or headache, in people within 10 days of a whiplash injury ([very low-quality evidence](#)).

### Functional improvement

*Compared with immobilisation or early mobilisation* Advice to "act as usual" plus NSAIDs may be more effective at 6 months than immobilisation plus 14 days sick leave plus NSAIDs at improving neck stiffness, but not neck range (not defined) in people with acute whiplash. We don't know how effective advice to "act as usual", active mobilisation from the start, and immobilisation in a rigid collar are, compared with each other, in reducing neck disability in people within 10 days of a whiplash injury ([low-quality evidence](#)).

**For GRADE evaluation of interventions for neck pain, see [table, p 31](#) .**

#### Benefits:

##### Early return to normal activity versus immobilisation versus early mobilisation:

We found two systematic reviews (search dates 2003, <sup>[77]</sup> and 2006 <sup>[79]</sup> ) which between them identified one RCT <sup>[86]</sup> of sufficient quality comparing early return to normal activity versus immobilisation plus rest, and we found one subsequent RCT. <sup>[84]</sup> The RCT identified by the systematic review (201 people presenting to an emergency department with acute whiplash) compared advice to "act as usual" plus NSAIDs versus immobilisation plus 14 days' sick leave plus NSAIDs. <sup>[86]</sup> It found that advice to "act as usual" plus NSAIDs significantly improved some symptoms (including pain during daily activities, neck stiffness, memory, concentration, and headache; P less than 0.05 for all outcomes) after 6 months compared with immobilisation plus 14 days' sick leave plus NSAIDs. It found no significant difference between treatments in neck range or length of sick leave (reported as non-significant for both outcomes, P value not reported). The RCT also found that a similar proportion of people had severe symptoms of neck pain after 6 months (proportion of people with severe symptoms defined as more than 3 on a scale from 0–5: 11% with advice to "act as usual" v 15% with immobilisation, P value not reported). The subsequent RCT compared three interventions: early return to normal activity, early mobilisation, and immobilisation in a neck collar. <sup>[84]</sup> The RCT is reported in the option on [early mobilisation, p 19](#) .

#### Harms:

##### Early return to normal activity versus immobilisation versus early mobilisation:

The systematic reviews <sup>[79]</sup> <sup>[77]</sup> and RCT <sup>[86]</sup> gave no information on adverse effects.

#### Comment:

The second systematic review (23 RCTs, 2344 people), <sup>[79]</sup> found the overall quality of the RCTs poor, with heterogenous results and insufficient evidence to support any clearly effective treatment. It found limited evidence that active and passive interventions seemed more effective than no treatment, but less convincing evidence about the effects of active interventions compared with passive ones. It could no longer justify the conclusion of the previous version of the review that "rest makes rusty".

## OPTION

## EXERCISE FOR ACUTE WHIPLASH INJURY

### Symptom improvement

*Compared with soft collar or usual care* Instruction on mobilisation exercises may be more effective than a soft collar at reducing pain at 6 weeks in people treated within 48 hours of a whiplash injury who all also took NSAIDs. We don't know whether active physiotherapy (exercise or mobilisation) plus advice on graded activity is more effective than usual care plus advice on graded activity in improving pain intensity or headache at 8, 12, 26, or 52 weeks in people with whiplash symptoms persisting for 4 weeks ([very low-quality evidence](#)).

*Different exercise regimens versus each other* We don't know whether a regular exercise regimen is more effective than a regular exercise regimen plus instructions to perform isometric exercise three times a day in improving pain at 3 or 6 months in people with acute whiplash ([low-quality evidence](#)).

### Functional improvement

*Compared with soft collar or usual care* Instruction on mobilisation exercises may be more effective than a soft collar at reducing self-assessed disability at 6 weeks in people treated within 48 hours of whiplash injury who also took NSAIDs. We don't know whether active physiotherapy (exercise or mobilisation) plus advice on graded activity is more effective than general-practitioner care plus advice on graded activity in improving work activities at 8, 12, 26, or 52 weeks in people with whiplash symptoms of 4 weeks' duration ([very low-quality evidence](#)).

*Different exercise regimens versus each other* We don't know whether a regular exercise regimen is more effective than a regular exercise regimen plus instructions to perform isometric exercise three times a day in improving disability at 3 or 6 months in people with acute whiplash ([low-quality evidence](#)).

**For GRADE evaluation of interventions for neck pain, see [table, p 31](#) .**

**Benefits:****Exercise versus soft collar or usual care:**

We found three systematic reviews (search dates 2001,<sup>[17]</sup> 2003,<sup>[77]</sup> and 2006<sup>[79]</sup>), which identified two RCTs of sufficient quality.<sup>[87]</sup> <sup>[88]</sup> The first RCT (200 people treated within 48 hours of injury) compared instruction on mobilisation exercises (2–5 physiotherapy visits in the first week) versus treatment with a soft collar.<sup>[87]</sup> All participants were allowed oral diclofenac as required. The RCT found that exercises significantly reduced the proportion of people with neck pain at 6 weeks compared with a soft collar (28% with exercise v 45% with a soft collar;  $P = 0.025$ ), and significantly reduced pain and disability at 6 weeks (VAS 0–10: mean neck pain intensity 1.04 with exercise v 1.60 with soft collar,  $P = 0.047$ ; mean self-assessed disability 0.92 with exercise v 1.56 with soft collar,  $P = 0.042$ ).<sup>[87]</sup> By 6 weeks, 36% of the collar group and 15% of the exercise group had withdrawn from treatment, which might have influenced the results. The second RCT (80 people with whiplash symptoms persisting for 4 weeks; see comment below) compared active physiotherapy (exercise or mobilisation) plus advice on graded activity by physiotherapists versus usual care (general-practitioner care which also included advice on graded activity).<sup>[88]</sup> The primary outcome measures were pain, headache, and work activities measured using VAS (0–100). There was substantial improvement in both groups over time. The RCT found no significant difference between physiotherapy and usual care in pain intensity, headache, or work activities measured at 8, 12, 26, or 52 weeks. One outcome for work activities was significantly better for usual care at 52 weeks compared with physiotherapy. However, this was no longer significant when adjusted for baseline differences between groups (see comment below).<sup>[88]</sup> Subgroup analyses showed that the severity of neck pain at baseline influenced outcome. For people with higher initial pain (VAS score of more than 75 mm) physiotherapy was significantly more effective than usual care at 12 weeks (mean difference in VAS score: 40.4 mm, 95% CI 11.1 mm to 69.7 mm;  $P = 0.013$ ). Of the secondary outcomes measured, physiotherapy was significantly more effective at improving neck rotation at 12 weeks compared with usual care (mean difference  $-12.9^\circ$ , 95% CI  $-21.8^\circ$  to  $-4.1^\circ$ ;  $P$  less than 0.01).<sup>[88]</sup>

