Technical Report Chapter 4: Treatment

Australian Clinical Guidelines for Health Professionals Managing People with Whiplash-Associated Disorders, Fourth Edition

State Insurance
Regulatory Authority

NSW
GOVERNMENT

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2. Abstract

Background: Whiplash-associated-disorders (WAD) are the most common reported injury for Australians involved in non-catastrophic motor vehicle crashes (MVC), where half have persisting problems. Despite three past iterations of Australian acute whiplash guidelines, implementation of evidence-based care can be inconsistent and little guidance has been provided on managing people with chronic WAD.

Objective: The objective of these evidence reviews, and recommendation development procedures, was to develop new multidisciplinary guidelines for the management of people with acute and chronic WAD in an Australian context.

Methods: A multidisciplinary panel (n=18) was convened that comprised key stakeholders. Randomised controlled trials (RCT) for managing people with acute and chronic WAD were identified by systematic review and the previous Australian guidelines. The panel prioritised three critical treatment outcomes (pain, disability, and psychological functioning) and 26 treatment clinical questions based on the extant literature and current clinical practice. Studies were classified under these questions and the Grading of Recommendations, Assessment, Development, and Evaluations (GRADE) Evidence to Decision Framework was used to develop treatment recommendations. Where there was no included evidence for people with whiplash injury for a given clinical question, relevant literature for similar conditions was evaluated (e.g., systematic reviews and/or clinical guidelines). Implementation considerations for each treatment were developed in accordance with the included studies (e.g., treatment dosage) and input from the guideline panel (e.g., subject matter experts, healthcare professionals, consumers).

Results: 44 trials for acute and 19 trials for chronic WAD were included. Recommendations FOR included active and behavioural interventions (e.g., education, neck-specific exercises, psychologically informed exercise, psychological interventions). NEUTRAL recommendations with stringent implementation considerations included passive and manual treatments (e.g., intermittent immobilisation, massage). Recommendations AGAINST included invasive and passive treatments (e.g., surgery, injections, manipulation, electrotherapy).

Conclusions: Active and behavioural interventions had the highest recommendations; however, recommendations were primarily conditional or neutral, largely due to low certainty evidence. Treatments should be aligned to the risk stratification (see Prognosis chapter) and clinical presentation features (see Diagnosis and Assessment chapter) of the person with WAD. People who are low risk and likely to recover require less treatment input and it is important not to overtreat them. Healthcare professionals should consider earlier referral to a whiplash specialist and/or psychologist for people at medium-high risk (acute WAD) or moderate-severe disability (chronic WAD) who are not recovering. Multidisciplinary care with a focus on developing injured person self-efficacy and improving function is recommended for managing people with chronic WAD.

3. Suggested citation

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4. Introduction

Whiplash-associated-disorders are the most common injury for the ~2.6 million Australians involved in a non-catastrophic MVC and are characterised by symptoms following whiplash trauma to the neck (MAA, 2009). Whilst half of those Australians injured should see rapid recovery following a MVC, the clinical course is not so clear for the remaining 50% who may develop chronic pain, disability, psychological disorders (e.g., posttraumatic stress, depression, and anxiety) and continue to report long-term interference in daily life (Campbell et al., 2018; Sterling et al., 2010).

The 2014 NSW SIRA "Guidelines for the Management of Acute Whiplash Associated Disorders for Health Professionals" (SIRA, 2014) covers management of people with WAD in the first 12 weeks following an MVC. The 2008 Trauma and Injury Recovery "Clinical Guidelines for Best Practice Management of Acute and Chronic Whiplash-Associated Disorders" (TRACsa, 2008) provides some guidance on management of people with chronic WAD. However, many studies have been published since the release of these two guidelines. At present, the acute guidelines are mostly used across Australia. As per the Australian National Health and Medical Research Council (NHMRC) Standards for Guidelines, recommendations within clinical guidelines need to be based on current evidence to ensure ongoing relevance and reliability. There is a need for systematic review and collation of current evidence to update the existing Australian WAD guidelines and bridge the gap between research and clinical practice. Since the previous guidelines the GRADE process for evaluating certainty of evidence and developing clinical recommendations is being increasingly used and is now a requirement of new Australian guidelines. The overall aim of developing these guidelines is to improve health and social outcomes of people with acute and chronic WAD by providing best practice recommendations for healthcare professionals managing these people. This technical report details evidence reviews and subsequent recommendations and implementation considerations for the treatment of people acute and chronic WAD.

5. Abbreviations

CBT = Cognitive behavioural therapy
CES-D = Centre for epidemiological Studies – Depression Scale
CNFDS = Copenhagen Neck Functional Disability Scale
CSQ = Coping Strategies Questionnaire
DASS = Depression Anxiety Stress Scale
DSM-5 = Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition
GRADE = Grading of Recommendations, Assessment, Development, and Evaluations
HADS = Hospital Anxiety and Depression Scale
HVLA = High velocity low amplitude
I-C = Intervention minus control
IES = Impact of Events Scale
MD = Mean difference
MPI = Multidimensional Pain Inventory
MVC = Motor vehicle collision
NDI = Neck Disability Index
NHMRC = National Health and Medical Research Council
NRS = Numeric rating scale
PCS = Pain Catastrophizing Scale
PDI = Pain Disability Index
PDS = Post-traumatic Stress Diagnostic Scale

PEMT = Pulsed electromagnetic therapy
PFActS-C = Pictorial Fear of Activities Scale
PHCP = primary healthcare professional
PIPS = Psychological Inflexibility in Pain Scale
PSEQ = Pain Self-Efficacy Questionnaire
PTSD = Post-traumatic stress disorder
PTSS = Post-traumatic stress symptoms
RCT = Randomised controlled trial
SES = Self-Efficacy Scale
SF-12 = Short Form 12 EQ-5D
SF-36 = Short Form 36 survey
SMD = standardised mean difference
TENS = Transcutaneous electrical nerve stimulation
TF-CBT = Trauma-focused cognitive behavioural therapy
TSK = Tampa Scale of Kinesiophobia
VAS = Visual analogue scale
WAD = Whiplash-associated disorders
WDQ = Whiplash Disability Questionnaire

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7.1. Review of evidence

7.1.1. Objectives

Objectives of this systematic review and recommendation development procedures were to: i) evaluate the effectiveness of treatment interventions for people with acute and subacute (injury to <3 months) and chronic (≥3 months post-injury) WAD; ii) synthesise treatment evidence from this systematic review and from treatment studies included in previous Australian guidelines for the management of people with acute and chronic WAD, under relevant clinical questions; and iii) develop clinical recommendations and implementation considerations for the treatment of people with acute and chronic WAD in an Australian context.

7.1.2. Systematic review

Systematic review methods used in the 2014 NSW SIRA "Guidelines for the Management of Acute Whiplash Associated Disorders for Health Professionals" (SIRA, 2014) and 2008 Trauma and Injury Recovery "Clinical Guidelines for Best Practice Management of Acute and Chronic Whiplash-Associated Disorders" (TRACsa, 2008) were adapted for this review to ensure a consistent methodological approach and synthesis of current evidence with that of the existing guidelines.

7.1.3. Search strategy

Database searches were performed specific to the population group (whiplash injury) and study design criteria (randomised controlled intervention trials, RCT). A single search strategy was used to capture original research articles pertaining to treatment interventions for acute or chronic WAD. The search strategy (Table 1) was developed in the Ovid Medline database and adapted for database specific medical subject headings.

Table 1: Treatment of whiplash-associated-disorders database search strategy

Characteristics	Search strategy
Whiplash injury	1. whiplash* 2. whiplash injuries/ 3. neck pain* adj4 whiplash 4. neck injur* adj4 whiplash 5. traumatic neck injur* 6. traumatic neck pain*
Treatment interventions	1. randomized controlled trial category/ 2. randomi?ed controlled trial* 3. controlled clinical trial/ 4. controlled clinical trial* 5. random* 6. clinical trial/ 7. placebo/ 8. double blind procedure/ 9. single blind procedure/ 10. double?blind* 11. single?blind* 12. intervention study/ 13. intervention*
Whiplash injury And Treatment interventions	1 OR 2 OR 3 OR 4 OR 5 OR 6 AND 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16 OR 17 OR 18 OR 19
Filters	Publication date: April 2007-current

/ = medical subject heading; * = truncation of keyword; adj4 = adjunct within 4 words keyword; ? = wildcard character

Searches were performed using eight electronic databases covering the period of 2007 to 17 November 2022: Allied and Complementary Medicine Database (Amed), CINAHL, Cochrane (Systematic Reviews Database), Embase, Medline, Physiotherapy Evidence Database (PEDro), PsycINFO, and Web of Science Core Collection. Articles were screened for eligibility using the online software Covidence (Covidence.org: Melbourne, Australia). Intervention trials included in the previous Australian whiplash guidelines were identified. Reference lists of review articles that were specific to whiplash injury were screened.

7.1.4. Inclusion criteria

Articles from the database searches and those included in the existing guidelines were screened against population, study design, and whiplash grade inclusion criteria (Table 2). Conflicts in title and abstract screening were resolved via consensus by the two reviewers. Full text screening of articles was performed by two reviewers. Two additional members of the research team were consulted on studies whose eligibility was unable to be determined by the reviewers, and a decision was made by consensus.

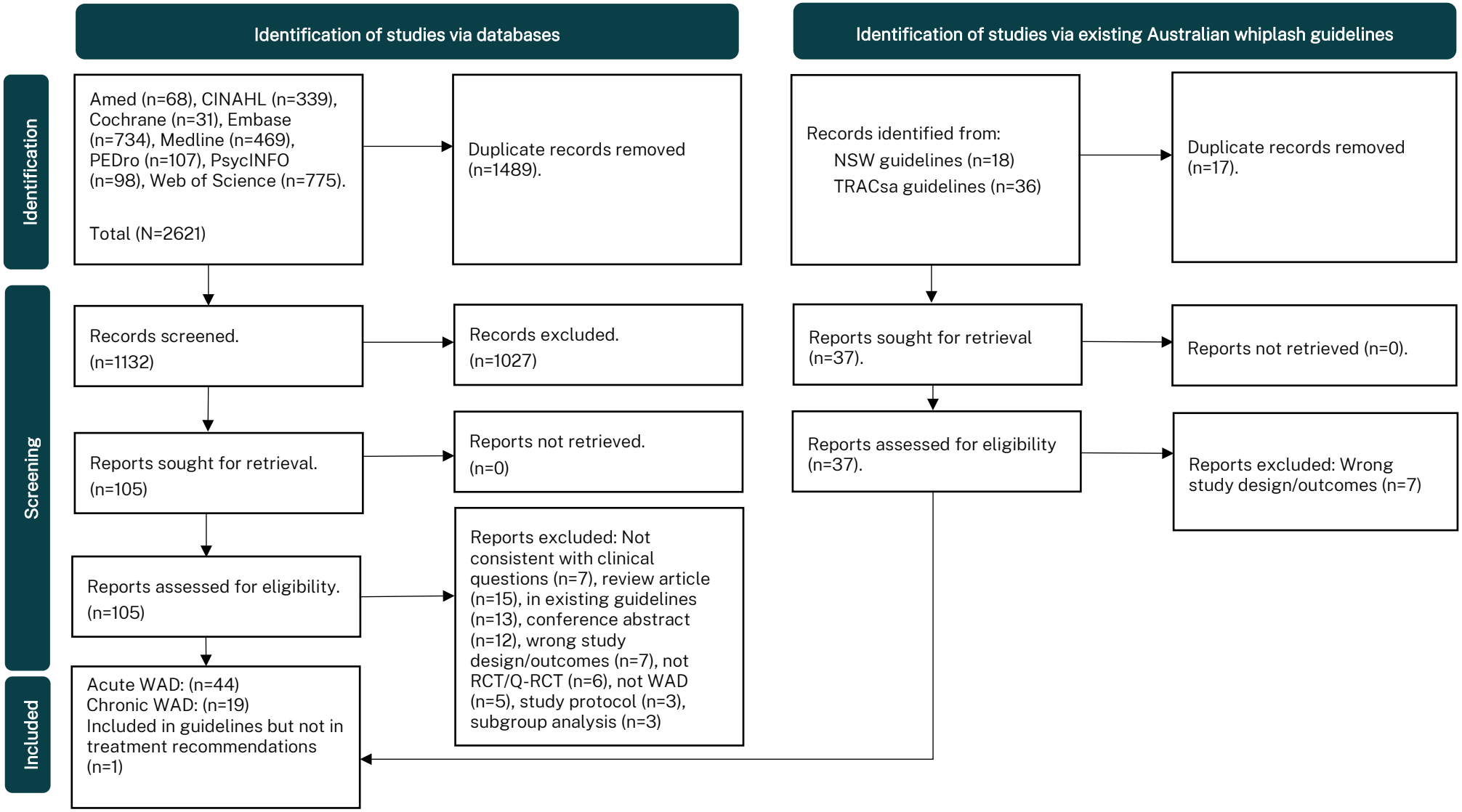
Table 2: Inclusion criteria for whiplash-associated-disorders treatment studies

Characteristics	Inclusion criteria
Population	• Human study. • Participants were of driving age (≥16 years). • Motor vehicle collision resulting in WAD grade I-III (Spitzer, 1995). • Study includes an identifiable and separately analysed subgroup of people suffering from whiplash, that comprise ≥50% of the total sample size.
Outcomes	• Evaluation of one or more critical outcomes defined in the Core Outcome Domain Set For Whiplash-Associated Disorders (CATWAD) (Chen et al., 2019): neck pain, neck disability, and/or psychological functioning.*
Study design	• Randomised or quasi-randomised controlled trials (RCT, Q-RCT). • Measurable outcomes of the treatment effect. • Available in English.
Acute	• Manuscript published between August 2012 - November 2022 (new search) • Participants were recruited with acute/subacute WAD (<3months post whiplash injury).
Chronic	• Manuscript published between April 2007 - November 2022 (new search) • Participants were recruited with chronic WAD (≥3months post whiplash injury).

*The guidelines panel reached consensus on these outcomes as 'critical' for developing treatment recommendations.

A PRISMA flow chart (Page et al., 2021) of the study selection pertaining to the treatment of people with acute and chronic WAD is shown in Figure 1. There were 105 full text articles screened from those identified in the databases and a further 37 articles from the existing Australian guidelines. There were 44 and 19 studies included that related to the treatment of acute and chronic WAD, respectively. One study was included in the guidelines as supporting information to the specific education question but were not considered as primary evidence in the treatment recommendations. Further information on the process of developing clinical questions relevant to an Australian context is outlined in 7.1.5.

Figure 1: Treatment of whiplash-associated disorders database search results



7.1.5. Selection of clinical questions

Treatment modalities were identified from previous Australian whiplash guidelines and from this systematic review. The research team drafted clinical questions that may be relevant to an Australian context based on the identified treatments. These questions were presented to the guideline panel in the form of an anonymous survey. For each question, the panel were asked to rate “is the clinical intervention question a priority in an Australian context?” on the following Likert scale: ‘yes’, ‘probably yes’, ‘probably no’, ‘no’, ‘don’t know’. They were then asked to consider possible interventions and clinical questions that were not listed in the survey but are currently implemented in an Australian context for the management of people with WAD. De-identified responses were summarised narratively and presented to the panel for discussion. The working group panel reached consensus on 26 clinical questions for treatment recommendation prioritisation. Phrasing of the clinical questions was an ongoing process, where amendments were made during working group panel recommendation meetings. Clinical questions for prioritisation are presented in Table 3, under relevant intervention classifications. Usual care was defined as advice and exercise.

Table 3: Clinical questions related to the treatment of whiplash-associated disorders.

