

Supplemental Data A: Definitions of interventions and primary/secondary interventions

Acupuncture (acu)

Per prior Cochrane review [1], the definition of acupuncture used was “*the diagnosis was made using traditional acupuncture theory and the needles were inserted in classical meridian points, extra points or ah-shi points (painful points)*”. Dry needling was classified with acupuncture and required needles to be inserted into myofascial trigger points. Acupressure, laser acupuncture and acupuncture via electrical stimulation were excluded from this acupuncture group as they did not involve needling. These interventions were included, respectively, under massage (acupressure) and electrotherapies (laser and electrical acupuncture).

Treatments within Class:

- acu_need: acupuncture following (traditional) acupuncture theory
- acu_dry: dry needling

Education (edu)

Patient education has been defined [2] previously “*a systematic experience, in a one-to one situation, that consists of one or more methods, such as the provision of information and advice and behaviour modification techniques*”. Similar to this prior review, we considered education to occur when back pain patients were given information to help them understand their condition, what behaviours are likely to be more beneficial. ‘Back school’ interventions were considered education. Advice to stay active was considered education. Both group and individual education were included. Using brochure or booklet with education material was included if a clinician explained the information to the patient. Studies on instructions as to how to perform other kinds of interventions (e.g., how to do exercise, or were included, studies on instructions on how to perform exercises were not included.

Treatments within Class:

- edu_school: back school
- edu_pne: pain neuroscience education
- edu_book: via printed materials
- edu_grpind: remaining group and individual education

Electrophysical agents (elc)

Therapeutic heat and cold, laser (including laser acupuncture) and light therapies, classic electrotherapies (e.g., electrical stimulation modalities including TENS; electrical acupuncture also included here), various electromagnetic applications (e.g., pulsed shortwave therapy), ultrasound therapy and a variety of mechanical therapies (e.g., vibration therapy and intermittent pneumatic compression therapy) are included as electrophysical agents given these modalities are considered comparable [3]. The electrophysical agents must be applied externally without breaking or piercing the skin.

Whole body vibration, where a person experiences vibration through their whole body, is excluded.

Treatments within Class:

- elc_electric: electrical stim or input of some form
- elc_hot: heat
- elc_cold: cold

- elc_mech: ultrasound therapy and a variety of mechanical therapies
- elc_etc: magnetic and remaining included

Epidural injections (epi)

As per prior Cochrane review [4], epidural injections involve the delivery of corticosteroid medication to the epidural space via injection. The anatomical approaches considered included, but were not limited to: caudal, interlaminar, and transforaminal approaches.

Treatments within Class:

- epi_caud: caudal approach
- epi_inter: interlaminar approach
- epi_trans: transforaminal approach
- epi_other: other included epidural INT not included in anatomical approaches listed above

Exercise (exe)

Exercise therapy has been [5] defined as “*a series of specific movements with the aim of training or developing the body by a routine practice or as physical training to promote good physical health*”. We required that a clinician or study investigator instructed and/or prescribed exercises to patients with the goal of improving the patient’s back disorder. Exercise could be performed as a group or individually. Whole body vibration and whole body vibration exercise was excluded.

Treatments within Class:

- exe_res: resistance exercise
- exe_sta: stabilization_motor_control
- exe_eso: pilates, yoga, traditional eastern approaches
- exe_aer: aerobic (e.g cycling, walking)
- exe_str: stretching
- exe_oth: other and water based

Manual therapies and manipulation (man)

A prior Cochrane review [6] defined mobilisation as the “*use low-grade velocity, small or large amplitude passive movement techniques within the patient's range of motion and control*” and manipulation as “*a high velocity impulse or thrust applied to a synovial joint over a short amplitude at or near the end of the passive or physiologic range of motion, which is often accompanied by an audible crack*”. The term “adjustments” is sometimes used in conjunction with chiropractic or osteopathic manual therapy treatment. Studies that incorporate visceral techniques as part of an osteopathy intervention will be included.