**Different exercise regimens versus each other:**

We found three systematic reviews (search dates 2001,<sup>[17]</sup> 2003,<sup>[77]</sup> and 2006<sup>[79]</sup>), which identified one RCT of sufficient quality.<sup>[89]</sup> The RCT (59 people with acute whiplash) compared two home exercise regimens: a regular exercise regimen versus the same exercise regimen plus instructions to perform an isometric exercise at least three times daily.<sup>[89]</sup> It found no significant difference between treatments in disability or pain after 3 or 6 months (at 6 months, disability measured by Pain Disability Index scale 0–70: mean 15.1 with regular exercise v 15.8 with additional isometric exercise; pain measured on a visual analogue scale [VAS] from 0–10: 2.0 with regular exercise v 1.8 with additional isometric exercise;  $P$  value reported as non-significant for both outcomes, CI not reported; see comment below).

**Harms:**

The systematic reviews<sup>[17]</sup> <sup>[79]</sup> <sup>[77]</sup> gave no information on adverse effects.

**Exercise versus soft collar or usual care:**

The first RCT gave no information on adverse effects.<sup>[87]</sup> The second RCT found that none of the participants reported any adverse effects.<sup>[88]</sup>

**Different exercise regimens versus each other:**

The RCT gave no information on adverse effects.<sup>[89]</sup>

**Comment:**

The second systematic review (23 RCTs, 2344 people),<sup>[79]</sup> found the overall quality of the RCTs poor, with heterogenous results and insufficient evidence to support any clearly effective treatment. It found limited evidence that active and passive interventions seemed more effective than no treatment, but less convincing evidence about the effects of active interventions compared with passive ones.<sup>[79]</sup> Only the 40% of people most severely affected by whiplash were included in the RCT comparing home exercise programmes, which may have led to a poorer outcome than that seen in practice.<sup>[89]</sup> Possible confounders in the third RCT were baseline differences in characteristics between the two treatment groups.<sup>[88]</sup> The physiotherapy group had higher baseline pain scores (and, hence, more scope for improvement), but higher scores for work activity (that is, people were more active) and therefore less scope for recovery in that area. The study adjusted results for neck pain intensity, work activities, gender, pre-existing problems, and high number of complaints. The adjusted results were similar to non-adjusted results, with no significant differences between groups for all primary outcomes.<sup>[88]</sup> The study also recruited fewer people than required, and this could have limited the statistical power.<sup>[88]</sup>

**OPTION****PEMF TREATMENT FOR ACUTE WHIPLASH INJURY****Symptom improvement**

*Compared with sham PEMF treatment* PEMF treatment may be more effective at reducing pain at 4 weeks, but not at 3 months, in people with acute whiplash who also received analgesia and a neck collar (**very low-quality evidence**).

For GRADE evaluation of interventions for neck pain, see [table, p 31](#).

- Benefits:** **PEMF treatment versus sham PEMF treatment:**  
We found four systematic reviews (search dates 1993, <sup>[10]</sup> 2003, <sup>[73]</sup> <sup>[77]</sup> and 2006 <sup>[79]</sup>), which identified the same single small RCT. <sup>[90]</sup> The RCT (40 people with acute whiplash who all received analgesia and a neck collar) compared PEMF treatment versus sham PEMF treatment. <sup>[90]</sup> It found that PEMF treatment significantly reduced pain after 4 weeks compared with sham treatment (P less than 0.05), but not after 3 months (reported as non-significant, P value not reported; absolute results for both outcomes presented graphically).
- Harms:** **PEMF treatment versus sham PEMF treatment:**  
The RCT gave no information on adverse effects. <sup>[90]</sup>
- Comment:** The fourth systematic review (23 RCTs, 2344 people), <sup>[79]</sup> found the overall quality of the RCTs poor, with heterogenous results and insufficient evidence to support any clearly effective treatment. It found limited evidence that active and passive interventions seemed more effective than no treatment, but less convincing evidence about the effects of active interventions compared with passive ones.

## OPTION MULTIMODAL TREATMENT FOR ACUTE WHIPLASH INJURY

### Symptom improvement

*Compared with physical treatments* Multimodal treatment (postural training, psychological support, eye fixation exercises, and manual treatment) may be more effective than physical treatment (electrical treatment, sonic treatment, ultrasound, and TENS) at improving pain at 1 and 6 months in people with whiplash due to a road traffic accident in the previous 2 months ([low-quality evidence](#)).

### Functional improvement

*Compared with physical treatments* Multimodal treatment (postural training, psychological support, eye fixation exercises, and manual treatment) may be more effective than physical treatment (electrical treatment, sonic treatment, ultrasound, and TENS) at reducing the time taken to return to work in people with whiplash due to a road traffic accident in the previous 2 months ([very low-quality evidence](#)).

### Note

We found no direct evidence about whether multimodal treatment is better than no active treatment.

For GRADE evaluation of interventions for neck pain, see [table, p 31](#).