Intervention classification	Clinical question
Active	
Neck-specific exercises	Are neck-specific exercises compared with general activity and advice other interventions effective for the management of people with acute or chronic whiplash associated disorders?
Psychologically informed exercise	Are psychologically informed exercise interventions compared with usual care effective for the management of acute or chronic WAD?
Dizziness-specific exercises	Are dizziness-specific exercises effective for the management of acute or chronic WAD with concurrent dizziness symptoms?
Multimodal physical therapy	Is multimodal physical therapy (e.g., exercise and manual therapy, and another treatment modality) compared with single interventions (e.g., advice for activity) effective for the management of acute or chronic WAD?
Psychological	
Trauma-focused cognitive behavioral therapy	Is trauma focused cognitive behavioral therapy compared with no intervention effective for the management of people with chronic WAD and post-traumatic stress disorder?
Exposure therapy	Is exposure therapy for fear of neck movement compared with advice effective for the management of acute or chronic WAD?
Education	
Specific information	Are specific education interventions compared with general advice effective for the management of acute or chronic WAD?
Healthcare professional implementation strategy	Are implementation strategies involving education compared with dissemination of clinical practice guidelines effective for the management of acute or chronic WAD?
Manual therapies	
Manipulation HVLA	Is manipulation (high-velocity low amplitude thrust (HVLA)) of the spine compared with usual care effective for the treatment of acute or chronic WAD?
Massage	Are massage techniques in addition to usual care effective for the management of people with acute or chronic WAD?
Passive therapies	
Soft collar	Is intermittent use of a cervical soft collar in addition to usual care effective for the management of acute WAD?
Electrotherapy	Are electrotherapy techniques in addition to usual care effective for the management of acute or chronic WAD?

Acupuncture	Are acupuncture techniques in addition to usual care effective for the treatment of acute or chronic WAD?
Trigger point needling	Are trigger point needling techniques in addition to usual care effective for the treatment of acute or chronic WAD?
Pharmacological (injection)	
Botulinum toxin-A injection	Are botulinum toxin-A injections compared with placebo injections effective for the management of acute or chronic WAD?
Corticosteroid injection	Are facet joint corticosteroid injections compared with placebo injections effective for the management of acute or chronic WAD?
Intravenous steroid injection	Are intravenous steroid injections compared with placebo injections effective for the management of acute or chronic WAD?
Pharmacological (oral)	
Simple analgesics	Are simple analgesics (e.g., paracetamol) compared with placebo effective for the management of acute or chronic WAD?
NSAIDs	Are non-steroidal anti-inflammatory drugs (NSAIDS) compared with placebo effective for the management of acute or chronic WAD?
Amitriptyline	Is amitriptyline compared with placebo effective for the management of acute or chronic WAD?
Pregabalin	Is pregabalin compared with placebo effective for the management of acute or chronic WAD?
Opioids	Are opioid analgesics compared with placebo effective for the management of acute or chronic WAD?
Multidisciplinary care	
Multidisciplinary care	Are multidisciplinary one-to-one interventions compared with usual care effective for the management of people with acute or chronic whiplash associated disorders?
Medical procedures	
Radiofrequency neurotomy	Is a radiofrequency neurotomy compared with placebo treatment effective for the management of cervical zygapophyseal-joint pain in people with chronic WAD?
Surgical intervention	Is spinal surgery compared with non-surgical treatment effective for the management of people with WAD and radiculopathy (WAD grade III)?
Other	
Treatment for WAD associated headache*	Are treatments for WAD associated headache effective for the management of people with acute or chronic WAD?

*No recommendation developed for treatment for WAD, see T.26 for further details.

7.1.6. Risk of bias

Study risk of bias was evaluated using the Physiotherapy Evidence Database (PEDro) scale (0-10) as studies were primarily allied health interventions (e.g., physical therapy, multimodal therapy) and to ensure consistency with appraisal of studies outlined in previous Australian whiplash guidelines. The eligibility criteria item is not included in the total PEDro score and was not reported in this technical report, as defined eligibility criteria was required for study inclusion. In addition to physical therapies, the PEDro scale has also been shown to be valid for evaluating methodological quality of pharmaceutical trials (Yamato et al., 2017). Low and high PEDro scores were indicative of high and low risk of bias, respectively. Studies with PEDro scores classified as < 4 were considered 'poor', 4 to 5 were considered 'fair', 6 to 8 were considered 'good' and 9 to 11 were considered 'excellent' (Cashin & McAuley, 2019). The PEDro scores of all included studies (acute and chronic) are presented in Table 4.

Table 4: PEDro risk of bias scores for included treatment studies

First author Year	Random allocation	Concealed allocation	Baseline similarity	Subject blinding	Therapist blinding	Assessor blinding	85% follow-up	ITT* analysis	Between group stat	Point estimate	Total
Aigner 2006	✔	-	-	✔	-	-	✔	-	✔	-	4
Andersen 2021[a]	✔	✔	✔	✔	-	✔	-	✔	✔	✔	8
Andersen 2022	✔	✔	✔	-	-	✔	✔	✔	✔	✔	8
Ask 2006	✔	✔	✔	-	-	✔	-	✔	✔	✔	7
Bonk 2000	✔	-	✔	-	-	-	✔	-	✔	✔	5
Borchgrevnik 1998	✔	-	✔	-	-	✔	✔	-	✔	✔	6
Braker 2008	✔	✔	✔	✔	✔	✔	✔	✔	-	✔	9
Bring 2016	✔	✔	✔	-	-	-	✔	✔	✔	✔	8
Brison 2005	✔	✔	✔	✔	-	✔	✔	✔	✔	✔	9
Bunketorp 2006	✔	✔	✔	-	-	✔	✔	✔	✔	✔	8
Cameron 2011	✔	✔	-	✔	-	✔	✔	✔	✔	✔	8
Carroll 2008	✔	✔	✔	✔	✔	✔	-	-	✔	✔	8
Conforti 2013	✔	-	-	-	✔	-	-	-	-	✔	3
Cote 2019	✔	✔	✔	-	-	✔	-	✔	✔	✔	7
Crawford 2004	✔	-	✔	-	-	-	✔	-	✔	✔	5
Dehner 2006	✔	-	-	-	-	-	✔	✔	✔	✔	5

Dehner 2009	✔	✔	✔	-	-	-	✔	-	✔	-	5
Dunne 2012	✔	-	-	-	-	-	✔	-	✔	✔	4
Ekvall-Hannsson 2006 Ekvall-Hansson 2013	✔	-	-	-	-	✔	-	✔	✔	✔	5
Fernandez de las Pen 2004	✔	-	✔	-	-	-	-	-	-	✔	3
Ferrari 2005	✔	✔	✔	-	-	✔	✔	-	✔	✔	7
Fitz-Ritson 1995	✔	✔	-	-	-	-	✔	-	-	✔	4
Foley-Nolan 1992	✔	✔	-	✔	✔	✔	✔	✔	✔	✔	9
Freund 2002	✔	-	✔	✔	✔	✔	✔	-	✔	✔	8
Garcia Naranjo 2017	✔	-	-	✔	-	✔	✔	-	✔	✔	6
Gennis 1996	✔	-	✔	-	-	-	-	-	✔	✔	4
Hendriks 1996	✔	-	-	-	-	-	✔	-	✔	-	3
Jull 2007	✔	✔	✔	-	-	✔	✔	✔	✔	✔	8
Jull 2013	✔	-	✔	-	-	✔	✔	-	-	✔	5

Kim 2020	✔	✔	✔	-	-	✔	✔	✔	✔	✔	8
Kongsted 2007	✔	✔	✔	-	-	✔	✔	✔	✔	✔	8
Kwak 2012	✔	✔	✔	-	-	✔	✔	✔	✔	✔	8
Lamb 2012	✔	✔	✔	-	-	-	-	✔	✔	✔	6
Lemming 2005	✔	✔	✔	✔	-	-	✔	-	✔	✔	7
Lord 1996	✔	✔	-	✔	✔	✔	✔	✔	✔	✔	9
Ludvigsson 2015	✔	✔	✔	-	-	✔	-	✔	✔	✔	7
McKinney 1989	✔	-	✔	-	-	✔	-	-	✔	✔	5
Mealy 1986	✔	✔	✔	-	-	✔	-	-	✔	✔	6
Michaleff 2014	✔	✔	-	-	-	✔	✔	✔	✔	✔	7
Nikles 2021	✔	✔	✔	✔	✔	-	-	✔	✔	✔	8
Oliveira 2006	✔	-	✔	-	-	-	✔	-	✔	-	4
Padberg 2007	✔	-	✔	✔	✔	✔	✔	-	✔	✔	8
Pennie 1990	✔	-	-	-	-	-	✔	-	✔	✔	4
Peolsson 2016	✔	✔	✔	-	-	✔	✔	✔	✔	✔	8
Piraneo 2012	✔	-	✔	✔	-	-	✔	-	✔	✔	6
Provinciali 1996	✔	-	✔	-	-	✔	✔	-	✔	✔	6
Rebbeck 2006	✔	✔	✔	-	-	-	✔	-	✔	✔	6
Robinson 2013	✔	-	-	-	-	-	✔	-	✔	✔	4

Rosenfeld 2006	✔	✔	✔	-	-	✔	✔	✔	✔	✔	8
Ruiz-Molinero 2014	✔	✔	-	✔	-	✔	✔	✔	✔	✔	8
Rydman 2020	✔	✔	✔	-	✔	-	✔	✔	✔	✔	8
Scholten-Peeters et al 2006	✔	✔	✔	-	-	✔	✔	✔	✔	✔	8
Shaked 2021	-	-	-	✔	✔	-	✔	-	✔	✔	5
Soderlund 2000	✔	-	✔	-	-	-	-	-	✔	✔	4
Soderlund 2001	✔	-	✔	✔	-	-	✔	-	✔	✔	6
Sterling 2015	✔	✔	-	✔	-	-	✔	✔	✔	✔	7
Sterling 2019	✔	✔	-	-	-	✔	✔	✔	✔	✔	7
Stewart 2007	✔	✔	✔	-	-	✔	✔	✔	✔	✔	8
Tough 2010	✔	✔	✔	✔	-	✔	-	✔	✔	✔	8
Vassiliou 2006	✔	✔	✔	-	-	-	✔	✔	✔	✔	7
Wiangkham 2019	✔	✔	-	✔	✔	✔	✔	✔	✔	✔	9
Wicksell 2008	✔	✔	✔	-	-	-	✔	✔	✔	✔	7

*Intention to treat

7.1.7. Data extraction and evidence synthesis

Data extraction was performed by two members of the research team. The following study information was extracted for each study: first-author, year of publication, study design (RCT or Q-RCT), setting, country, number of participants and % of female participants, age (mean, SD), WAD duration at recruitment, classification of acute or chronic WAD population, significant baseline group differences, intervention and control characteristics, follow-up timepoints, and adverse events. Treatment effect data were extracted for neck pain, neck disability, and psychological functioning outcomes into a custom spreadsheet in Microsoft Excel. If there were multiple follow-up timepoints, treatment effects were extracted at the longest follow-up timepoint ≤3 months (short-term effect) and the longest follow-up timepoint >3 months to 12 months (long-term effect). The decision to separate treatment effects into short- and long-term was made by the guideline panel, as both timeframes were deemed relevant to making an informed decision on the treatment recommendation. Because of the wide variety of assessments, measurements, and tools used to assess psychological outcomes, we considered an outcome as *psychological* if the authors defined it as such, or if they were listed in this reference (L. Campbell et al., 2018). Economic evaluation (e.g., cost effectiveness) was also extracted as a secondary outcome if reported in the RCT.

Where required, 1) data were extracted from published figures using Web Plot Digitizer (https://automeris.io/WebPlotDigitizer), 2) standard deviations (SD) were calculated from standard errors (SD = SE x √N), and 3) means and SDs were calculated from medians and ranges (Hozo et al., 2005), or from medians and inter-quartile ranges (Wan et al., 2014). Meta-analyses were performed using the inverse variance weighting random-effect model to compute a pooled estimate of mean difference (MD) or standardized mean difference (SMD), and respective 95% confidence intervals (95% CI) if there were two or more included studies. MDs were used to pool data from a specific measure or rating instrument using the same scale (e.g., all studies measuring disability outcomes measured using the Neck Disability Index measured using a 0-100 scale), while SMDs were used to pool studies use different rating instruments to measure the same outcome (e.g., pain outcomes measured in some studies using visual analogue scales and others using numeric rating scales) (Andrade, 2020). When more than one measure was available for a single category (e.g., Tampa Scale of Kinesiophobia and Impact of Events Scale; both psychological outcomes), we chose the measure that was considered by the authors as the primary outcome. If this was not possible, or if there were more than one measure of the same outcome considered as a primary outcome, we chose the measure that was consistent with other studies in the same clinical question to allow for meta-analysis. If there were no common outcomes, we chose the outcome with significant between group differences.

Statistical heterogeneity was assessed using the chi-squared test and I^2 statistic where I^2 < 50% was considered as not important, 50-75% as moderate, and > 75% as high heterogeneity (Higgins et al., 2003). All meta-analyses were performed in R (V. 3.6.1 and later, the R Foundation for Statistical Computing) using the *meta* (metacont and forest.meta functions) and *tidyverse* packages. Statistical significance was accepted at $p < 0.05$.

7.1.8. Certainty of evidence

The GRADE system (Guyatt et al., 2008) was used to evaluate the certainty of treatment effects on short- and long-term critical outcomes (neck pain, neck disability, psychological functioning). The certainty rating (very low, low, moderate, high) provided an indication of the likelihood that the estimated effect was close to that of the true effect and was used to inform recommendations. Informative statements were developed to communicate the certainty of treatment effects to the guideline panel, consistent with GRADE guidance (Santesso et al., 2020).

Evidence certainty was evaluated against each of the four primary GRADE domains (publication bias was not considered as there were insufficient studies across clinical questions to evaluate statistically):

1. Risk of bias: based on the risk of bias evaluation using the PEDro scale for included studies and considering the weighting of each study (sample size) to the summarised treatment effect.

2. Inconsistency: extent of heterogeneity in the study findings as evaluated by visual inspection of the treatment effects and confidence intervals for narrative summaries, and/or heterogeneity statistics for meta-analyses.
3. Indirectness: extent to which the included studies were applicable to the clinical question (e.g., intervention and comparator type) and an Australian healthcare context.
4. Imprecision: i) whether there was optimal information size (>400 participants for continuous outcomes); ii) by considering the position of the estimated effect and width of confidence intervals with respect to zero and the clinically meaningful effect (favouring treatment or control).

Clinically meaningful effects for people with acute and chronic WAD were considered as measurable improvement in neck pain (at least a 2-point difference on the 0-10 NRS for pain), neck disability (at least 10% difference in NDI), or psychological functioning (as reported as clinically significant by the study authors on a known scale, or at least 10% difference) (Sterling et al., 2019).

7.1.9. Absence of evidence procedures

There is limited high-quality (RCTs) evidence for the management of people with WAD using pharmacological and surgical treatment interventions. Where no evidence was found, but the treatment is used in an Australian context for managing WAD and may have associated adverse effects, evidence and recommendations from other clinical guidelines were reviewed. Five pharmacological treatment clinical questions were developed for these guidelines. Where there was no direct evidence for WAD populations, the panel agreed to review evidence and recommendations pertaining to other pain conditions presented in the following clinical guidelines: i) Australian and New Zealand College of Anaesthetists and Faculty of Pain Medicine: Acute Pain Management Scientific Evidence (5th ed, 2020) (Schug et al., 2020); ii) United Kingdom National Institute for Health and Care Excellence's (NICE) Chronic Pain Assessment and Management Guidelines (NICE, 2021).