Treatments within Class:

- man_man: manual therapy and mobilisation (without manipulation)
- man_mip: manipulation
- man_chos: chiropractic or osteopathy not otherwise more precisely specified

Massage (mas)

Massage has been [7] defined as “*the manipulation of the soft tissue of whole body areas to bring about generalised improvements in health, such as relaxation or improved sleep, or*

specific physical benefits, such as relief of muscular aches and pains” Trigger point therapy, myofascial release, Shiatsu, reflexology, and acupressure are also classified as massage.

Treatments within Class:

- mas_mas: massage
- mas_tpm: Trigger point therapy, myofascial release
- mas_oth: Shiatsu, reflexology, acupressure and other specifically named treatments determined to be massage

McKenzie (mck)

The McKenzie method [8] has also been termed Mechanical Diagnosis and Therapy and is a system that involves the use of mechanical loading strategies to guide specific treatment based on the patient’s responses to these mechanical loading strategies (sub-group membership) [9]. In this treatment approach, treatment is individualized for each patient based on the response of their pain/impairment to mechanical loading strategies (sustained or repeated movements and postures) and classified into dysfunction, posture and derangement syndromes. Given it is the most prevalent classification, studies using directional preference treatment only (for derangement syndrome) will also be included. Directional preference management was defined as individualized treatment based on the response to mechanical loading strategies. Trials evaluating the effect of directional preference management on back pain were included.

Treatments within Class:

- mck_mck: Mckenzie

Pharmacotherapy (pha)

Pharmacotherapy interventions considered in this review included non-steroidal anti-inflammatory drugs (NSAIDs), Opioids, Skeletal muscle relaxants, Benzodiazepines, Antidepressants, Acetaminophen (paracetamol), systemic corticosteroids and anticonvulsants. Analgesic medicines work in various ways to reduce the intensity of pain but may also cause unwanted harmful effects.

Treatments within Class:

- pha_nsai: NSAIDs
- pha_opi: Opioids
- pha_relx: Skeletal muscle relaxants
- pha_benz: Benzodiazepines
- pha_antd: Antidepressants
- pha_para: Acetaminophen (paracetamol)
- pha_cort: systemic corticosteroids and
- pha_conv: anticonvulsants

Psychological therapies (including cognitive-behavioural therapies) (psy)

Per prior Cochrane review [10], psychological interventions were classed as any intervention that is designed following a psychological theory of behaviour and behaviour change. Mindfulness meditation, or other forms of meditation, were not, by themselves, considered psychological therapies.

Treatments within Class:

- psy_cbt: cognitive behavioural therapies

- psy_oth: other psychological therapies

Percutaneous procedures (per)

The following percutaneous procedures were considered:

- Radio frequency denervation: Radiofrequency denervation has been defined [11] as “*a minimally invasive and percutaneous procedure performed under local anaesthesia or light intravenous sedation. Radiofrequency energy is delivered along an insulated needle in contact with the target nerves to denature the nerve*”. It was initially developed for the lumbar zygapophyseal joint, and is now applied to denervate other joints in the spine [12].
- Spinal cord stimulation: “*This method was a clinical outgrowth from the well-known gate-control theory for segmental pain suppression. The idea was to apply electric stimulation to the dorsal columns of the spinal cord which are easily accessible and contain large diameter afferent fibers. Thus, stimulating electrodes were applied epidurally to the dorsal aspect of the cord. The gate control theory implied that activation of these coarse fiber systems inhibited transmission of nociceptive information at the segmental level and actually predicted that all types of pain would be equally suppressed.*” [13,14]
- Percutaneous multifidus stimulation Percutaneous multifidus stimulation involves “*a stimulating probe is placed into the multifidus muscle via percutaneous procedure, using known anatomical landmarks to target the medial branches of the dorsal rami. Electrical stimulation is applied to target the medial branch of the dorsal ramus after the branch exits the intervertebral foramen prior to innervation of the multifidus and facet joints.*”[15]
- Percutaneous rhizolysis, medial bundle branch blocks:
 - Percutaneous rhizolysis (radiofrequency neurotomy), medial bundle branch blocks: “*Low-back pain may arise from degenerative changes in the posterior joints of the lumbar spine. These joints are innervated by a branch of the posterior primary ramus, which follows an anatomically constant course. Pain impulses from these joints can be interrupted by coagulating the nerve with a radiofrequency wave, the probe having been placed in the area of the nerve percutaneously.*” [16]
 - Facet joint medial bundle branch radiofrequency ablation (MBB-RFA) “*involves using energy in the radiofrequency range to perform necrosis of specific nerves (medial branches of the dorsal rami in patients with lumbar facetogenic pain), avoiding the neural transmission of pain. The aim of MBB-RFA is to both provide relief of pain and decrease the possibility of recurrence*”. [17,18]