- Benefits:** **Multimodal treatment versus physical treatments:**  
We found two systematic reviews (search dates 2003, <sup>[77]</sup> and 2006 <sup>[79]</sup>) which identified the same RCT <sup>[91]</sup> of sufficient quality (60 people with whiplash due to a road traffic accident in the previous 2 months). The RCT compared [multimodal treatment](#) (postural training, psychological support, eye fixation exercises, and manual treatment) versus physical treatments (electrical treatment, sonic treatment, ultrasound, and TENS). <sup>[91]</sup> The RCT found that multimodal treatment significantly reduced pain by the end of treatment (P less than 0.05) and after 1 and 6 months (P less than 0.001) compared with physical treatments (pain measured on visual analogue scale 0–10; median visual analogue scale scores: from 6.8 before treatment to 1.9 at 6 months with multimodal treatment v from 7.4 before treatment to 4.8 at 6 months with physical treatments). <sup>[91]</sup> The RCT also found that multimodal treatment significantly reduced the time taken to return to work compared with physical treatment (mean delay in returning to work: 38.4 days with multimodal treatment v 54.4 days with physical treatment; P less than 0.001).
- Harms:** **Multimodal treatment versus physical treatments:**  
The RCT <sup>[91]</sup> gave no information on adverse effects.
- Comment:** The second systematic review (23 RCTs, 2344 people), <sup>[79]</sup> found the overall quality of the RCTs poor, with heterogenous results and insufficient evidence to support any clearly effective treatment. <sup>[79]</sup> It found limited evidence that active and passive interventions seemed more effective than no treatment, but less convincing evidence about the effects of active interventions compared with passive ones.

## OPTION DRUG TREATMENTS (ANALGESICS, ANTIDEPRESSANTS, EPIDURAL CORTICOSTEROIDS, EPIDURAL LOCAL ANAESTHETICS, MUSCLE RELAXANTS, NSAIDS) FOR ACUTE WHIPLASH INJURY

*Antidepressants, NSAIDs, or usual care*

*compared with manipulation* We don't know whether manipulation is more effective than diazepam, azapropazone, or usual care at improving pain at 3 weeks in people with subacute or chronic neck or back pain ([very low-quality evidence](#)). We found no direct information about drug treatments (analgesics, NSAIDs, antidepressants, muscle relaxants, epidural corticosteroids, epidural local anaesthetics) in the treatment of people with acute whiplash injury.

**For GRADE evaluation of interventions for neck pain, see [table, p 31](#) .**

- Benefits:** We found three systematic reviews (search dates 1993, <sup>[10]</sup> 2003, <sup>[73]</sup> and 2006 <sup>[79]</sup>), which identified no RCTs. One subsequent RCT compared a single dose of intramuscular ketorolac versus osteopathic [manipulation](#) in 58 people with acute neck pain, 58% of whom had whiplash injuries. <sup>[92]</sup> However, subgroup analysis for those with whiplash injuries was not reported
- Harms:** The subsequent RCT reported that, with ketorolac, eight people cited one or more of the following: arm soreness, bad taste in mouth, dizziness, drowsiness, dyspepsia, heart racing, light-headedness, nausea, and vomiting. <sup>[92]</sup> In the manipulation group, one person said their arm felt "funny" after manipulation.
- Comment:** None.

## QUESTION What are the effects of treatments for chronic whiplash injury?

### OPTION PERCUTANEOUS RADIOFREQUENCY NEUROTOMY

#### Symptom improvement

*Compared with sham treatment* Percutaneous radiofrequency neurotomy may be more effective than sham treatment with electrode insertion at increasing the proportion of people free from pain at 27 weeks, and at increasing the median time for half of the pain to return ([low-quality evidence](#)).

**For GRADE evaluation of interventions for neck pain, see [table, p 31](#) .**

- Benefits:** **Percutaneous radiofrequency neurotomy versus sham treatment:** We found four systematic reviews (search dates 2002, <sup>[93]</sup> 2003, <sup>[77]</sup> 2004, <sup>[94]</sup> and 2005 <sup>[95]</sup>) of percutaneous radiofrequency neurotomy for neck pain, which between them identified one small RCT (24 people). <sup>[96]</sup> The RCT identified by the reviews found that neurotomy significantly increased the proportion of people free from pain compared with sham treatment (sham treatment with electrode insertion) after 27 weeks, and that neurotomy significantly increased the median time taken for more than half of the pain to return (proportion free from pain: 58% with active treatment v 8% with sham treatment, ARR 50%, 95% CI 3% to 85%, NNT 2, 95% CI 1 to 29; time to return of pain: 263 days with radiofrequency neurotomy v 8 days with sham treatment, P = 0.04; see comment below). <sup>[96]</sup>
- Harms:** The RCT gave no information on adverse effects. <sup>[96]</sup>
- Comment:** Few RCTs have considered treatment for chronic whiplash, and many people with whiplash are included in RCTs of chronic mechanical neck pain. The RCT identified by the reviews, although small (24 people), was well-designed and of high methodological quality. <sup>[96]</sup>

### OPTION MULTIMODAL TREATMENT FOR CHRONIC WHIPLASH INJURY

#### Symptom improvement

*Compared with physical treatments* Multimodal treatment may be more effective at increasing the proportion of people satisfied with pain control and with their ability to perform activities at 3 months in people with chronic whiplash, but we don't know whether multimodal treatment is more effective at improving pain at the end of treatment or at 3 months ([low-quality evidence](#)).

#### Functional improvement

*Compared with physical treatments* We don't know whether multimodal treatment is more effective at improving disability or range of movement at the end of treatment or at 3 months in people with chronic whiplash ([low-quality evidence](#)).

#### Note

We found no direct information about whether multimodal treatment is better than no active treatment.