No evidence was found for surgical management of WAD, and limited evidence is present for the surgical management of other neck-pain conditions. The panel agreed to use a systematic review on spinal surgery (decompression or decompression with fusion) for the management of chronic neck pain and radiculopathy to inform the recommendation. This systematic review was relevant for our guidelines as a small subgroup of people with WAD experience cervical radiculopathy (<5%), based on NSW State Insurance Regulatory Authority report data. Screening for cervical radiculopathy (WAD grade III) is considered in the Diagnosis section of these guidelines (see Technical Report Chapter 1).

7.2. Recommendation development

For each clinical question, an evidence summary and draft GRADE Evidence to Decision Framework (Alonso-Coello et al., 2016) was provided to the guideline panel for review prior to meeting, consistent with the format detailed in this technical report. Additionally, a short video summary of the evidence was provided to the panel which explained findings from the evidence synthesis in a language appropriate for all panel members. Recommendation development meetings were held monthly via Microsoft Teams and the GRADE Evidence to Decision Framework was used to discuss and develop treatment recommendations, irrespective of the strength of the evidence. The magnitude of effects (benefits/adverse effects) and certainty of evidence from the systematic evidence review were considered as critical outcomes by the panel when developing recommendations. Resources, equity, acceptability, and feasibility framework elements received input from healthcare professionals, consumers, and insurers on the guideline panel. There were limited cost-effectiveness evaluations reported in RCTs. Follow-up rates in clinical trials were used as an indicator of treatment acceptability by participants.

Following review and panel agreement on content presented in the framework (the panel was asked to comment on each item in the framework) an anonymous online voting system (Menti.com) was used by the panel to reach consensus on a recommendation classification. Recommendation classifications and their interpretations are outlined in Table 5. More than 50% of votes were

required to reach consensus, with a quorum of eight panel members. However, 50% was not considered sufficient to be a consensus if there is strong opposition to the result. If there is no clear consensus after the first vote, the working group would critically discuss the outcome and rationale before proceeding to a second vote. Where a consensus cannot be reached, the Chair could choose to have the casting vote.

Clinical implementation considerations were developed for all recommendations that were neutral, conditional for, or strong for. These considerations were informed by the extant literature presented in the evidence summary (e.g., type and dosage of treatment) and from input by the guideline panel (e.g., subject matter experts, healthcare professionals, consumers).

Table 5: Treatment recommendation classifications and their interpretation

Recommendation classification	Interpretation
Strong for	Healthcare professionals should provide the intervention to all or almost all people, in all or almost all circumstances, in accordance with the implementation considerations. "The guideline panel strongly recommend that healthcare professionals use (treatment) …"
Conditional for	Healthcare professionals should provide the intervention to most people, but not all, in accordance with the implementation considerations. "The guideline panel suggests that healthcare professionals use (treatment) …"
Neutral	Neither for nor against the intervention. Healthcare professionals could provide the intervention as an adjunct treatment in some instances, in accordance with the implementation considerations. "The guideline panel cannot recommend for or against (treatment) …"
Conditional against	Healthcare professionals should not provide the intervention to most people. "The guideline panel suggest that healthcare professionals do not use (treatment) …"
Strong against	Healthcare professionals should not provide the intervention to all or almost all people in all or almost all circumstances. "The guideline panel strongly recommend that healthcare professionals do not use (treatment) …"

Recommendations were developed separately for the management of acute and chronic WAD, unless stated otherwise, as some treatments are only applicable to one phase (e.g., intermittent immobilisation with soft collar in the acute phase). In some circumstances where evidence was present for one phase only, a pragmatic approach was used for the other phase; the panel would discuss the translatability of evidence (for example, was baseline recruitment within the 'subacute' phase but close to 3-months, holding implications for chronic WAD), adverse effects, and other elements of the GRADE Evidence to Decision Framework before developing a recommendation. It was unlikely that a treatment could be 'recommended for' using this method, however, there were instances where neutral recommendations were made (neither for nor against the treatment) and more stringent clinical practice points were developed.

7.3. Method limitations

The evidence synthesis and recommendation development procedures are potentially limited by the following factors:

- Most treatment recommendations were based on low certainty evidence due to heterogeneity in study design and low pooled sample size for critical outcome measures. Critical outcome effects were evaluated separately for short- (2 weeks to 3 months) and long-term (>3 months to years) follow-up, which reduced the overall magnitude of evidence for pooled analyses.
- Certainty in the evidence was also reduced due to variation in the implementation of physical and multimodal treatments compared with usual care control interventions which may have induced heterogeneity in pooled estimates. Further, control interventions for physical interventions (e.g., neck specific exercises, multimodal physical therapy) generally included advice for activity, which meant that clinically meaningful effects between interventions were rare as both interventions involved physical activity. Where appropriate, subgroup analyses were considered when developing recommendations, for example, where people with higher disability exhibited a greater magnitude of improvement in critical outcome(s) compared with those with lower disability scores.
- Effect sizes were calculated based on the between group difference at follow-up timepoints, with the assumption that the random allocation of participants eliminated any initial variation between them. This assumption may hold true for trials with large samples, but it may not be accurate for smaller ones. We extracted data on significant baseline group differences and considered group similarity in our risk of bias evaluation.
- Risk of bias was evaluated using the PEDro scale as recommended interventions for managing whiplash injury in an Australian context are primarily allied health treatments. While the NHMRC Guidelines for Guidelines (https://www.nhmrc.gov.au/guidelinesforguidelines) advise use of published and validated risk of bias tools that are applicable to the guideline clinical questions, the Cochrane Risk of Bias 2.0 Tool is listed as a good practice tool for evaluating risk of bias in RCTs. Agreement between the two tools varies, with no distinct threshold for acceptable risk of bias summary scores between the two instruments (Moseley et al., 2019). Higher agreement has been found between the two tools for constructs related to concealed allocation and blinding of participants and assessors. Either instrument can be used for evaluating study risk of bias, but not interchangeably (Moseley et al., 2019), which could have resulted in different interpretations of risk of bias had we used the Cochrane Risk of Bias 2.0 Tool. One difficulty when considering risk of bias for allied health interventions is that therapist blinding, and in some instances participant blinding, is generally not possible. However, differences between high and low risk of bias in these guidelines was generally due to non-reporting or insufficient allocation concealment procedures, assessor blinding, and follow-up rates; key constructs when appraising the quality of these studies.
- Evidence of treatment effects from non-RCTs were not considered in the development of the guidelines.
- Reliance on other clinical guidelines (e.g., for acute and chronic pain management) for pharmacological treatments that have not been investigated in clinical trials for managing acute or chronic WAD.

8. Active treatment recommendations

T.1. Neck-specific exercises

Are neck-specific exercises compared with general activity and advice effective for the management of people with acute or chronic whiplash associated disorders?

T.1.1. Executive summary

There were four acute WAD trials and one chronic WAD trial that compared neck-specific exercises with comparator interventions (e.g., exercise, education) (Table 6). Table 7 and Table 8 outline the GRADE Evidence to Decision Framework decisions for the management of people with acute and chronic WAD, respectively.

Effect on neck pain (see T.1.2 for details)

Acute WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=3 trials (Ask, 2009; Bunketorp, 2006; Soderlund, 2000). Neck-specific exercises were compared against whole body endurance and strength training (Ask, 2009), a general home exercise program (Bunketorp, 2006), and education for activity (Soderlund, 2000). The evidence suggests that neck-specific exercises compared with exercise or education results in little to no effect on short-term neck pain in people with acute WAD.

Acute WAD long-term (>3 months to 12 months) (low certainty in the evidence):

N=4 trials (Ask, 2009; Bunketorp, 2006; Rosenfeld, 2003; Soderlund, 2000). Neck-specific exercises were compared against other exercise interventions (Ask, 2009; Bunketorp, 2006) and education for activity (Rosenfeld, 2003; Soderlund, 2000) in people with acute WAD. Three trials showed no significant difference in long-term neck pain and one trial (Rosenfeld, 2003) showed clinically significant reductions in long-term neck pain with neck-specific exercises that were introduced within 4 days of whiplash injury. The evidence suggests that neck-specific exercises compared with general exercise or education for activity results in small reductions in long-term neck pain in acute WAD.

Chronic WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=1 trial (Peolsson, 2016). Compared neck-specific exercises to a waitlist (no intervention). The evidence suggests that neck-specific exercises compared with no intervention results in a clinically significant reduction in short-term neck pain in chronic WAD.

Effect on neck disability (See T.1.3 for details)

Acute WAD short-term (2 weeks to 3 months) (very low certainty):

N= 3 trials (Ask, 2009; Bunketorp, 2006; Soderlund, 2000). Two studies showed no significant difference in short-term neck disability while one study (Bunketorp, 2006) showed clinically significant reductions in short-term neck disability when comparing neck-specific exercises with a general home exercise program. Neck-specific exercises compared with exercise or education may result in small reductions in short-term neck disability in acute WAD, but the evidence is very uncertain.

Acute WAD long-term (>3 months to 12 months) (low certainty in the evidence):

N= 3 trials (Ask, 2009; Bunketorp, 2006; Soderlund, 2000). The evidence suggests that neck-specific exercises compared with exercise or education results in little to no effect on long-term neck disability in acute WAD.

Chronic WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N= 1 trial (Peolsson, 2016). The evidence suggests that neck-specific exercises compared with no intervention results in a clinically significant reduction in short-term neck disability in chronic WAD.

Effect on psychological functioning (See T.1.4 for details)

Acute WAD short-term (2 weeks to 3 months) (very low certainty in the evidence):

N=1 trial (Bunketorp, 2006). Compared neck-specific exercises with a general home exercise program. The evidence suggests that neck-specific exercises compared with general exercise may result in clinically significant improvements in short-term psychological functioning in acute WAD, but the evidence is very uncertain.

Acute WAD long-term (>3 months to 12 months) (very low certainty in the evidence):

N=1 trial (Bunketorp, 2006). Neck-specific exercises compared with general exercise may result in little to no effect on long-term psychological functioning in acute WAD, but the evidence is very uncertain.

Additional considerations: Adverse effects

Acute WAD: Not reported (Ask 2009), no adverse effects (Bunketorp 2009; Rosenfeld 2003; Soderlund 2000).

Chronic WAD: No adverse effects (Peolsson 2016).

Table 6: Summary of included studies (neck-specific exercises)

Author Year WAD type	Participants and setting (country)	Intervention (neck-specific exercises)	Control (general activity/advice)	Outcomes included	Neck pain outcomes	Neck disability outcomes	Psych functioning outcomes	Summary (risk of bias PEDRO score)
(Ask et al., 2009) Acute	25 participants from an outpatient spine clinic with acute WAD (Norway)	Physiotherapy supervised low load motor relearning program with initial emphasis on coordination and holding capabilities of neck and shoulder muscles across 1-2 30min sessions/wk over 6 wk, 6-10 sessions total. Also advised to perform home exercises and general activity.	Physiotherapy supervised higher load endurance and strength training: active movements against gravity, neck resistance exercises using bands, upper body/global strengthening (body weight and dumbbell). 15-20 reps per exercise. In addition: advice to perform home exercises and general activity.	Neck pain and neck disability at 6wk and 12mo	VAS (0-100)	NDI (0-50)	X	No significant differences in low load motor control training and higher load endurance/strength training for short- and long-term neck pain and neck disability in acute WAD. (7)
(Bunketorp et al., 2006) Acute	47 participants from an inter-disciplinary rehabilitation centre with acute WAD (Sweden)	Neck pain pamphlet provided and participants encouraged to undertake aerobic exercise. Supervised physiotherapy sessions (1-1.5 hours, 2x/wk) with a focus on training of neck and shoulder muscles.	Neck pain pamphlet provided. Physiotherapy advised general home exercise program (2x/day). Review by physiotherapist at the rehabilitation centre fortnightly where exercise intensity, frequency, and technique was monitored.	Neck pain, and psychological functioning at 3 and 9mo	VAS (0-100)	PDI (0-70)	TSK, SES, PDI	Greater short-term improvements (3 mo) in self-efficacy, fear of movement and pain disability in supervised neck-specific training compared with general home exercise training. (8)

(Rosenfeld et al., 2006) Acute	88 participants from primary care units and hospital emergency rooms with acute WAD (Sweden)	The active intervention and involvement thus consisted of two phases: 1) an initial phase including information, postural control, and cervical rotation exercises; and 2) a second phase, if symptoms were unresolved, of evaluation and treatment according to McKenzie principles.	Standard intervention consisted of written information in a leaflet on injury mechanisms, advice on suitable activities, and postural correction.	Neck pain at 6mo	VAS (0-100)	X	X	Active treatment protocol was clinically and statistically beneficial for long-term neck pain in people with acute WAD who began neck-specific exercises within 4 days of their injury. (8)
(Söderlund et al., 2000) Acute	66 participants from a hospital emergency department with acute WAD (Finland)	Neck and shoulder exercises aiming to improve kinaesthetic sensibility and co-ordination. Advice on rest, activity modification, posture, and load management.	Same as intervention minus exercise	Neck pain and neck disability at 3mo and 12mo	VAS (0-10)	PDI (0-70)	X	No clinical or statistical difference between groups. (3)

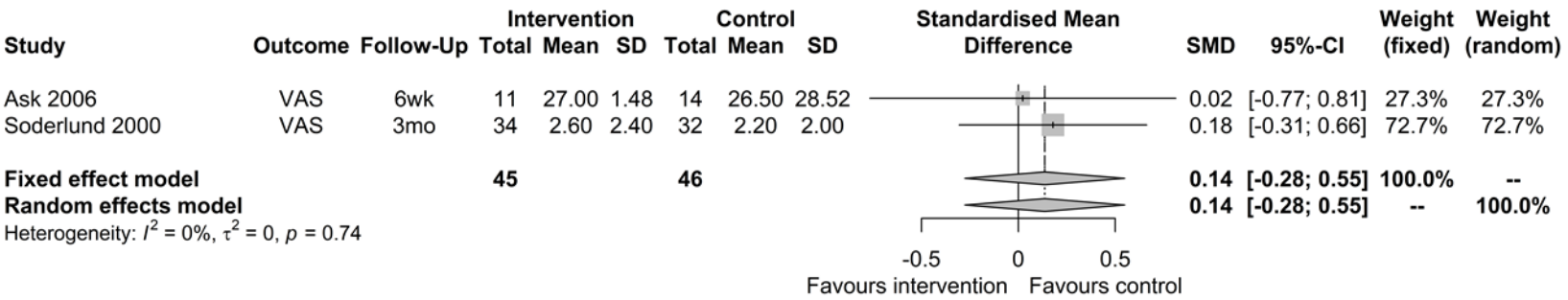
(Peolsson et al., 2016) Chronic	60 participants from primary care setting with chronic WAD (Sweden)	Advice, education, and supervised biweekly exercise sessions at physiotherapy clinic focusing on activity of the deep neck muscles and motor control training, and head resistance exercises to focus on neck muscle endurance. Participants also received instruction for continuation of these exercises after 3/12 intervention period	Placed on waitlist	Neck pain and neck disability at 3mo	VAS (0-100)	NDI (0-50) PDI (0-70)	X	Neck-specific exercises were more beneficial than no intervention while on a WL for individuals with chronic WAD. (9)

T.1.2. Effect on neck pain

Short-term outcomes (acute WAD)

Included studies: Ask, 2009; Bunketorp, 2006; Soderlund, 2000;