Treatments within Class:

- per_rad: Radio frequency denervation
- per_ssc: Spinal cord stimulation
- per_mfs: Percutaneous multifidus stimulation
- per_rhi: Percutaneous rhizolysis (radiofrequency neurotomy), medial bundle branch blocks
- per_mmb: Facet joint medial bundle branch radiofrequency ablation (MBB-RFA)

Surgery (sur)

The following types of surgery were included:

- Discectomy (any type): open discectomy, sequestrectomy or aggressive discectomy, microdiscectomy, endoscopic open/percutaneous discectomy, automated open/percutaneous discectomy
- Non fusion stabilization [19]: Graf ligament, Dynesys, interspinous stabilisation devices (e.g., Coflex, Wallis ligament, DIAM), total disc arthroplasty (replacement), facet arthroplasty/facet replacement
- Fusion [19]: anterior, posterior, or circumferential spinal fusion (decompression/discectomy/laminectomy/laminotomy) with/without autologous bone graft harvested from the iliac crest or use of allograft femoral rings stuffed with autologous cancellous bone with/without pedicle screw [20]

Surgery may include indirect/direct decompression [21], decompression with/without instrumentation fusion [21,22] PLIF, ALIF, TLIF, minimally invasive spine surgeries (including laparoscopic ALIF, minimally invasive PLIF, XLIF, OLIF, AxiaLIF).

Treatments within Class:

- sur_dis: Discectomy (any type)
- sur_nstab: Non fusion stabilization
- sur_fus: Fusion
- sur_deco: Decompression/laminectomy/laminotomy without an instrument for foraminal/canal stenosis

Traction (tra)

Traction involves application of a distractive axial force to the spine and trunk for therapeutic effect [23]: “*Mechanical or motorized traction (where the traction is exerted by a motorized pulley), manual traction (in which the traction is exerted by the therapist, using his or her body weight to alter the force and direction of the pull), and auto-traction (where the person controls the traction forces by grasping and pulling bars at the head of the traction table)*” [23] were included as traction. Other forms of traction may include the use of gravity to generate the traction force (e.g., on a tilted table, or hung vertically by the lower extremities).

Treatments within Class:

- tra_mech: Mechanical or motorized traction
- tra_man: manual traction
- tra_auto: auto-traction and use of gravity to generate the traction force

Multidisciplinary (multidisciplinary pain management) (mul)

Multidisciplinary pain management incorporates a number of intervention types, such as education (e.g., mechanisms of chronic pain, anatomy), goal setting, exercise, stress management, relaxation and imagery, meditation and aspects of psychological therapies, medication management, family member participation implemented as one package of treatment [24–26]. These may be done as individual sessions or as group sessions. If a study labelled its intervention as multidisciplinary pain management, then this was considered multidisciplinary pain management. Other studies may have combined individual interventions

into a multidisciplinary program but did not specifically label it as multidisciplinary pain management. In this case, if the reviewers agreed that the intervention included a minimum of education, exercise, psychological therapies delivered by a multidisciplinary clinician team (at least 2 clinicians from different fields), this was classified as 'multidisciplinary pain management'. Otherwise, these interventions were classified under 'treatment combinations' (below).

Treatments within Class:

- mul_mdp: Multidisciplinary pain management

Physical therapy (otherwise not falling into specific treatment combination) (pio)

Into this group fall any interventions that are generic 'physiotherapy' or 'physical therapy' treatments, often at the discretion of the clinician, but otherwise not detailed or defined.