**For GRADE evaluation of interventions for neck pain, see [table, p 31](#) .**



- Benefits:** **Multimodal treatment versus physical treatments:**  
We found two systematic reviews (search dates 2003<sup>[77]</sup> and 2006<sup>[79]</sup>) which identified the same RCT (33 people with chronic whiplash).<sup>[97]</sup> The RCT compared physical treatments alone versus multimodal treatment (see comment below). It found no significant difference between treatments in disability, pain, or range of movement at the end of treatment or at 3 months. However, significantly more people treated with multimodal treatment were satisfied with pain control at the end of treatment and with their ability to perform activities at 3 months (P less than 0.05).
- Harms:** The RCT gave no information on adverse effects.<sup>[97]</sup>
- Comment:** Few RCTs have considered treatment for chronic whiplash, and many people with whiplash are included in RCTs of chronic mechanical neck pain. Limitations of this RCT include its small size, and the difference in time spent with the therapist in the two groups.<sup>[97]</sup>

## OPTION PHYSICAL TREATMENTS

### Symptom improvement

*Compared with multimodal treatment* Physical treatments may be less effective at increasing the proportion of people satisfied with pain control and with their ability to perform activities at 3 months in people with chronic whiplash, but we don't know whether physical treatments are more effective at improving pain at the end of treatment or at 3 months (very low-quality evidence).

*Exercise plus advice compared with advice alone* Exercise plus advice may be more effective at reducing pain at 6 weeks but not at 12 months in people with whiplash of 3–12 months' duration (very low-quality evidence).

### Functional improvement

*Compared with multimodal treatment* We don't know whether physical treatments are more effective at improving disability or range of movement at the end of treatment or at 3 months in people with chronic whiplash (very low-quality evidence).

*Exercise plus advice compared with advice alone* Exercise plus advice may be more effective at improving function (measured by Patient-Specific Functional scale) at 6 weeks but not at 12 months in people with whiplash of 3–12 months' duration (very low-quality evidence).

For GRADE evaluation of interventions for neck pain, see table, p 31 .

- Benefits:** **Physical treatments versus multimodal treatment:**  
See benefits of multimodal treatment, p 24 .
- Exercise plus advice versus advice alone:**  
One RCT (134 people with whiplash of 3–12 months' duration) compared exercise (12 sessions over 6 weeks) plus advice versus 3 advice sessions.<sup>[98]</sup> Exercise plus advice significantly reduced pain (measured on a visual analogue scale [VAS] 0–10) and improved function (assessed on the Patient-Specific Functional scale [0–10, 0 = unable to perform activity, 10 = able to perform at pre-injury level]) at 6 weeks compared with advice, but there was no significant difference at 12 months (mean difference in pain scores: 6 weeks: –1.1, 95% CI –1.8 to –0.3, P = 0.005; 12 months: –0.2, 95% CI –0.6 to –0.1, P = 0.59; function: 6 weeks: 0.9, 95% CI 0.3 to 1.6, P = 0.006; 12 months: 0.6, –0.1 to +1.4, P = 0.10). Notably, 35 people (56%) in the advice group and 18 people (29%) in the exercise-plus-advice group sought additional treatment between 6 weeks' and 12 months' follow-up (significance not reported).
- Harms:** **Physical treatments versus multimodal treatment:**  
The RCT gave no information on adverse effects.<sup>[97]</sup>
- Exercise plus advice versus advice alone:**  
Twelve patients (18%) in the advice group reported adverse effects at 6 weeks, including muscle pain, headache, and ongoing pain.<sup>[98]</sup> Thirteen patients (20%) in the exercise-plus-advice group reported adverse effects at 6 weeks, including muscle pain with exercise, knee pain, and lumbar spine pain.
- Comment:** **Physical treatments versus multimodal treatment:**  
See comment on multimodal treatment, p 24 .
- Exercise plus advice versus advice alone:**  
The RCT suggested that the effects of exercise in people with chronic whiplash injuries are small, short term, and only significant in people with greater baseline pain and disability.<sup>[98]</sup>

**QUESTION** What are the effects of treatments for neck pain with radiculopathy?

**OPTION** SURGERY VERSUS CONSERVATIVE TREATMENT

### Symptom improvement

*Surgery compared with physical treatments or immobilisation in a neck collar* We don't know how effective surgery, physical treatments, and immobilisation in a neck collar are, compared with each other, at reducing pain at 12 months in people with severe radicular symptoms of at least 3 months' duration (*very low-quality evidence*).

For GRADE evaluation of interventions for neck pain, see [table, p 31](#).

**Benefits:** **Surgery versus physical treatments versus immobilisation in a neck collar:**  
We found one systematic review (search date 1998, <sup>[99]</sup> 1 RCT <sup>[100]</sup>). The RCT included in the review (81 people with severe radicular symptoms for at least 3 months; outcome assessors not blinded; see comment below) compared three interventions: surgery, physical treatments, and immobilisation in a neck collar. <sup>[100]</sup> It found no significant difference among treatments in symptoms after 1 year (mean pain on a 100 mm visual analogue scale at 12 months: 30 mm with surgery v 39 mm with physical treatments v 35 mm with collar; P value reported as non-significant, CI not reported).

**Harms:** **Surgery versus physical treatments versus immobilisation in a neck collar:**  
The RCT gave no information on adverse effects. <sup>[100]</sup>

**Comment:** In the RCT, the number of people with prolapsed intervertebral disc was not reported. <sup>[100]</sup> The RCT reported that people who did not improve between 3 and 12 months were given additional treatments: one person in the physical-treatment group and five in the collar group had surgery; eight people in the surgery group had a second operation; and 12 people in the surgery group and 11 in the collar group received physical treatments. The RCT also assessed emotional state and reported that, when assessing all participants in the trial, 41% of people had a high anxiety score, and 31% of people had a high depression score, which correlated with pain intensity after but not before treatment. <sup>[101]</sup> At 1 year, 19% of people in the trial were depressed, which suggests that treatment should aim to improve both physical and psychological symptoms. <sup>[101]</sup> Conservative treatment needs further assessment, particularly in people considered to be poor-risk candidates for surgery.