GRADE Certainty Assessment						Total no of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other			
3	Serious[a]	Not serious[b]	Not serious[c]	Serious[d]	n/a	Total people (N=138) Meta-analysis (2 trials) MD 0.40 (-0.66, 1.46) Bunketorp (2009) (n=47) proportion (%) of people in each group that had improvements in pain intensity (based on VAS 0-100) I-C: 12% (-16.5, 39.7), p =0.43	⨁⨁◯◯ Low	CRITICAL
(Acute WAD) Short-term neck pain (follow-up: 2wk-3m; assessed with: VAS 0-10 or VAS 0-100)								

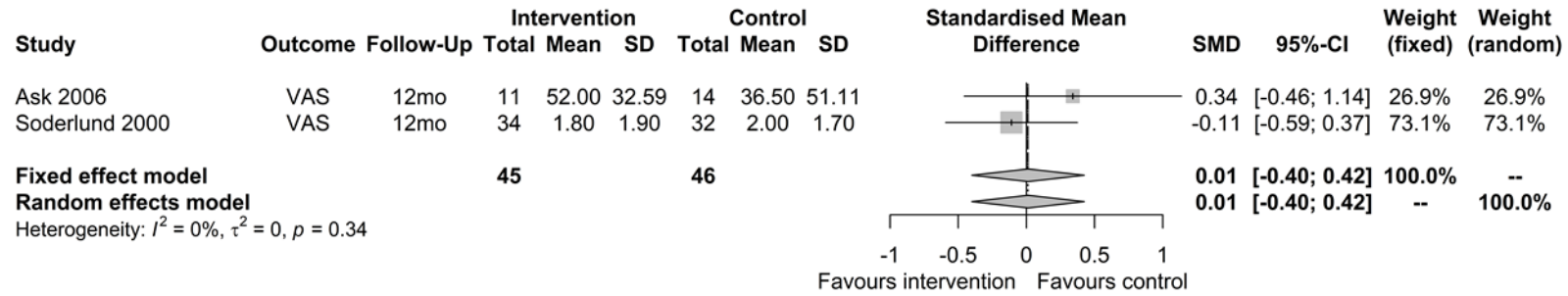


[a]The study by Soderlund et al. (2000) had high risk of bias (PEDRO 3/10) and represented ~1/2 of total participants for this outcome.
[b]There was homogeneity in outcomes between the two studies presented in the meta-analysis. Bunketorp et al. (2009) was unable to be meta-analyse but showed a similar result of no significant effect.
[c]Study interventions and comparators were consistent with care available in an Australian context.
[d]Total number of participants was below the threshold for precision.

Long-term outcomes (acute WAD)

Included studies: Ask, 2009; Bunketorp, 2006; Rosenfeld, 2003; Soderlund, 2000

GRADE Certainty Assessment						No of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other			
4	Not serious[a]	Serious[b]	Not serious[c]	Serious[d]	n/a	Total people (N=226) Meta-analysis of n=2 trials MD pain (below): -0.19 (-1.06, 0.68) Rosenfeld, 2003 (n=88): <4 d group I-C VAS (0-100) change score (6mo): -30.34 (-46.97, -13.71). >2wk group I-C change score (6mo): -7.9 (-20.41, 4.61) Bunketorp, 2006 (n=47): Proportion (%) of people in each group that had improvements in pain intensity (based on VAS 0-100) at 6mo I-C: -9% (-37.6, 19.4), p =0.43	⨁⨁◯◯ Low	CRITICAL
(Acute WAD) Long-term neck pain (follow-up: >3mo; assessed with: VAS 0-10 or VAS 0-100)								



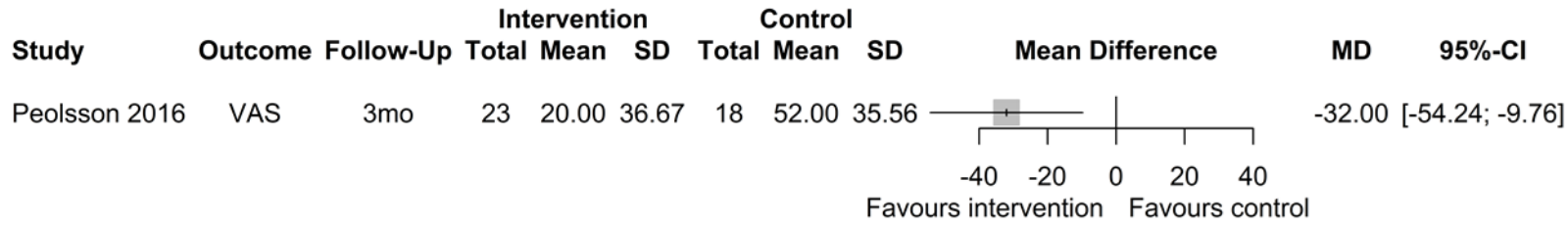
[a]Low risk of bias in 3/4 studies (Ask, 2009; Bunketorp, 2006; Rosenfeld, 2003). PEDRO scores 7-8/10.
[b]There was homogeneity in outcomes between the two studies presented in the meta-analysis. Bunketorp et al. (2009) was unable to be meta-analysed but showed a similar result of no significant effect. However, the study by Rosenfeld et al. (2003) showed clinically significant improvements in participants who commenced neck-specific exercises <4 days post-injury.
[c]Study interventions and comparators were consistent with care available in an Australian context.
[d]Total number of participants were below the threshold for imprecision.

Short-term outcomes (chronic WAD)

Included studies: Peolsson, 2016

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention (n=31); Control (n=29) Pain (VAS 0-100); mean difference; I-C; mean (95% CI) 3/12 intervention period: -32 (-54.23, -9.76)	⨁⨁◯◯ Low	CRITICAL
1	Not serious[a]	Not serious	Not serious[b]	Very serious[d]	n/a			

(Chronic WAD) Short-term neck pain (follow-up: 3mo; assessed with: VAS (0-100))



[a]Very low risk of bias (Pedro 9/10)
[b]Study intervention consistent with care available in an Australian context.
[c]Total participants significantly below the threshold for precision.

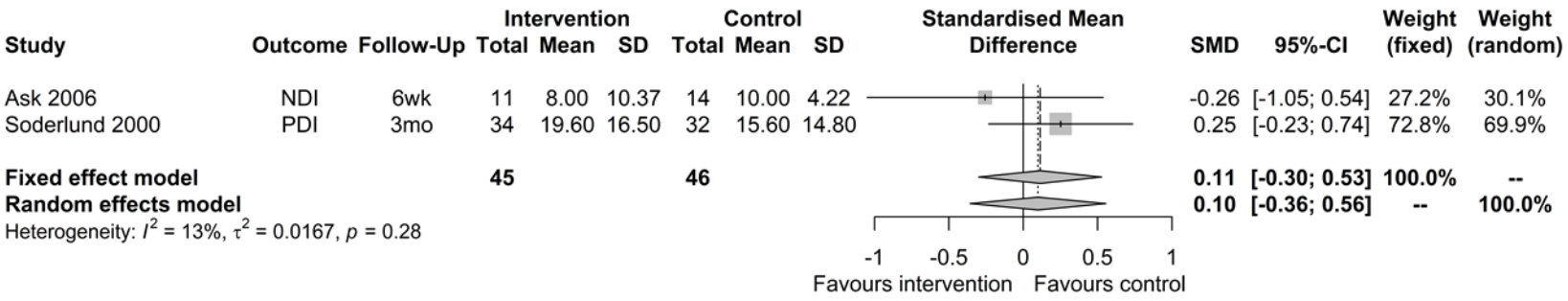
T.1.3. Effect on neck disability

Short-term outcomes (acute WAD)

Included studies: Ask, 2009; Bunketorp, 2006; Soderlund, 2000

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Total participants (N=138) Meta-analysis of n=2 trials SMD disability (below): 0.10 (-0.36, 0.56) Bunketorp (2009): Pain disability index (PDI) % change difference from baseline I-C: (3 mo) 33% (6.0, 59.4) p =0.03	⊕◯◯◯ Very low	CRITICAL
3	Serious[a]	Serious[b]	Not serious[c]	Serious[d]	n/a			

(Acute WAD) Short-term neck disability (follow-up: 2wk-3mo; assessed with: NDI 0-50 or PDI 0-70)



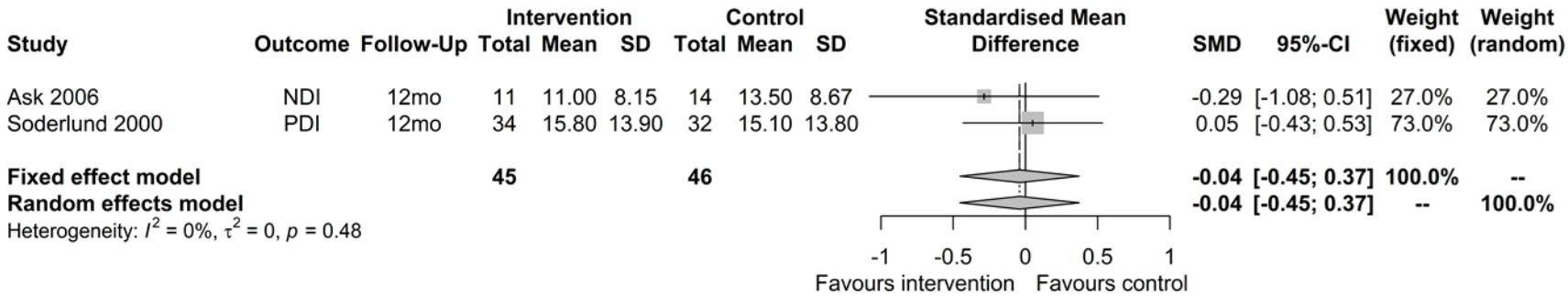
[a]The study by Soderlund et al. (2000) had high risk of bias (PEDRO 3/10) and represented ~1/2 of total participants for this outcome.
[b]There was homogeneity in outcomes between the two studies presented in the meta-analysis. Bunketorp et al. (2009) was unable to be meta-analysed but showed clinically significant improvements in neck disability.
[c]Study interventions and comparators were consistent with care available in an Australian context.
[d]Total number of participants were below the threshold for imprecision.

Long-term outcomes (acute WAD)

Included studies: Ask, 2009; Bunketorp, 2006; Soderlund, 2000

GRADE Certainty Assessment						No of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Total people (N=138) Meta-analysis of n=2 trials SMD disability (below): -0.04 (-0.45, 0.37) Bunketorp (2009) Pain disability index (PDI) % change difference from baseline I-C: (9 mo) -11% (-8.3, 37.1) p =0.03	⊕⊕◯◯ Low	CRITICAL
3	Serious[a]	Not serious[b]	Not serious[c]	Serious[d]	n/a			

(Acute WAD) Long-term neck disability (follow-up: >3mo; assessed with: NDI 0-50 or PDI 0-70)



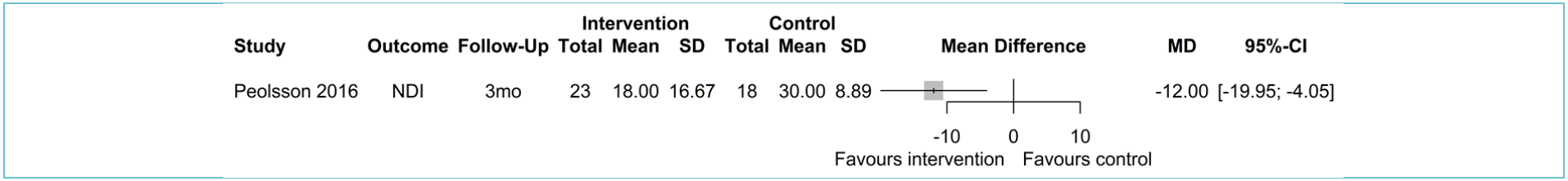
[a]The study by Soderlund et al. (2000) had high risk of bias (PEDRO 3/10) and represented ~1/2 of total participants for this outcome.
[b]There was homogeneity in outcomes between the two studies presented in the meta-analysis. Bunketorp et al. (2009) was unable to be meta-analysed but similarly showed no significant effect.
[c]Study interventions and comparators were consistent with care available in an Australian context.
[d]Total number of participants were below the threshold for imprecision.

Short-term outcomes (chronic WAD)

Included studies: Peolsson, 2016

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention (n=31); Control (n=29) NDI; mean difference; I-C; mean (95% CI) 3/12 intervention period (NDI 0-50): -12 (-21.41, -2.59)	⊕⊕◯◯ Low	CRITICAL
1	Not serious[a]	Not serious	Not serious[b]	Very serious[c]	n/a			

(Chronic WAD) Short-term neck disability (follow-up: 3mo; assessed with: Neck Disability Index (NDI) (0-50))



[a]Very low risk of bias (Pedro 9/10).
[b]Study intervention consistent with care available in an Australian context.
[c]Total participants significantly below the threshold for precision.

T.1.4. Effect on psychological functioning

Short-term outcomes (acute WAD)

Included studies: Bunketorp, 2006

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention (n=22); Control (n=25)	⊕◯◯◯ Very low	CRITICAL
1	Not serious[a]	Serious[b]	Not serious[b]	Very serious[c]	n/a	SES % change difference from baseline; I-C Short-term (3 mo): 32% (5.1-59.2) p =0.03. TSK % change difference from baseline; I-C Short-term (3 mo): 33% (6.0-59.4) p =0.03.		
(Acute WAD) Short-term psychological functioning (follow-up: 3mo; assessed with: Self Efficacy Scale (SES) and Tampa Scale of Kinesiophobia (TSK))								

[a]Low risk of bias (PEDRO=8/10).
[b]Findings based on a single study with small sample size.
[c]Study interventions and comparators were consistent with care available in an Australian context.
[d]Total participants significantly below the threshold for precision.

Long-term outcomes (acute WAD)

Included studies: Bunketorp, 2006

GRADE Certainty Assessment						No of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	SES % change difference from baseline; I-C	⊕◯◯◯	CRITICAL

1	Not serious[a]	Not serious	Not serious[b]	Extremely serious[c]	n/a	Long-term (6mo): No significant difference, 20% (-8.4-47.6) p =0.18. TSK % change difference from baseline; I-C Long-term (6mo): No significant difference, -11% (-34.8-12.2) p =0.35.	Very low	
(Acute WAD) Long-term psychological functioning (follow-up: 3mo; assessed with: Self Efficacy Scale (SES) and Tampa Scale of Kinesiophobia (TSK))								

[a]Low risk of bias (PEDRO=8/10).
[b]Study interventions and comparators were consistent with care available in an Australian context.
[c]Total participants significantly below the threshold for precision and % change from baseline for both psychological functioning measures crossed 0 and the clinical significance threshold.