Treatments within Class:

- pio_pio: generic physiotherapy or physical therapy treatments

Placebo or sham (pla)

Any intervention defined as a placebo or sham intervention by the study authors, or described as such consistent with previous meta-analysis [27].

Treatments within Class:

- pla_pla: placebo

“Usual care” (e.g., GP Management) (usu)

Intervention deemed 'usual care', including GP management.

Treatments within Class:

- usu_usu: usual care

No treatment (true control) (tru)

No intervention provided, including waitlist control where no treatment is given.

Treatments within Class:

- tru_tru: true control, no intervention
- tru_wait: waiting list control where not treatment is given

Combinations of the above treatments were included and classified according to their primary and secondary treatment components via agreement between the extractors (with adjudication where necessary)

Definition of primary and secondary INT components

The following approach was used to classify primary and secondary intervention components in groups that receive multiple treatments within the same treatment group but did not clearly fall under the multidisciplinary definition above:

1) Pick the primary intervention that contributes to the treatment group: if an intervention comprised >50% of the treatment (per judgement of the extractor), then it was taken as 'primary'. If no intervention component was >50%, then pick the one with the highest proportion.

In cases that were unclear, the following hierarchy of guiding principles was used:

- Any prior publications (e.g., protocol paper, primary outcome publication) arising from the same study were checked.
- A treatment component that is more thoroughly described could be considered the primary component. For example, if exercise was fully described but advice is labelled as "advice" and not described in similar detail, then exercise was considered as the primary.
- Where a treatment component was mentioned in either the article title or the group subheading was labelled as one of the interventions, then that was taken as the primary intervention component. For example, if the group subheading was called "exercise" but it contained exercise and advice components, then exercise was considered the primary component).
- To split true stalemates, the intervention element mentioned first in the treatment description and/or label was taken to be the primary component (e.g., "exercise and advice" = exercise mentioned first and therefore primary component).
- A minimum threshold to be classified as a primary component was 25%.

2) Secondary component of treatments with multiple components: in some cases, a treatment group may have more than two components, but not fall under the multidisciplinary definition. In this case, the following principles were followed: only ONE secondary intervention component was included, regardless of how many there were. To qualify as being classified as a secondary treatment component, it needed to represent at least 20% of the total intervention (per judgement of the extractor), otherwise the intervention will be classified as having only a primary intervention with no secondary component.

3) If a study arm could not be classified according to the above criteria, then it was treated as a non-included INT (see below). We considered including an additional 'multimodal' category beyond the multidisciplinary group defined above. However, we determined this would be uninformative as it would encompass a heterogeneous range of treatments and thus not provide useful guidance for clinical practice.

Where both primary and secondary intervention components are present we will include these in analyses as combinations of intervention and they will be analysed separately. For example, Physical therapy as a primary component and Massage as a secondary component will be analysed as "Physical therapy + massage". Due to the approach we have described for classifying primary and secondary components, the order of components may be important, such that we assume that "Physical therapy + massage" is not the same as "Massage + physical therapy".

Where a secondary intervention component is given in all arms of a study, in addition to the analysis above we will also fit a model in which the study treatments are coded as only the primary intervention in order to test whether assuming additivity of treatment efficacy is reasonable, as this may lead to better connected NMAs with more precise estimates.

Handling of studies that examined non-included INTs

Some studies will examine an INT that is not subject of the current review. In this case, the arms in the study were assessed on a case by case basis.

- If the 'primary treatment component' of an arm was a non-included INT (e.g., back belts), then that individual arm was not included in extraction and therefore analysis.
- If the 'primary treatment component' was an included INT but the 'secondary treatment component' a non-included INT, then the individual arm was included.
- Pending these decisions, if at least two arm of an individual study could be included, then the study as a whole was included. Otherwise it was excluded.

For example, in the case of a three arm study [28] on "back belt + exercise" vs "exercise" vs "control", the "back belt + exercise" arm was excluded, but the "exercise" and "control" arms were included. Thus the study could also be included.

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