**OPTION** DRUG TREATMENTS (ANALGESICS, ANTIDEPRESSANTS, EPIDURAL CORTICOSTEROIDS, EPIDURAL LOCAL ANAESTHETICS, MUSCLE RELAXANTS, NSAIDS) FOR NECK PAIN WITH RADICULOPATHY

### Symptom improvement

*Epidural corticosteroid plus local anaesthetic plus morphine compared with epidural interlaminar corticosteroid plus lidocaine* We don't know whether epidural triamcinolone plus lidocaine plus morphine is more effective than epidural interlaminar triamcinolone plus lidocaine at reducing pain at 1 year in people with radiculopathy of more than 1 year's duration (*very low-quality evidence*).

#### Note

We found no direct information about whether drug treatments (analgesics, NSAIDs, antidepressants, muscle relaxants, epidural corticosteroids, epidural local anaesthetics) are better than no active treatment.

#### Note

The FDA issued a drug safety alert on the risk of rare but serious skin reactions with paracetamol (acetaminophen) (August 2013).

For GRADE evaluation of interventions for neck pain, see [table, p 31](#).

**Benefits:** **Epidural corticosteroid plus local anaesthetic plus morphine versus epidural interlaminar corticosteroid plus local anaesthetic:**  
We found two systematic reviews (search dates 2003 <sup>[102]</sup> and 2006 <sup>[103]</sup>), which between them identified one RCT meeting our inclusion criteria. <sup>[104]</sup> The RCT (24 people with neck pain with radiculopathy for more than 1 year) found similar success rates in the proportion of people with reduced pain at 1 year between epidural corticosteroid (triamcinolone) plus lidocaine plus morphine and epidural interlaminar corticosteroid (triamcinolone) plus lidocaine (80% with epidural corticosteroid plus lidocaine plus morphine v 78% with epidural corticosteroid plus lidocaine; significance of difference from baseline within group and difference between groups not reported in review). <sup>[104]</sup>

**Analgesics (paracetamol), NSAIDs, antidepressants, muscle relaxants, and benzodiazepines:**  
We found no systematic review or RCTs.

**Harms:**

**Epidural corticosteroids, and epidural local anaesthetics:**

The first systematic review reported occasional complications, such as infection or abscess formation after cervical epidural injection.<sup>[102]</sup>

**Analgesics (paracetamol), NSAIDs, antidepressants, muscle relaxants, and benzodiazepines:**  
We found no RCTs.

**Drug safety alert:**

**August 2013, paracetamol (acetaminophen)** The Food and Drug Administration (FDA) has issued a drug safety alert on the risk of rare but serious skin reactions with paracetamol (acetaminophen). These skin reactions, known as Stevens–Johnson Syndrome (SJS), toxic epidermal necrolysis (TEN), and acute generalised exanthematous pustulosis (AGEP), can be fatal.(www.fda.gov/)

**Comment:** None.

**GLOSSARY**

**Cognitive behavioural therapy** Brief (6–20 sessions over 12–16 weeks) structured treatment, incorporating elements of cognitive therapy and behavioural therapy. Behavioural therapy is based on learning theory and concentrates on changing behaviour. It requires a highly trained therapist.

**Multimodal treatment** includes a physical or mechanical treatment plus psychotherapy such as cognitive behavioural therapy. Usually performed by physiotherapists and psychologists working together. In this review, multimodal treatment does not include the use of combinations of physical and mechanical treatments, although some reviews and RCTs use this definition.

**Low-quality evidence** Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

**Manipulation** A manual treatment involving the use of short- or long-lever high-velocity thrusts directed at one or more of the cervical spine joints which does not involve anaesthesia or instrumentation. Manual treatment is usually performed by chiropractors or osteopaths.

**McKenzie treatment** A type of mobilisation consisting of a comprehensive mechanical evaluation to assess the effect on the patient's symptoms of repetitive movements, static positioning, or both. This mechanical diagnosis is intended to enable the physiotherapist to prescribe a series of individualised exercises. The emphasis is on active patient involvement, with the aim of minimising the number of visits to the clinic. For people with more difficult mechanical problems, a certified McKenzie physiotherapist can provide advanced hands-on techniques until the person is able to perform the prescribed exercises alone.

**Mobilisation** Any manual treatment to improve joint function which does not involve high-velocity movement, anaesthesia, or instrumentation. Usually performed by physiotherapists.

**Moderate-quality evidence** Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

**Neck Disability Index** A 10-item self-report measure. Items include pain intensity, personal care, lifting, reading, headaches, concentration, work, driving, sleeping, and recreation. Each item is rated on a 6-point scale (0–5), so the Neck Disability Index scores vary from 0–50. The results are recalculated and expressed on a scale ranging from 0% (no disability) to 100% (maximum disability).

**Northwick Park Neck Pain Questionnaire** is a 9-item scale covering the following areas: neck-pain intensity, neck pain and sleeping, pins and needles or numbness in the arms at night, duration of symptoms, carrying items, reading and watching television, working and housework, social activities, and driving. Each item is scored 0–4 and the total score is converted into a percentage (0–100%).<sup>[105]</sup>

**Short-Form Health Survey-36 items (SF-36)** A scale that assesses health-related quality of life across eight domains: limitations in physical activities (physical component), limitations in social activities, limitations in usual role activities due to physical problems, pain, psychological distress and wellbeing (mental health component), limitations in usual role activities because of emotional problems, energy and fatigue, and general health perceptions.

**Very low-quality evidence** Any estimate of effect is very uncertain.

**SUBSTANTIVE CHANGES**

**Collars and pillows for non-specific neck pain** One small RCT found that the exercise or pillow alone did not reduce pain compared with placebo control (hot and cold packs and massage).<sup>[34]</sup> Benefits data enhanced; categorisation unchanged (Unknown effectiveness).

**Drug treatments** One new systematic review added<sup>[103]</sup> which identified no new RCTs; benefits and harms data enhanced; categorisation unchanged (Unknown effectiveness).