Table 7: Evidence to decision framework (neck-specific exercises for acute WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Trivial ● Small ○ Moderate ○ Large ○ Varies ○ Don't know	Acute (N=4 trials): Overall effects were variable between the four trials, with little to no difference in neck pain and neck disability, except for two trials that showed clinically significant benefits in long-term neck pain (Rosenfeld, 2003) and short-term neck disability and psychological functioning (Bunketorp, 2006).	Small sample sizes in all four studies. High risk of bias in one study (Soderlund, 2000). Interventions and comparators differed between studies. Comparator interventions were active interventions (education/advice for activity or general exercises) for the acute trials and is considered as part of usual care in an Australian context. As a result, clinically meaningful differences between groups would be rare.
Undesirable Effects How substantial are the undesirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Large ○ Moderate ○ Small ● Trivial ○ Varies ○ Don't know	Acute WAD: Not reported (Ask 2009), no adverse effects (Bunketorp 2009; Rosenfeld 2003; Soderlund 2000).	Neck-specific exercises are low load and are unlikely to have significant adverse effects. Study by Rosenfeld, 2003 showed clinically significant benefits in long-term neck pain and no adverse effects despite starting neck-specific exercises in one group <4 days post-injury.
Certainty of evidence		

What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations
● Very low ○ Low ○ Moderate ○ High ○ No included studies	Evidence certainty ranged from very low to low for short- and long-term critical outcome measures.	
Balance of effects **Does the balance between desirable and undesirable effects favour the intervention or the comparison?**		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ● Probably favours the intervention ○ Favours the intervention ○ Varies ○ Don't know	Acute (N=4 trials): No adverse effects, small overall benefits informed by two trials that showed clinically significant benefits in some critical outcomes.	Interventions and comparators differed between studies. Comparators in acute trials were an active intervention (advice for activity or global exercises). Healthcare professionals should consider the appropriateness for prescribing neck-specific exercises early (<4 days) after whiplash injury in people with high initial pain.
Resources required **How large are the resource requirements (costs)?**		
Judgement	Research evidence	Additional considerations

○ Large costs ● Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	In acute WAD trials exercise interventions were supervised by a primary healthcare professional (physiotherapist) in two trials: Ask 2009: 6–10 sessions of physiotherapy over 6 weeks for both intervention and control groups. Bunketorp 2009: 2 supervised sessions weekly (mean: 18 sessions). The control group performed home training with 4 follow-up sessions with a physiotherapist. The remaining two studies (Rosenfeld 2000; Soderlund 2000) had an initial session and several follow-up appointments with a physiotherapist, but the exercise interventions were low-load high frequency neck exercises performed by the participants independently (~6-week intervention).	Moderate costs associated with supervised sessions/follow-up.
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	Moderate costs associated with supervised sessions/follow-up.
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations

○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ● Probably favours the intervention ○ Favours the intervention ○ Varies ○ No included studies	Acute: (n=1 trial Rosenfeld, 2009). The costs were significantly lower after 6 and 36 months with neck-specific exercises compared with advice. Neck-specific exercises resulted in significantly reduced sick leave compared with advice.	Intervention carried out in Sweden - unknown regulatory and other contextual factors. Cost-effectiveness of supervised neck specific exercises compared with advice for activity likely depends on risk stratified care.
Equity What would be the impact on health equity?		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ● Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Primary healthcare professionals are widely available in an Australian context and can implement neck specific exercises in people with acute WAD.
Acceptability Is the intervention acceptable to key stakeholders?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	Ask (2009): 1 drop out in neck-specific exercise group due to other illness. Bunketorp (2009) 85% follow-up rate. Reasons for dropout from the intervention group: unable to contact (n=1), lack of time (n=1), wished to receive acupuncture for pain relief (n=1).	Low load neck-specific exercises are an acceptable intervention and are unlikely to have adverse effects.

	Rosenfeld 2000: 88 participants (91%) were followed-up at 6 months. The reasons for loss of follow up were: one person moved abroad, one person could not be traced, one person sustained a new neck injury and was then excluded, one was dissatisfied with the information concerning the study, and one was dissatisfied with the treatment protocol. Soderlund (2009): ~90% follow-up rate at 6 months for both intervention and control groups. No significant differences in exercise program compliance rates between groups.	
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know	The majority of insurance claimants in a NSW cohort were shown to receive neck exercises (n = 188/209; 90%) (Bandong et al., 2018).	Intervention is feasible to implement in primary healthcare settings in Australia and is consistent with current recommended practice.

T.1.5. Conclusions (neck-specific exercises for acute WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	○	●	○

Recommendations
The guideline panel suggest that healthcare professionals use neck-specific exercises for the management of people with acute WAD. *(Panel vote summary: 12/12 100% conditional for)* **Justification** • Small overall benefits compared with active control interventions (advice for activity or global exercises), with two trials showing clinically significant effects on some critical outcomes.

- No adverse effects reported in included trials. Neck-specific exercises are low load and are unlikely to have significant adverse effects.
- Neck-specific exercises are generally included as part of psychologically informed exercise (see T.2) and multimodal physical therapy (see T.4).
- Acceptable intervention to people in supervised and home-based settings.
- Intervention is feasible to implement in healthcare settings in Australia and is consistent with current recommended practice.

Implementation considerations

Training:

- Required to effectively implement neck-specific exercises.

Dose:

- 1-2x/wk for 6wk as supervised sessions.

Considerations:

- Develop an injured person's skills to independently perform neck-specific exercises (e.g., home exercise program).
- Healthcare professionals require training to implement neck-specific exercises.
- Evaluate critical outcomes regularly.

Table 8: Evidence to decision framework (neck-specific exercises for chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Trivial ○ Small ○ Moderate ● Large ○ Varies ○ Don't know	Chronic (N=1 trial): Clinically significant improvements in short-term neck pain and neck disability with neck specific exercises compared with no intervention.	Single study which is in comparison to waitlist control. There were high drop-out rates in both groups.
Undesirable Effects **How substantial are the undesirable anticipated effects?**		
Judgement	Research evidence	Additional considerations

○ Large ○ Moderate ○ Small ● Trivial ○ Varies ○ Don't know	No adverse effects reported (Peolsson 2016).	Neck-specific exercises are low load and are unlikely to have significant adverse effects.
Certainty of evidence **What is the overall certainty of the evidence of effects?**		
Judgement	Research evidence	Additional considerations
● Very low ○ Low ○ Moderate ○ High ○ No included studies	Evidence certainty ranged from very low to low for short- and long-term critical outcome measures.	
Balance of effects **Does the balance between desirable and undesirable effects favour the intervention or the comparison?**		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ● Probably favours the intervention ○ Favours the intervention ○ Varies ○ Don't know	Chronic (n=1 trial): No adverse effects reported and clinically significant overall benefits.	Single study which is in comparison to waitlist control. There were high drop-out rates in both groups. Recommended intervention for the management of people with acute WAD.
Resources required **How large are the resource requirements (costs)?**		
Judgement	Research evidence	Additional considerations

○ Large costs ● Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	Peolsson (2016) treatment dosage: 2xsessions/wk for 12 wk.	Moderate costs associated with supervised sessions.
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	Can be performed as part of routine consultation and independently by people with chronic WAD.
Equity What would be the impact on health equity?		

Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ● Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Primary healthcare professionals are widely available in an Australian context and can implement neck specific exercises in people with chronic WAD.
Acceptability **Is the intervention acceptable to key stakeholders?**		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	Peolsson (2016): High drop-out rates in intervention 29% (reasons: personal reasons n=4, unknown n=5) and wait-list groups 37% (unknown n=11). Higher baseline neck pain intensity (P =.04) was shown among the dropouts compared with those completing the 3-month program (pooled across both groups).	Low load neck-specific exercises are generally an acceptable intervention, but PHCPs should consider the person's neck pain in response to neck-specific exercises.
Feasibility **Is the intervention feasible to implement?**		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know		Intervention is feasible to implement in primary healthcare settings in Australia and is consistent with current recommended practice.

T.1.6. Conclusions (neck-specific exercises for chronic WAD)

Type of recommendation (neck-specific exercises for chronic WAD)

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	○	●	○

Recommendations
The guideline panel suggests that healthcare professionals use neck-specific exercises for the management of people with chronic WAD. *(Panel vote summary: 11/13 85% conditional for; 2/13 15% neutral)* **Justification** • Clinically significant overall benefits compared with control as no intervention. However, findings were from a single trial. • No adverse effects reported in included trial. Neck-specific exercises are low load and are unlikely to have significant adverse effects. • Neck-specific exercises are generally included as part of psychologically informed exercise (see T.2) and multimodal physical therapy (see T.4). • Acceptable intervention to people in supervised and home-based settings. • Intervention is feasible to implement in healthcare settings in Australia and is consistent with current recommended practice. **Implementation considerations** *Training:* • Required to effectively implement neck-specific exercises. *Dose:* • 1-2x/wk for 6wk as supervised sessions. *Considerations:* • Develop an injured person's skills to independently perform neck-specific exercises (home exercise program). • Healthcare professionals require training to implement neck-specific exercises. • Evaluate critical outcomes regularly.

T.2. Active: Psychologically informed exercise

Are psychologically informed exercise interventions compared with usual care (advice/exercise) effective for the management of acute or chronic WAD?

T.2.1. Executive summary

Psychologically informed exercise interventions are implemented by HCPs (e.g., physiotherapist) and target early stress symptoms using cognitive behavioral approaches in addition to exercise. Three acute WAD and three chronic WAD clinical trials were included that evaluated psychologically informed exercise interventions compared with usual care (exercise and/or advice) (Table 9). Table 10 and Table 11 outline the GRADE Evidence to Decision Framework decisions for the management of people with acute and chronic WAD, respectively.

Effect on neck pain (see T.2.2 for details)

Acute WAD short-term (2 weeks to 3 months) (moderate certainty in the evidence):

N=2 trials (Bring 2016, Sterling 2019). Compared psychologically informed exercise interventions with exercise and advice as per WAD guidelines (Bring, 2016; Sterling, 2019). Psychologically informed exercise likely results in a moderate reduction in short-term neck pain in acute WAD.

Acute WAD long-term (>3 months to 12 months) (low certainty in the evidence):

N=2 trials (Bring 2016, Sterling 2019). The evidence suggests that psychologically informed exercise compared with exercise and advice results in little to no effect on long-term neck pain in acute WAD.

Chronic WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=3 trials (Ludvigsson 2015, Soderlund 2001, Stewart 2007). Compared psychologically informed exercise interventions to general physical activity (Ludvigsson, 2015), neck-specific exercise (Soderlund 2001), or advice (Stewart, 2007). The evidence suggests that psychologically informed exercise results in little to no effect compared with exercise and advice on short-term neck pain in chronic WAD.

Chronic WAD long-term (>3 months to 12 months) (low certainty in the evidence):

N=2 trials (Ludvigsson 2015, Stewart 2007). The evidence suggests that psychologically informed exercise compared with exercise and advice results in a little to no effect on long-term neck pain in chronic WAD.

Effect on neck disability (see T.2.3 for details)

Acute WAD short-term (2 weeks to 3 months) (moderate certainty in the evidence):

N=3 trials (Bring 2016, Lamb 2012, Sterling 2019). Compared either a multimodal intervention consisting of psychologically informed exercise and manual therapy (Lamb 2012), or psychologically informed exercise (Bring, 2016; Sterling, 2019) with exercise and advice. Psychologically informed exercise compared with usual care likely results in little to no difference on short-term neck disability in acute WAD.

Acute WAD long-term (>3 months to 12 months) (moderate certainty in the evidence):

N=3 trials (Bring 2016, Lamb 2012, Sterling 2019). Psychologically informed exercise compared with exercise and advice likely results in little to no difference in long-term neck disability in acute WAD.

Chronic WAD short-term (2 weeks to 3 months) (moderate certainty in the evidence):

N=3 trials (Ludvigsson 2015, Soderlund 2001, Stewart 2007). In two out of three studies psychologically informed exercise resulted in moderate reductions in short-term neck disability (Ludvigsson, 2015; Steward, 2007). The study by Soderlund (2001) showed no significant differences in short-term neck disability, however, the control was neck-specific exercise.

Psychologically informed exercise likely results in small reductions in short-term neck disability in chronic WAD.

Chronic WAD long-term (>3 months to 12 months) (moderate certainty in the evidence):

N=2 trials (Ludvigsson 2015, Stewart 2007). Psychologically informed exercise likely results in a moderate reduction in long-term neck disability in chronic WAD.

Effect on psychological functioning (see T.2.4 for details)

Acute WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=2 trials (Bring 2016, Lamb 2012, Sterling 2019). The evidence suggests that psychologically informed exercise compared with exercise and advice results in little to no difference in short-term psychological functioning in acute WAD.

Acute WAD long-term (>3 months to 12 months) (low certainty in the evidence):

N=3 trials (Bring 2016, Lamb 2012, Sterling 2019). The evidence suggests that psychologically informed exercise results in little to no difference in long-term psychological functioning in acute WAD.

Chronic WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=1 trial (Stewart 2007). The evidence suggests that psychologically informed exercise results in moderate improvements in short-term psychological functioning in chronic WAD.

Chronic WAD long-term (>3 months to 12 months) (low certainty in the evidence):

N=1 trial (Stewart 2007) The evidence suggests that psychological informed exercise results in little to no difference in long-term psychological functioning in chronic WAD.

Additional considerations: Adverse effects

Bring 2016 (acute WAD): Not reported.

Lamb 2012 (acute WAD): No adverse effects.

Sterling 2019 (acute WAD): Exacerbation of neck pain (I: n=1, C: n=1).

Ludvigsson 2015 (chronic WAD): Not reported.

Soderlund 2001 (chronic WAD): Not reported.

Stewart 2007 (chronic WAD): Adverse effects (I: n=12, C n=13). Primary complaint in intervention group was muscle pain (4) followed by an increase in headaches (2) and ongoing pain (2). Primary complaint in control group was muscle pain with exercise (3) followed by knee pain (2) and lumbar spine pain (2)

Table 9: Summary of included studies (psychologically informed exercise interventions for acute and chronic WAD)

Author Year	Participants and setting (country)	Intervention (psychologically informed exercise)	Control (usual care)	Outcomes included	Neck pain outcomes	Neck disability outcomes	Psych functioning outcomes	Summary (risk of bias PEDRO score)
(Bring et al., 2016)* Acute	55 participants from hospital emergency units with acute WAD (Sweden)	Face-to-face appointments with a physiotherapist covering functional behavioural intervention with physical, cognitive, and behavioural, basic skills exercises, applied skills exercises, generalisation, maintenance/relapse prevention strategies.	Self-care/exercise instructions equivalent with WAD guidelines provided before randomisation. Physiotherapy advice on muscle relaxation techniques, posture, and general physical activity provided.	Neck pain, neck disability, and psychological functioning at 10wk, 3mo, 6mo, and 12mo.	NRS (0-10)	PDI (0-70)	TSK, CSQ	An individually tailored behavioural program improved disability and psychological factors in people with whiplash associated disorders up to 12 months after treatment compared with self-care instructions. (8)
(Lamb et al., 2012) Castelnuovo 2013 ~ Acute	599 participants from a hospital emergency department with acute WAD (UK)	Therapists provided manual therapy (joint mobilisations excluding manipulation), other soft-tissue techniques, exercise, tips on management of pain and on resumption of normal activities, some simple psychological strategies to deal with travel anxiety, and a screen for post-traumatic	Provided advice by a physiotherapist over a single session	Neck disability and psychological functioning at 4mo, 8mo, and 12mo	X	NDI (0-50)	SF12	A package of physiotherapy gave a modest acceleration to early recovery of persisting symptoms but was not cost effective from a UK NHS perspective. A single physiotherapy advice session for persistent symptoms is recommended. (5)

		stress over six sessions.						
(Sterling et al., 2019) Acute	108 participants from a primary care clinic with acute WAD (Australia)	Physiotherapist supervised exercise (1-2 sessions/week across 6 weeks) and also provided with whiplash injury recovery educational booklet. Stress inoculation training was administered (1 session/wk, for 6 wk) to help participants identify/understand stress, develop stress management skills, and apply skills in stressful situations.	Provided with whiplash injury recovery educational booklet. Physiotherapist supervised exercise as per intervention group.	Neck pain, neck disability, and psychological functioning at 6wk, 6mo, and 12mo.	NRS (0-10)	NDI (0-50)	PDS, DASS, PCS, SF-36	A physiotherapist-led intervention of stress inoculation training and exercise resulted in clinically relevant improvements in disability compared with exercise alone. (8)
(Ludvigsson et al., 2015)^ Chronic Peterson 2015 Ludvigsson 2016 Overmeer 2016 Ludvigsson 2017 Hiu Kwan 2018 Ludvigsson 2019	147 participants identified from registers of primary health care centers, specialist orthopaedic clinics, and hospital outpatient services with chronic WAD (Sweden)	Neck-specific exercises plus a behavioral intervention that included oral education regarding physiological and psychological aspects of pain, as well as activities aimed at pain management and problem-solving, including the management of symptomatic relapses. Exercises progressed from gentle isometric	Participants were prescribed individualised physical activity following an in-person consultation with a physiotherapist. The purpose of this prescription was to increase overall physical activity, either with individualised home exercise or activities performed in public gyms, or elsewhere, outside the health care system.	Neck pain and neck disability at 3mo and 6mo	VAS (0-100)	NDI (0-50)	X	A behavioural intervention in addition to neck-specific exercises resulted in moderate reductions in short- and long-term neck disability compared with general physical activity. (8)