**Early mobilisation for acute whiplash injury** One RCT added <sup>[84]</sup> which compared early mobilisation, immobilisation in a rigid collar followed by mobilisation, and advice to "act as usual", and found no significant difference in neck pain, headache scores, and neck disability among the three groups; benefits and harms data enhanced; categorisation unchanged (Likely to be beneficial). One systematic review <sup>[79]</sup> revised its conclusions and suggested that it could no longer justify the conclusion of the previous version of the review that "rest makes rusty".

**Exercise for non-specific neck pain** One systematic review added. <sup>[19]</sup> Two secondary analyses <sup>[30]</sup> <sup>[31]</sup> of a previously published RCT <sup>[29]</sup> added which found that people with highest pain scores benefited most from exercise, <sup>[30]</sup> and that both endurance and strength exercises decreased pain at 12 months compared with no specific exercise, with the greatest improvement found within the first 2 months of treatment. <sup>[31]</sup> Another small RCT found that the exercise or pillow alone did not reduce pain compared with placebo control (hot and cold packs and massage). <sup>[34]</sup> One long-term follow-up publication <sup>[36]</sup> of an RCT added which found that, although mobilisation speeded recovery in the short term (26 weeks) compared with exercise or usual care, there was no significant difference between treatments in perceived recovery in the long term (1 year); benefits data enhanced; categorisation unchanged (Likely to be beneficial).

**Manipulation for non-specific neck pain** One systematic review added; <sup>[19]</sup> One RCT added which found a greater improvement in neck pain at rest and in the range of movement with manipulation versus mobilisation; <sup>[58]</sup> benefits and harms data enhanced; categorisation unchanged (Likely to be beneficial).

**Mobilisation for non-specific neck pain** One systematic review added; <sup>[19]</sup> one long-term follow-up publication <sup>[36]</sup> of an RCT added, which found that, although mobilisation speeded recovery at 7 and 26 weeks compared with exercise or usual care (analgesics, education, and counselling), there was no significant difference in perceived recovery at 1 year. One RCT comparing McKenzie mobilisation versus CBT added which found no significant difference between groups in [Northwick Park Neck Pain Questionnaire](#); <sup>[59]</sup> One RCT comparing mobilisation versus manipulation added, <sup>[58]</sup> which found that manipulation improved neck pain at rest and range of movement compared with mobilisation; <sup>[58]</sup> benefits data enhanced, categorisation unchanged (Likely to be beneficial).

**Physical treatments for chronic whiplash injury** One RCT <sup>[98]</sup> added, comparing 12 sessions of exercise plus advice versus three advice sessions, which found that the effects of exercise were small and only seen in the short term (6 weeks); benefits data enhanced; categorisation unchanged (Unknown effectiveness).

**Traction for non-specific neck pain** One systematic review added which identified no new RCTs of sufficient quality; <sup>[39]</sup> categorisation unchanged (Unknown effectiveness).

**Acupuncture for non-specific neck pain** One systematic review added which found moderate evidence that acupuncture is more effective at achieving pain relief immediately after treatment and at short-term follow-up (less than 3 months) than some sham treatments, inactive treatment, or waiting list control; although only 4 of 10 RCTs were of high quality. <sup>[46]</sup> Two subsequent RCTs added which found that acupuncture improved pain and disability compared with sham TENS, <sup>[47]</sup> and compared with delayed acupuncture treatment. <sup>[48]</sup> Benefits data enhanced; categorisation changed from Unknown effectiveness to Likely to be beneficial.

**Early return to normal activity for acute whiplash injury** One RCT added <sup>[84]</sup> which compared three interventions: advice to "act as usual", early mobilisation, and immobilisation in a rigid collar followed by mobilisation, and which found no significant difference in neck pain, headache scores, and neck disability among the three groups. One systematic review <sup>[79]</sup> revised its conclusions because of the poor quality of the RCTs, and heterogenous results, and found insufficient evidence to support any clearly effective treatment; benefits data enhanced; categorisation changed from Likely to be beneficial to Unknown effectiveness. The review suggested that it could no longer justify the conclusion of the previous version of the review that "rest makes rusty".

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**TABLE** GRADE evaluation of interventions for neck pain