		neck exercises to progressive resistance training in the gym using a weighted pulley for head resistance. physical activity.						
(Söderlund & Lindberg, 2001) Chronic	32 participants from an orthopaedic clinic with chronic WAD (Sweden)	Neck and shoulder exercises aiming to improve kinaesthetic sensibility and co-ordination. Advice on rest, activity modification, posture, and load management. Cognitive-behavioural interventions that included learning of basic physical and psychological skills, application, and generalisation of these basic skills in everyday activities, and maintenance of these skills.	Same as intervention minus cognitive behavioural interventions	Neck pain, neck disability, and psychological functioning at 3mo	NRS (0-10)	PDI (0-70)	CSQ	Cognitive behavioural therapy improved people's' perception of ability to perform daily activities three months post treatment. (6)
(Stewart et al., 2007) Chronic	134 participants from a primary care outpatient clinic with chronic WAD (Australia)	Therapist-led exercise program, CBT, and advice. Exercise program was six-weeks long and was delivered in an individually, progressively, sub-maximally to improve participants' ability to complete functional activities	Advice only	Neck pain, neck disability, and psychological functioning at 6wk and 12mo	NRS (0-10)	NDI (0-50)	Short-Form 36 (SF36)	In the short-term exercise and advice is slightly more effective than advice alone for people with persisting pain and disability following whiplash. Exercise is more effective for subjects with higher baseline pain and disability. (8)

		specified by the participant as being difficult because of whiplash. CBT included setting goals of progressively increasing difficulty, shaping, encouraging self-monitoring of progress and self-reinforcement. Advice included standardised education, reassurance and encouragement to resume light activity alone.						

SES, Self-Efficacy Scale; TSK, Tampa Scale of Kinesiophobia; NDI, Neck Disability Index; PDI, Pain Disability Index; SF12, Short Form 12; EQ-5D; CSQ, Coping Strategies Questionnaire; SF-36, Short Form 36; PDS, Post-traumatic Stress Diagnostic Scale; DASS, Depression Anxiety Stress Scale; PCS, Pain Catastrophizing Scale

*used face to face vs control (not Internet)

^ only used data from Ludvigsson 2015 study; intervention was neck-specific exercise plus behavioral intervention and selected general physical activity control group

~ only used data from Lamb 2012 study; compared groups in Step 2 (physio package vs advice only); SF12-mental scores

T.2.2. Effect on neck pain

Short-term outcomes (acute WAD)

Included studies: Bring 2016, Sterling 2019

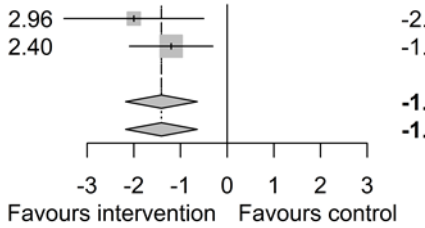
GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Meta-analysis presented below.	⊕⊕⊕◯	CRITICAL

2	Not serious[a]	Not serious[b]	Not serious[c]	Serious[d]	n/a		Moderate	

(Acute WAD) Short-term neck pain (follow-up: 6 wk to 3mo; assessed with: NRS; scale from 0-10)

Study	Outcome	Follow-Up	Intervention Total	Intervention Mean	Intervention SD	Control Total	Control Mean	Control SD	MD	95%-CI	Weight (fixed)	Weight (random)
Bring 2016	NRS 0-10	3mo	18	2.00	1.48	19	4.00	2.96	-2.00	[-3.50; -0.50]	26.2%	26.2%
Sterling 2019	NRS 0-10	6wk	51	2.50	2.20	51	3.70	2.40	-1.20	[-2.09; -0.31]	73.8%	73.8%
Fixed effect model			**69**			**70**			**-1.41**	**[-2.18; -0.64]**	**100.0%**	**--**
Random effects model									**-1.41**	**[-2.18; -0.64]**	**--**	**100.0%**

Heterogeneity: I^2 = 0%, τ^2 = 0, p = 0.37



[a]Low risk of bias in both studies (PEDRO = 8/10).
[b]Study findings were homogenous (I^2=0%).
[c]Study interventions and controls are consistent with an Australian healthcare context.
[d]Total number of participants below the threshold for precision.

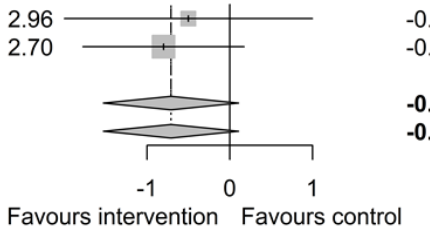
Long-term outcomes (acute WAD)

Included studies: Bring 2016, Sterling 2019

GRADE Certainty Assessment						No of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Meta-analysis presented below.	⊕⊕◯◯ Low	CRITICAL
2	Not serious[a]	Not serious[b]	Not serious[c]	Very serious[d]	n/a			

Study	Outcome	Follow-Up	Intervention Total	Intervention Mean	Intervention SD	Control Total	Control Mean	Control SD	MD	95%-CI	Weight (fixed)	Weight (random)
Bring 2016	NRS 0-10	12mo	18	2.00	1.48	19	2.50	2.96	-0.50	[-2.00; 1.00]	29.7%	29.7%
Sterling 2019	NRS 0-10	12mo	51	2.90	2.30	51	3.70	2.70	-0.80	[-1.77; 0.17]	70.3%	70.3%
Fixed effect model			**69**			**70**			**-0.71**	**[-1.53; 0.11]**	**100.0%**	**--**
Random effects model									**-0.71**	**[-1.53; 0.11]**	**--**	**100.0%**

Heterogeneity: I^2 = 0%, τ^2 = 0, p = 0.74

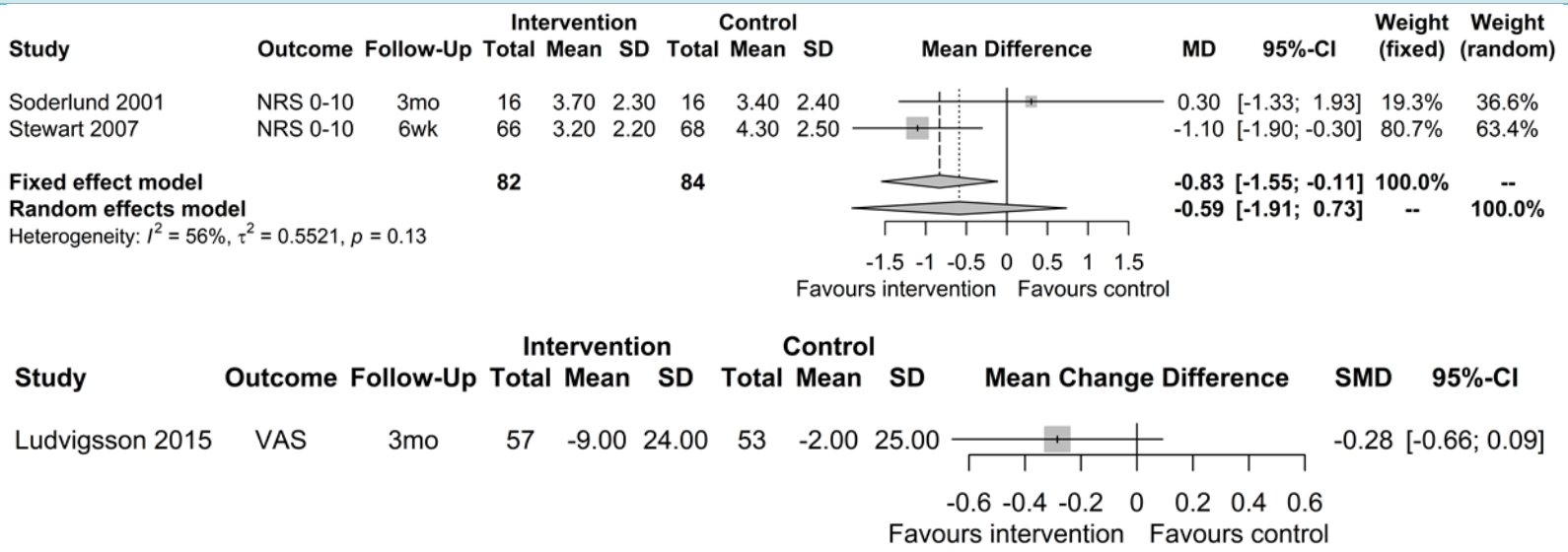


[a]Low risk of bias in both studies (PEDRO = 8/10).
[b]Study findings were homogenous (I^2=0%).
[c]Study interventions and controls are consistent with an Australian healthcare context.
[d]Total number of participants below the threshold for precision and wide confidence intervals.

Short-term outcomes (chronic WAD)

Included studies: Ludvigsson 2015, Soderlund 2001, Stewart 2007

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Soderlund 2001 (intervention n=16, control n=16), Stewart 2007 (intervention n=66, control n=68): Meta-analysis presented below. Ludvigsson 2015 (intervention n=71, control n=69): Forest plot presented below.	⊕⊕◯◯ Low	CRITICAL
3	Not serious[a]	Serious[b]	Not serious[c]	Serious[d]	n/a			



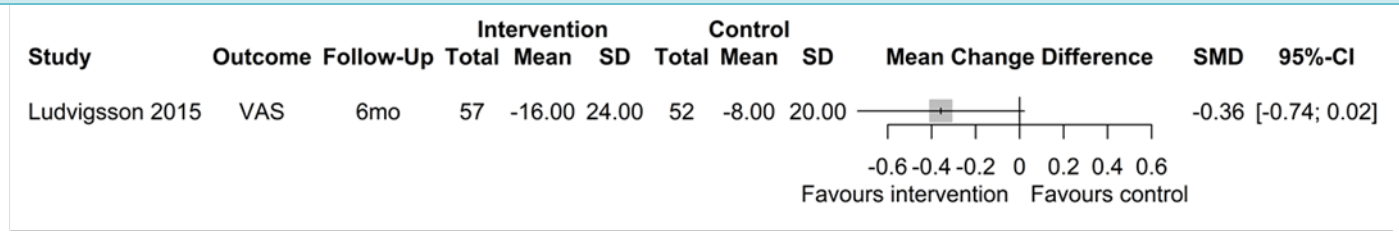
[a]Low overall risk of bias (PEDRO score range 6-8/10).

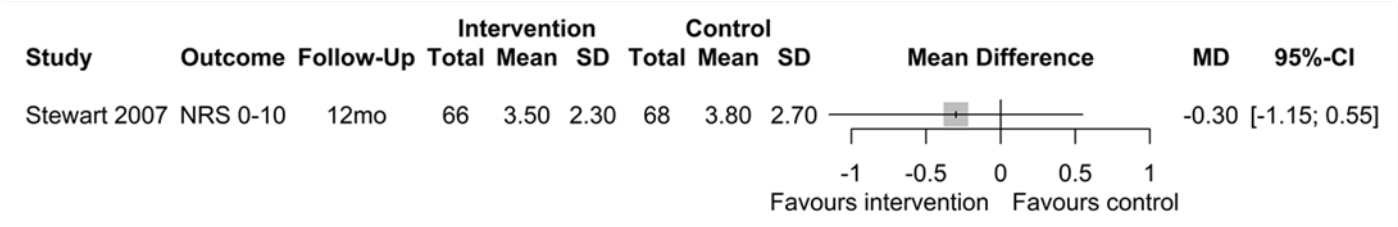
[b]Heterogenity present in study findings (Soderlund, 2001; Stewart, 2007).
[c]Study interventions and controls are consistent with an Australian healthcare context.
[d]Wide confidence intervals crossing 0 in pooled mean difference and standardised mean change difference.

Long-term outcomes (chronic WAD)

Included studies: Ludvigsson 2015, Stewart 2007

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Ludvigsson 2015 (intervention n=71, control n=69): See forest plot below. Stewart 2007 (intervention n=66, control n=68): mean difference of -0.30 (-1.15, 0.55)	⨁⨁◯◯ Low	CRITICAL
2	Not serious[a]	Not serious[b]	Not serious[c]	Very serious[d]	n/a			





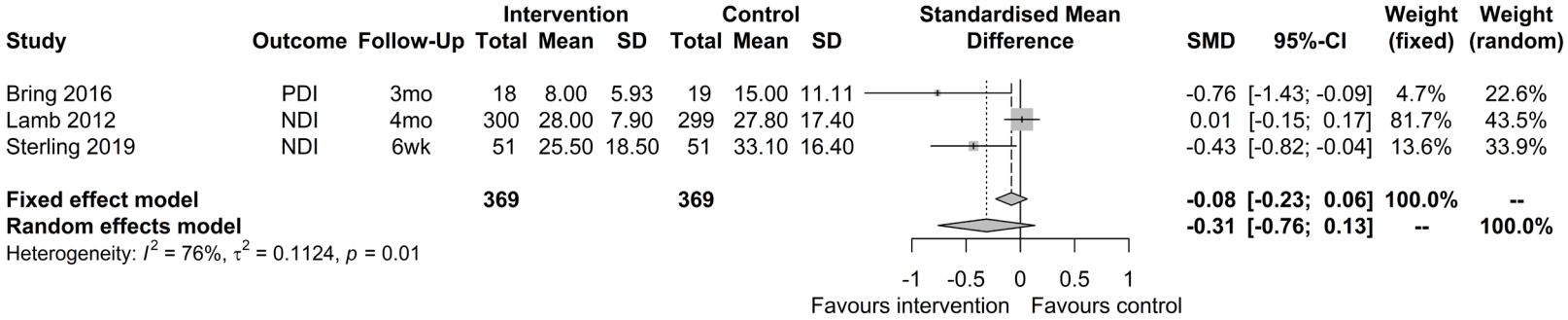
[a]Low risk of bias in both studies (PEDRO = 8/10).
[b]No significant differences found between intervention and control in both studies.
[c]Study interventions and controls are consistent with an Australian healthcare context.
[d]Wide confidence intervals crossing 0 in study by Stewart (2007) and spanning large to no effect in study by Ludvigsson (2015). Total number of participants below threshold for precision.

T.2.3. Effect on neck disability

Short-term outcomes (acute WAD)

Included studies: Bring 2016, Lamb 2012, Sterling 2019

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Meta-analysis presented below.	⊕⊕⊕◯ Moderate	CRITICAL
3	Not serious	Serious[a]	Not serious	Not serious[b]	n/a			

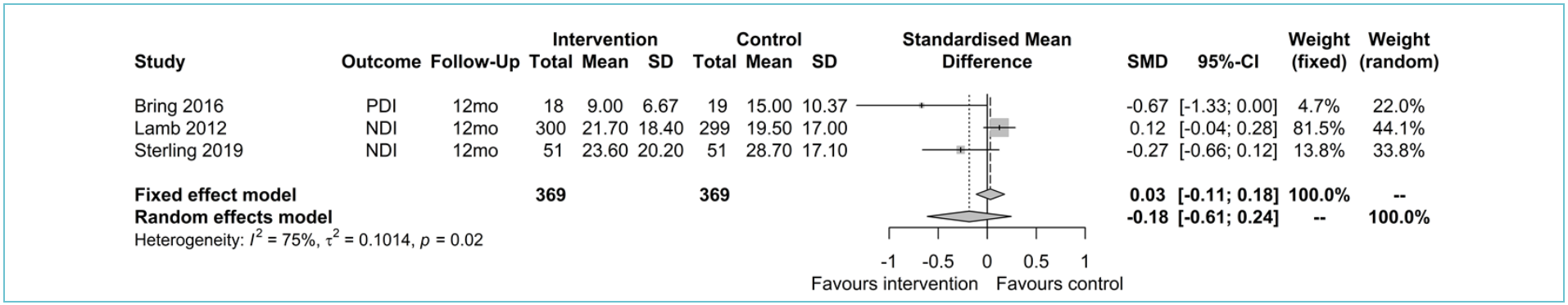


[a]High heterogeneity present between studies (I^2=76%).
[b]Total number of participants N=738. Wide confidence intervals in the study by Bring (2016), however, the studies by Lamb (2012) and Sterling (2019) represented the majority of total participants and exhibited greater data precision.

Long-term outcomes (acute WAD)

Included studies: Bring 2016, Lamb 2012, Sterling 2019

GRADE Certainty Assessment						No of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Meta-analysis presented below.	⊕⊕⊕◯ Moderate	CRITICAL
3	Not serious	Serious[a]	Not serious	Not serious[b]	n/a			



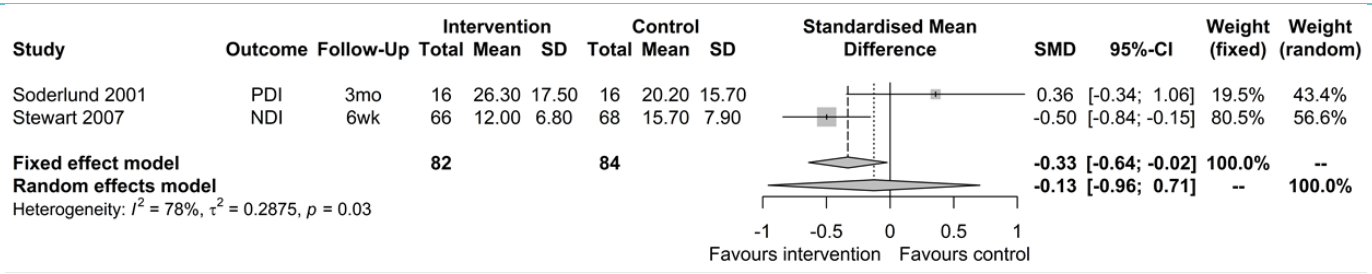
[a]High heterogeneity present between studies (I^2=75%).

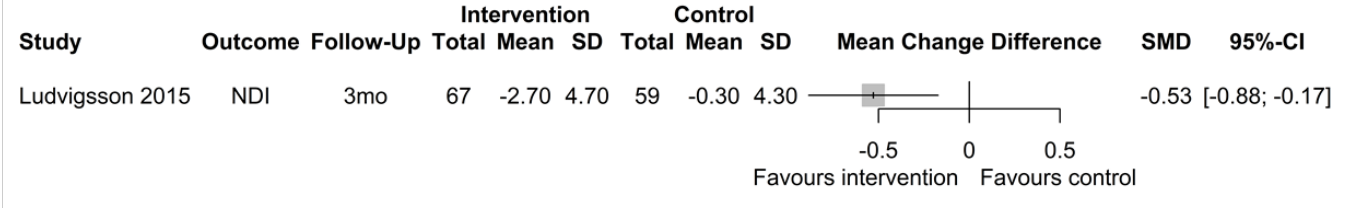
[b]Total number of participants N=738. Wide confidence intervals in the study by Bring (2016), however, the studies by Lamb (2012) and Sterling (2019) represented the majority of total participants and exhibited greater data precision.

Short-term outcomes (chronic WAD)

Included studies: Ludvigsson 2015, Soderlund 2001, Stewart 2007

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Soderlund 2001 (intervention n=16, control n=16), Stewart 2007 (intervention n=66, control n=68): Meta-analysis presented below. Ludvigsson 2015 (intervention n=71, control n=69): Forest plot presented below.	⨁⨁⨁◯ Moderate	CRITICAL
3	Not serious[a]	Not serious[b]	Not serious[c]	Serious[d]				



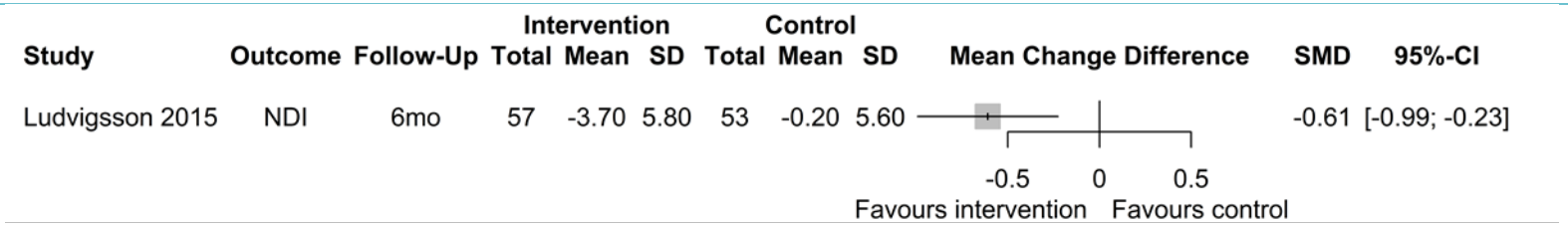


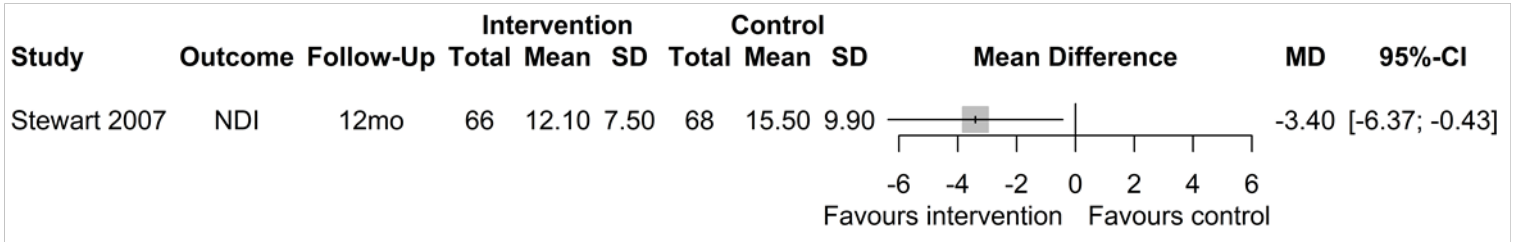
[a]Low overall risk of bias (PEDRO score range 6-8/10).
[b]Heterogenity present in study findings in meta-analysis of two studies (Soderlund, 2001; Stewart, 2007), however, the studies by Ludvigsson (2015) and Soderlund (2001) had similar outcomes (moderate reductions in neck disability) and represented the majority of overall participants. Note: the study by Soderlund (2001) used neck-specific exercises as the control.
[c]Study interventions and controls are consistent with an Australian healthcare context.
[d]Wide confidence intervals crossing 0 and clinical thresholds in SMD.

Long-term outcomes (chronic WAD)

Included studies: Ludvigsson 2015, Stewart 2007

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Ludvigsson 2015 (intervention n=71, control n=69): Presented in forest plot below (mean change SMD). Stewart 2007 (intervention n=66, control n=68): Presented forest plot below (MD).	⊕⊕⊕◯ Moderate	CRITICAL
2	Not serious[a]	Not serious[b]	Not serious[c]	Serious[d]	n/a			





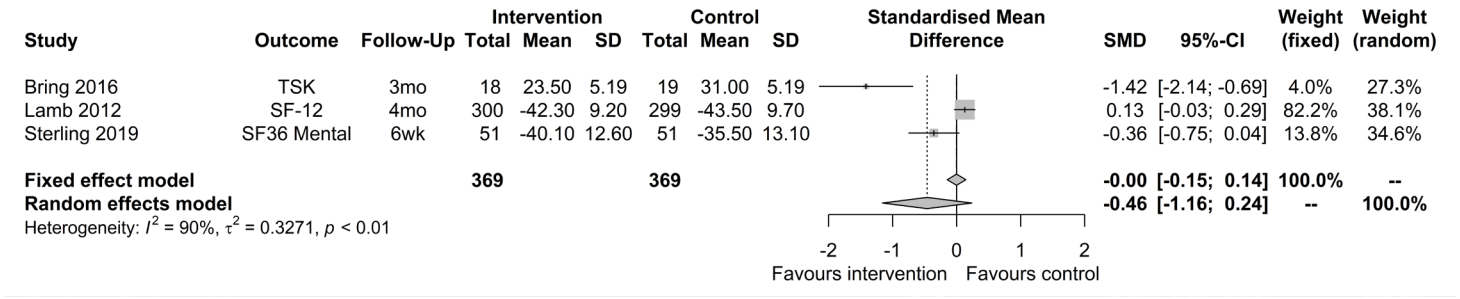
[a]Low risk of bias in both studies (PEDRO = 8/10).
[b]Similar magnitude of effect in each study.
[c]Study interventions and controls are consistent with an Australian healthcare context.
[d]Total number of participants below threshold for precision.

T.2.4. Effect on psychological functioning

Short-term outcomes (acute WAD)

Included studies: Bring 2016, Lamb 2012, Sterling 2019

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Meta-analysis presented below.	⊕⊕◯◯ Low	CRITICAL
3	Not serious	Serious[a]	Not serious	Serious[b]	n/a			

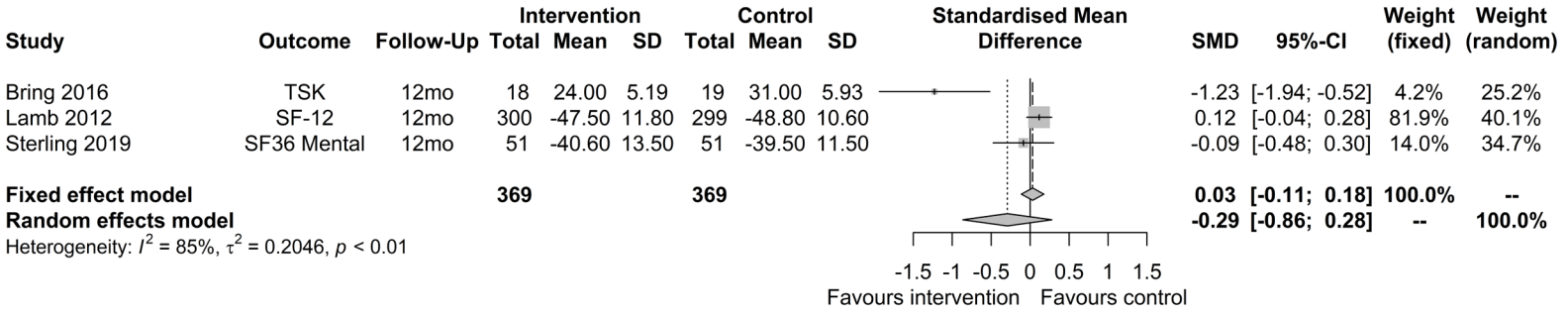


[a]High heterogeneity present between studies (I^2=90%). Study by Bring (2016) represents a small proportion of overall participants and differs in the assessment of psychological functioning compared with Lamb (2012) and Sterling (2019).
[b]Wide confidence intervals crossing 0 and clinical significance threshold in SMD.

Long-term outcomes (acute WAD)

Included studies: Bring 2016, Lamb 2012, Sterling 2019

GRADE Certainty Assessment						No of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Meta-analysis presented below.	⊕⊕◯◯ Low	CRITICAL
3	Not serious	Serious[a]	Not serious	Serious[b]	n/a			



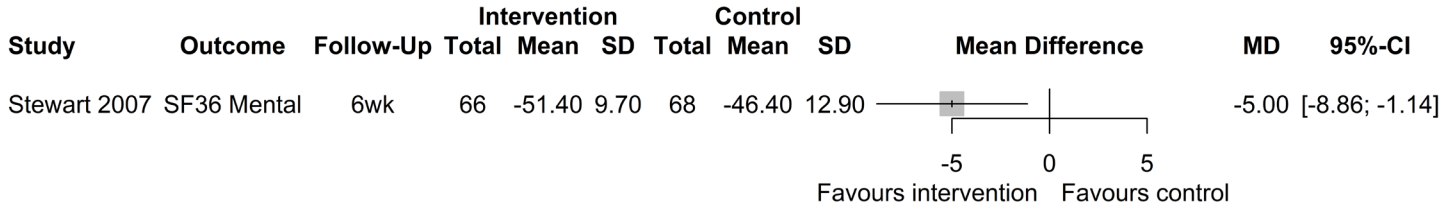
[a]High heterogeneity present between studies (I^2=85%). Study by Bring (2016) represents a small proportion of overall participants and differs in the assessment of psychological functioning compared with Lamb (2012) and Sterling (2019).

[b]Wide confidence intervals crossing 0 and clinical significance threshold in SMD.

Short-term outcomes (chronic WAD)

Included studies: Stewart 2007

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	See forest plot below.	⨁⨁◯◯ Low	CRITICAL
1	Not serious	Not serious	Not serious	Very serious[a]	n/a			

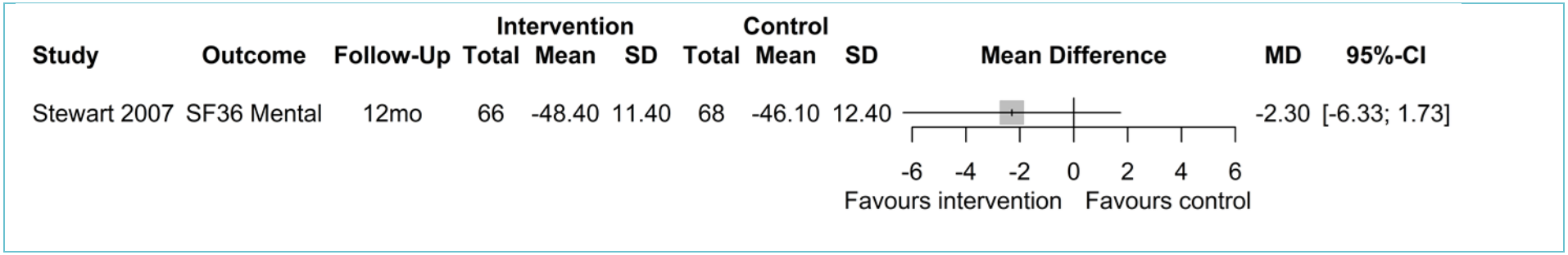


[a]Total number of participants below the threshold for precision.

Long-term outcomes (chronic WAD)

Included studies: Stewart 2007

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Stewart 2007 (intervention n=66, control n=68): mean difference of -2.30 (-6.33, 1.73)	⨁⨁◯◯ Low	CRITICAL
1	Not serious	Not serious	Not serious	Very serious[a]	n/a			



[a]Wide confidence intervals crossing 0 and total number of participants below the threshold for precision.