Important outcomes	Symptom improvement, functional improvement, quality of life									
	Number of studies (participants)	Outcome	Comparison	Type of evidence	Quality	Consistency	Directness	Effect size	GRADE	Comment
	What are the effects of treatments for people with non-specific neck pain without severe neurological deficit?									
	1 (60) <sup>[20]</sup>	Symptom improvement	Proprioceptive and strengthening exercises v usual care	4	-1	0	0	0	Moderate	Quality point deducted for sparse data
	1, 3 papers (180) <sup>[29] [30] [31]</sup>	Symptom improvement	Endurance or strengthening (isometric) exercise v no specific exercise programme	4	-3	0	-1	0	Very low	Quality points deducted for sparse data, unclear randomisation, and incomplete reporting of results. Directness point deducted for restricted population
	1 (180) <sup>[29] [30] [31]</sup>	Functional improvement	Endurance or strengthening (isometric) exercise v no specific exercise programme	4	-2	0	-1	0	Very low	Quality points deducted for sparse data and unclear randomisation. Directness point deducted for restricted population
	1, 2 papers (103) <sup>[21] [22]</sup>	Symptom improvement	Exercise (strength training, endurance training, or coordination exercises) v stress management	4	-2	0	-1	0	Very low	Quality points deducted for sparse data and incomplete reporting of results. Directness point deducted for restricted population
	1 (393) <sup>[32]</sup>	Symptom improvement	Exercise (dynamic muscle training) v relaxation training or advice to continue with ordinary activity	4	0	0	-2	0	Low	Directness points deducted for low uptake of interventions and for restricted population
	1 (393) <sup>[32]</sup>	Functional improvement	Exercise (dynamic muscle training) v relaxation training or advice to continue with ordinary activity	4	0	0	-2	0	Low	Directness points deducted for low uptake of interventions and for restricted population
	1 (218) <sup>[33]</sup>	Symptom improvement	Exercise plus infrared v TENS plus infrared v infrared alone	4	-1	-1	0	0	Low	Quality point deducted for incomplete reporting of results. Consistency point deducted for no consistent evidence of benefit across different symptoms
	1 (218) <sup>[33]</sup>	Functional improvement	Exercise plus infrared v TENS plus infrared v infrared alone	4	-1	0	-1	0	Low	Quality point deducted for incomplete reporting of results. Directness point deducted for unclear outcome assessment
	1 (151) <sup>[34]</sup>	Symptom improvement	Exercise v sleeping neck support (pillow) v exercise plus pillow v placebo (hot or cold packs plus massage)	4	-3	0	-1	0	Very low	Quality points deducted for sparse data, incomplete reporting of results, and uncertainty about validity of control group as it included two active treatments. Directness point deducted for low overall baseline pain
	1 (100) <sup>[40]</sup>	Symptom improvement	Traction v sham traction	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results.
	1 (493) <sup>[41]</sup>	Symptom improvement	Traction v positioning v instruction in posture v neck collar v placebo tablets v untuned short-wave diathermy	4	-2	0	-1	0	Very low	Quality points deducted for incomplete reporting of results and inclusion of co-intervention (analgesics). Directness point deducted for unclear outcome assessment
	1 (81) <sup>[43]</sup>	Symptom improvement	PEMF treatment v sham PEMF treatment	4	-3	0	-1	0	Very low	Quality points deducted for sparse data, sub-group analysis, and baseline differences between groups. Directness point deducted for unclear measurement of outcomes

Important outcomes	Symptom improvement, functional improvement, quality of life									
	Number of studies (participants)	Outcome	Comparison	Type of evidence	Quality	Consistency	Directness	Effect size	GRADE	Comment
	9 (at least 4470) <sup>[14] [15] [44] [45] [46] [47] [48]</sup>	Symptom improvement	Acupuncture v sham treatment, inactive treatment, or waiting list control	4	-2	0	-2	0	Very low	Quality points deducted for weak methods of RCTs and incomplete reporting. Directness points deducted for inclusion of people with whiplash or radicular pain, lack of clarity of diagnosis in 1 RCT, and use of a composite outcome measure
	1 (3766) <sup>[48]</sup>	Quality of life	Acupuncture v sham treatment, inactive treatment, or waiting list control	4	-2	0	-1	0	Very low	Quality points deducted for lack of blinding and incomplete reporting of results. Directness point deducted for lack of clarity of diagnosis
	1 (74) <sup>[14]</sup>	Symptom improvement	Spray and stretch v placebo	4	-2	0	-1	0	Very low	Quality points deducted for sparse data and incomplete reporting of results. Directness point deducted for unclear outcome assessment
	1, 2 papers (183) <sup>[23] [24] [36]</sup>	Symptom improvement	Mobilisation v exercise or v usual care	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
	1 (77) <sup>[26]</sup>	Symptom improvement	McKenzie mobilisation v exercise or v control	4	-3	0	0	0	Very low	Quality points deducted for sparse data, poor methods, and incomplete reporting of results
	1 (315 people in total, only 96 of whom had neck pain) <sup>[59]</sup>	Symptom improvement	McKenzie mobilisation v CBT	4	-2	0	-1	0	Very low	Quality points deducted for incomplete reporting of results, and no separate reporting of people with neck pain. Directness points deducted for inclusion of co-intervention (advice booklets)
	3 (155) <sup>[49]</sup>	Symptom improvement	Manipulation v muscle relaxants, NSAIDs, or usual care	4	-1	0	-2	0	Very low	Quality points deducted for sparse data. Directness points deducted for inclusion of people with back pain and control including different active treatments (including diazepam, anti-inflammatory drugs, and usual care)
	3 (506) <sup>[56] [57] [58]</sup>	Symptom improvement	Manipulation v mobilisation	4	-3	0	0	0	Very low	Quality points deducted for incomplete reporting of results, lack of blinding, and short follow-up
	3 (506) <sup>[56] [57] [58]</sup>	Functional improvement	Manipulation v mobilisation	4	-3	0	0	0	Very low	Quality points deducted for incomplete reporting of results, lack of blinding, and short follow-up
	1 (256) <sup>[55]</sup>	Symptom improvement	Manipulation or mobilisation v other physical treatments (exercises plus massage with or without heat, PEMF treatment, ultrasound, or short-wave diathermy) v usual care or placebo	4	-1	0	-2	0	Very low	Quality points deducted for incomplete reporting of results. Directness points deducted for combination of different treatments in comparison group and inclusion of people with back pain
	1 (119) <sup>[54]</sup>	Symptom improvement	Manipulation or mobilisation v exercise	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
	1 (191) <sup>[60] [65]</sup>	Symptom improvement	Manipulation plus strengthening exercises v either treatment alone	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
	1 (191) <sup>[60] [65]</sup>	Functional improvement	Manipulation plus strengthening exercises v either treatment alone	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results



Important outcomes	Symptom improvement, functional improvement, quality of life									
	Number of studies (participants)	Outcome	Comparison	Type of evidence	Quality	Consistency	Directness	Effect size	GRADE	Comment
	1 (350) <sup>[35]</sup>	Symptom improvement	Manual therapy (manipulation, mobilisation) plus advice plus exercise v pulsed short-wave diathermy plus advice plus exercise v advice plus exercise alone	4	-2	0	0	0	Low	Quality points deducted for incomplete reporting and combined intervention group of manual therapy
	1 (66) <sup>[28]</sup>	Symptom improvement	Exercise plus behavioural modification v exercise plus CBT	4	-2	0	-1	0	Very low	Quality points deducted for sparse data and incomplete reporting of results. Directness point deducted for inclusion of people with shoulder pain
	1 (185) <sup>[69]</sup>	Symptom improvement	CBT plus physiotherapy v CBT v minimal treatment	4	-2	0	-2	0	Very low	Quality points deducted for sparse data and incomplete reporting of results. Directness points deducted for inclusion of people with back pain and unclear clinical relevance of reported outcome
	2 (525) <sup>[70] [71]</sup>	Symptom improvement	Patient education or patient education plus exercise v no treatment, CBT or stress management	4	-2	0	-1	0	Very low	Quality points deducted for incomplete reporting and inclusion of co-intervention (exercise). Directness point deducted for inclusion of people with back and shoulder pain
	3 (316) <sup>[75] [76] [74]</sup>	Symptom improvement	Muscle relaxants v placebo	4	-2	0	-1	0	Very low	Quality points deducted for incomplete reporting of results, and short follow-up. Directness point deducted for inclusion of people with range of musculoskeletal disorders
What are the effects of treatments for acute whiplash injury?										
	5 (970) <sup>[80] [81] [82] [83] [84]</sup>	Symptom improvement	Early mobilisation (including exercises) v immobilisation or less active treatment	4	-2	0	-2	0	Very low	Quality points deducted for poor follow-up, and incomplete reporting of results. Directness points deducted for no direct statistical comparison between groups, and inclusion of co-interventions (other neck interventions)
	2 (519) <sup>[84] [80]</sup>	Functional improvement	Early mobilisation (including exercises) v immobilisation or less active treatment	4	-1	0	-2	0	Very low	Quality point deducted for incomplete reporting of results. Directness points deducted for no direct statistical comparison between groups and inclusion of co-interventions (other neck interventions)
	2 (659) <sup>[84] [86]</sup>	Symptom improvement	Early return to normal activity v immobilisation or v early mobilisation	4	-1	0	-2	0	Very low	Quality point deducted for incomplete reporting of results. Directness points deducted for no direct statistical comparison between groups, and inclusion of co-interventions (other neck interventions)
	2 (659) <sup>[84] [86]</sup>	Functional improvement	Early return to normal activity v immobilisation v early mobilisation	4	-1	0	-1	0	Low	Quality point deducted for incomplete reporting of results. Directness point deducted for inclusion of co-interventions (other neck interventions)
	2 (280) <sup>[87] [88]</sup>	Symptom improvement	Exercise v soft collar or v usual care	4	-1	0	-2	0	Very low	Quality point deducted for incomplete reporting of results. Directness points deducted for high rate of withdrawals, baseline differences between groups, and use of co-intervention
	2 (280) <sup>[87] [88]</sup>	Functional improvement	Exercise v soft collar or v usual care	4	-1	0	-2	0	Very low	Quality point deducted for incomplete reporting of results. Directness points deducted for high rate of dropouts baseline differences between groups, and use of co-intervention

Important outcomes		Symptom improvement, functional improvement, quality of life							
Number of studies (participants)	Outcome	Comparison	Type of evidence	Quality	Consistency	Directness	Effect size	GRADE	Comment
1 (59) <sup>[89]</sup>	Symptom improvement	Different exercise regimens v each other	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results.
1 (59) <sup>[89]</sup>	Functional improvement	Different exercise regimens v each other	4	-2	0	0	0	Low	
1 (40) <sup>[90]</sup>	Symptom improvement	PEMF treatment v sham PEMF treatment	4	-2	0	-1	0	Very low	Quality points deducted for sparse data and incomplete reporting of results. Directness point deducted for inclusion of co-intervention
1 (60) <sup>[91]</sup>	Symptom improvement	Multimodal treatment v physical treatments	4	-2	0	-1	0	Very low	Quality points deducted for sparse data and incomplete reporting of results. Directness point deducted for inclusion of different comparators in control group
1 (60) <sup>[91]</sup>	Functional improvement	Multimodal treatment v physical treatments	4	-1	0	-2	0	Low	Quality point deducted for sparse data. Directness points deducted for inclusion of different comparators in control group
What are the effects of treatments for chronic whiplash injury?									
1 (24) <sup>[96]</sup>	Symptom improvement	Percutaneous radiofrequency neurotomy v sham treatment	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
1 (33) <sup>[97]</sup>	Symptom improvement	Multimodal treatment v physical treatments	4	-3	0	0	0	Very low	Quality points deducted for sparse data, incomplete reporting of results, and difference in time spent by therapist with the two groups
1 (33) <sup>[97]</sup>	Functional improvement	Multimodal treatment v physical treatments	4	-3	0	0	0	Very low	Quality points deducted for sparse data, incomplete reporting of results, and difference in time spent by therapist in the two groups
1 (134) <sup>[98]</sup>	Symptom improvement	Exercise plus advice v advice alone	4	-1	0	-1	0	Low	Quality point deducted for sparse data. Directness point deducted for use of additional treatment
1 (134) <sup>[98]</sup>	Functional improvement	Exercise plus advice v advice alone	4	-1	0	-1	0	Low	Quality points deducted for sparse data. Directness point deducted for use of additional treatment
What are the effects of treatments for neck pain with radiculopathy?									
1 (81) <sup>[100]</sup>	Symptom improvement	Surgery v physical treatments or v immobilisation in a neck collar	4	-3	0	0	0	Very low	Quality points deducted for sparse data, incomplete reporting of results, and lack of blinding of outcome assessors
1 (24) <sup>[104]</sup>	Symptom improvement	Epidural corticosteroid plus epidural local anaesthetic plus morphine v epidural interlaminar corticosteroid plus lidocaine	4	-3	0	0	0	Very low	Quality points deducted for sparse data, incomplete reporting of results, and no direct statistical comparison between groups

Type of evidence: 4 = RCT; 2 = Observational. Consistency: similarity of results across studies  
Directness: generalisability of population or outcomes  
Effect size: based on relative risk or odds ratio