Table 10: Evidence to decision framework (psychologically informed exercise interventions for acute WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Trivial ○ Small ● Moderate ○ Large ○ Varies ○ Don't know	Acute: Psychologically informed exercise compared with exercise and advice likely results in a moderate reduction in short-term neck pain in acute WAD. Little to no differences between interventions were shown for other critical variables.	Neck specific exercises are included in psychologically informed exercise interventions which is a recommended intervention for managing people with acute WAD.
Undesirable Effects **How substantial are the undesirable anticipated effects?**		
Judgement	Research evidence	Additional considerations
○ Large ○ Moderate ○ Small ● Trivial ○ Varies ○ Don't know	Bring 2016 (acute WAD): Not reported. Lamb 2012 (acute WAD): No adverse effects. Sterling 2019 (acute WAD): Exacerbation of neck pain (I: n=1, C: n=1).	Participants in the study by Sterling et al. (2019) were at medium/high risk of poor recovery (NDI: ≥32) and presented with hyperarousal symptoms (≥3 hyperarousal subscale of the PDS). Healthcare professionals can be confident at prescribing psychologically informed exercise interventions for people with high levels of pain or disability but should

		still consider prescribing exercises carefully.
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations
○ Very low ● Low ○ Moderate ○ High ○ No included studies	Certainty in the evidence ranged from low to moderate for short- and long-term critical outcome measures.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ● Probably favours the intervention ○ Favours the intervention ○ Varies ○ Don't know	Improvements in some critical outcomes compared with exercise and advice, with trivial adverse effects.	Control interventions were active interventions.
Resources required		

How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Large costs ● Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	Dose 6-12 sessions including psychologically informed exercise interventions by primary healthcare professional (physiotherapist). Therapists underwent formal training to conduct the interventions, for example: - Lamb (2012): 30–40 min duration training sessions, repeated every 4 months to coincide with medical staff rotations. - Sterling (2019): Physiotherapists who delivered the psychologically informed exercise intervention received 1.5 days training in stress inoculation technique by a psychologist. After the training, the physiotherapists audiotaped practice sessions of each of the six components of stress inoculation. These were audited by the psychologist and feedback was provided.	Moderate costs associated with treatment dosage and healthcare professional training procedures. Healthcare professionals may require some psychological training to effectively implement this intervention.
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations

○ Favours the comparison ○ Probably favours the comparison ● Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ○ No included studies	A package of physiotherapy gave a modest acceleration to early recovery of persisting symptoms but was not cost effective from a UK NHS perspective. Cost-effectiveness was evaluated using incremental cost per Quality-Adjusted-Life-Year (QALY). Physiotherapy psychologically informed exercise package was associated with higher mean NHS costs (£414·73 for the physiotherapy package vs £356·37 for advice) and lower mean QALYs (0·691 for the physiotherapy package vs 0·702 for advice). Using the usual UK metrics, the program was not cost effective compared with advice.	Intervention can be beneficial to participants without being cost effective. NHS - different system to an Australian context. Cost-effectiveness likely depends on stratified care approaches (i.e., not all people with acute WAD require targeted psychologically informed exercise like stress inoculation as it will be more appropriate for those at medium-high risk of poor recovery).
Equity What would be the impact on health equity?		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ● Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included studies.	Delivered by primary healthcare professionals (e.g., physiotherapists) who are reasonably distributed across Australia. However, healthcare professionals may require some psychological training to effectively implement this intervention.
Acceptability Is the intervention acceptable to key stakeholders?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	One acute WAD clinical trial and one chronic WAD trial were conducted in Australia. Dropout rates for both studies were low: Acute WAD Sterling (2019): 53 participants in intervention group, the primary outcome measure (NDI) was completed by 96% participants at 6 weeks and 94% at 12 months. 55 participants in the control group, NDI was completed by 93% at 6 weeks 87% at 12 months. The majority of people found the psychological techniques in the study by Sterling to be helpful in managing stress and pain, coping with their injury, and returning to function (Silva Guerrero et al., 2022).	People accept the delivery of this intervention by primary healthcare professionals.

	Chronic WAD Stewart (2007): 134 participants, 132 (99%) attended the 6-week follow-up and 125 (93%) attended the 12-month follow-up.	
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	Included studies involved one session-one day of training, whilst the study by Sterling et al (2019) had more comprehensive training comprising two days of training and individual feedback on the 6 modules of stress inoculation. Note that this intervention was provided for medium/high risk people only.	Principles of cognitive behavioural therapy are taught in tertiary education. Reasonable geographical distribution of primary healthcare professionals (e.g., physiotherapists) across Australia. Healthcare professionals would need to be prepared to undertake the training. Healthcare professionals require ongoing CPD points for accreditation. Online training modules could be considered and are currently under development. Regarding the study by Sterling et al. (2019), more training is required however this is for therapists managing people with acute WAD who are medium/high risk of poor prognosis.

T.2.5. Conclusions (psychologically informed exercise interventions for acute WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	○	●	○

Recommendations

The guideline panel suggest that healthcare professionals use psychologically informed exercise interventions for the management of people with acute WAD.

(Panel vote summary: 11/14 79% conditional for; 2/14 14% strong for; 1/14 7% neutral)

Justification

- Psychologically informed exercise compared with usual care (exercise and advice) likely results in a moderate reduction in short-term neck pain in acute WAD. Little to no differences between interventions was shown for other critical variables.
- Greater proportion of long-term responders [defined by: Neck Disability Index (NDI, cut off change of ≥5/50), Visual Analogue Scale Bothersomeness (VAS-B, ≥50% reduction), Current Pain Visual Analogue Scale (P-VAS, ≥50% reduction)] in intervention compared with control (54% vs 21%) (Ludvigsson, 2015).
- Undesirable effects are trivial.
- A psychologically informed exercise intervention has been shown to be acceptable to people in a qualitative study.
- Neck specific exercises are included in psychologically informed exercise interventions and are recommended for the management of people with acute WAD.

Subgroup considerations

- Psychologically informed exercise interventions could be applied to people with both low and medium/high risk acute/chronic WAD.
- Sterling et al. (2019) stress inoculation intervention is more appropriate for medium/high risk subgroup (elevated pain and hyperarousal symptoms).
- Stewart (2007): participants with high levels of pain intensity and disability were associated with greater short- and long-term treatment effects compared with lower pain and disability.

Implementation considerations

Indications:

- Appropriate for people at medium/high risk of poor outcome (e.g., Sterling et al (2019) provided intervention for medium/high risk subgroup). Stewart al (2007) found people with higher pain and disability had greater treatment response.

Training:

- Additional formal training required (feasible given HCP's require continuing professional development (CPD) points for registration.
- Where and how to access training will be a point for implementation (e.g., online modules).

Dose:

- 2x/wk for 6 weeks. Consider acceptable dosage for the person.

Considerations:

- Exercise interventions were delivered by primary HCP's (e.g., physiotherapists).
- Psychologically informed interventions (e.g., cognitive behavioural therapy, stress management skill development) were used.
- HCP's require formal training in psychological interventions by a psychologist.
- Evaluate outcomes regularly.
- Non-responders who are exhibiting high distress should be referred to a whiplash specialist* +/- psychologist.

*For these guidelines, defined as an allied health or medical HCP with advanced clinical expertise in the managing whiplash. May include but not limited to specialist physiotherapists, specialist physicians.

Table 11: Evidence to decision framework (psychologically informed exercise interventions for chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Trivial ○ Small ● Moderate ○ Large ○ Varies ○ Don't know	Psychologically informed exercise interventions compared with exercise and advice likely results in small-moderate reductions in short- and long-term neck disability, and improvements in short-term psychological functioning.	The study by Soderlund et al. (2001) compared neck-specific exercises with a psychological intervention to neck-specific exercises, rather than general exercise/advice. Neck-specific exercises are a recommended treatment for the management of people with acute WAD.
Undesirable Effects How substantial are the undesirable anticipated effects?		
Judgement	Research evidence	Additional considerations

○ Large ○ Moderate ○ Small ● Trivial ○ Varies ○ Don't know	Ludvigsson 2015 (chronic WAD): Not reported. Soderlund 2001 (chronic WAD): Not reported. Stewart 2007 (chronic WAD): Adverse effects (I: n=12, C n=13). Primary complaint in intervention group was muscle pain (4) followed by an increase in headaches (2) and ongoing pain (2). Primary complaint in control group was muscle pain with exercise (3) followed by knee pain (2) and lumbar spine pain (2).	Stewart (2007): participants with high levels of pain intensity and disability were associated with greater short- and long-term treatment effects compared with lower pain and disability. Healthcare professionals can be confident at prescribing psychologically informed exercise interventions for people with high levels of pain or disability but should still consider prescribing exercises carefully.
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations
○ Very low ● Low ○ Moderate ○ High ○ No included studies	Certainty in the evidence ranged from low-moderate for short- and long-term critical outcome measures.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ● Probably favours the intervention	Small to moderate improvements neck disability and psychological functioning compared with exercise and advice, with trivial adverse effects.	The study by Soderlund et al. (2001) compared neck-specific exercises with a psychological intervention to neck-specific exercises, rather than general exercise/advice. Neck-specific exercises are a recommended treatment for the management of people with acute WAD.

○ Favours the intervention ○ Varies ○ Don't know		
Resources required **How large are the resource requirements (costs)?**		
Judgement	Research evidence	Additional considerations
○ Large costs ● Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	Dose: 12 sessions over 6 weeks (Soderlund 2001; Stewart 2007) or 24 sessions over 12 weeks (Ludvigsson 2015). Therapists underwent formal training to conduct the interventions, for example: Ludvigsson (2015): Standardized oral and written information about the intervention and a day of theoretical and practical training. Stewart (2007): Treatment manual was developed, and each physiotherapist was trained in the study protocol and interventions. Physiotherapists were educated by an experienced clinical psychologist about the principles of the cognitive behavioural approach.	Moderate costs associated with treatment dosage and healthcare professional training procedures. Healthcare professionals may require some psychological training to effectively implement this intervention.
Certainty of evidence of required resources **What is the certainty of the evidence of resource requirements (costs)?**		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	

Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	
Equity What would be the impact on health equity?		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ● Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know		Delivered by primary healthcare professionals (e.g., physiotherapists) who are reasonably distributed across Australia. However, healthcare professionals may require some psychological training to effectively implement this intervention.
Acceptability Is the intervention acceptable to key stakeholders?		

Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	One acute WAD clinical trial and one chronic WAD trial were conducted in Australia. Dropout rates for both studies were low: Acute WAD Sterling (2019): 53 participants in intervention group, the primary outcome measure (NDI) was completed by 96% participants at 6 weeks and 94% at 12 months. 55 participants in the control group, NDI was completed by 93% at 6 weeks 87% at 12 months. The majority of people found the psychological techniques in the study by Sterling to be helpful in managing stress and pain, coping with their injury, and returning to function (Silva-Guerrero et al., 2022). Chronic WAD Stewart (2007): 134 participants, 132 (99%) attended the 6-week follow-up and 125 (93%) attended the 12-month follow-up.	People accept the delivery of this intervention by primary healthcare professionals.
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	Included studies involved one session to one day of training in these interventions.	Principles of cognitive behavioural therapy are taught in tertiary education. Reasonable geographical distribution of primary healthcare professionals (e.g., physiotherapists) across Australia. PHCPs would need to be prepared to undertake the training. PHCPs require ongoing professional development points for accreditation. Online training modules could be considered and are currently under development.

T.2.6. Conclusions (psychologically informed exercise interventions for chronic WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	○	●	○

Recommendations
The guideline panel suggest that healthcare professionals could use psychologically informed exercise interventions for the management of people with chronic WAD. *(Panel vote summary: 9/13 69% conditional for; 4/13 31% strong for)* **Justification** • Psychologically informed exercise interventions compared with exercise and advice likely results in small-to-moderate reductions in short- and long-term neck disability, and improvements in short-term psychological functioning. • Undesirable effects are trivial and similar in frequency to exercise and advice. Intervention is acceptable to people as shown in acute whiplash qualitative study and supported by high follow up rate in chronic trial. • Greater proportion of long-term responders [defined by: Neck Disability Index (NDI, cut off change of ≥5/50), Visual Analogue Scale Bothersomeness (VAS-B, ≥50% reduction), Current Pain Visual Analogue Scale (P-VAS, ≥50% reduction)] in intervention compared with control (54% vs 21%) (Ludvigsson, 2015). • Neck specific exercises are included in psychologically informed exercise interventions and are recommended for management of people with chronic WAD. **Subgroup considerations** • Psychologically informed exercise interventions could be applied to people with both low and medium/high risk acute and chronic WAD. • Sterling et al. (2019) stress inoculation intervention is more appropriate for medium/high risk and moderate-severe disability (chronic) subgroups (elevated pain and hyperarousal symptoms). • Stewart (2007): participants with high levels of pain intensity and disability were associated with greater short- and long-term treatment effects compared with lower pain and disability. **Implementation considerations** *Indications:*

- More appropriate for those with psychological distress and moderate-severe neck pain/ disability in the chronic phase.

Training:

- Additional formal training required (feasible given HCP's require continuing professional development (CPD) points for registration.
- Where and how to access training will be a point for implementation (e.g., online modules).

Dose:

- 2x/wk for 6 weeks.
- Consider acceptable dosage for the person.

Considerations:

- Exercise interventions were delivered by primary HCP's (e.g., physiotherapists). Psychologically informed interventions (e.g., cognitive behavioural therapy, stress management skill development) were used.
- HCP's require formal training in psychological interventions by a psychologist.
- Evaluate outcomes regularly.
- Non-responders who are exhibiting high distress should be referred.

T.3. Active: Dizziness-specific exercises

Are dizziness-specific exercises effective for the management of acute or chronic WAD with concurrent dizziness symptoms?

T.3.1. Executive summary

Dizziness-specific exercises includes vestibular, phasic, and sensorimotor exercises, for example: keeping eyes still on a target whilst the head moves, standing on foam and turning the head from side to side, walking on a slope and turning the head from side to side, standing on a trampoline and moving eyes from side to side. There were two trials evaluating the effect of dizziness-specific exercises for the management of people with chronic WAD with concurrent dizziness symptoms (Table 12). No trials were included for acute WAD. Table 13 outlines the GRADE Evidence to Decision Framework decisions for the management of people with acute and chronic WAD.

Effect on dizziness ability* (see T.3.2 for details)

*The guideline panel agreed to include dizziness ability as a critical outcome for this question as it was specific to a subgroup of people with WAD and concurrent dizziness symptoms.

Chronic WAD short-term (2 weeks to 3 months) (very low certainty in the evidence):

N=1 trial (Ekvall-Hannsson, 2013). Compared vestibular program against no intervention. A vestibular program compared with no intervention was effective in reducing dizziness handicap in people with chronic WAD with concurrent dizziness, but the evidence is very uncertain.

Effect on neck disability (see T.4.3 for details)

Chronic WAD short-term (2 weeks to 3 months) (very low certainty in the evidence):

N=1 trial (Fitz-Ritson, 1995). Compared phasic head, neck, and arm exercises compared with general exercises. Dizziness-specific exercises compared with general exercises resulted in clinically significant reductions in neck disability in people with chronic WAD, but the evidence is very uncertain.

Additional considerations: Adverse effects

Ekvall-Hannsson 2013 (Chronic WAD): No adverse effects.

Fitz-Ritson 1995 (Chronic WAD): Not reported.

Table 12: Summary of included studies (dizziness-specific exercises for acute and chronic WAD)

Author Year	Participants and setting (country)	Intervention (Dizziness-specific exercises)	Control	Outcomes included	Dizziness outcomes*	Neck disability outcomes	Summary (risk of bias PEDRO score)
(Ekvall-Hansson et al., 2006)^ Ekvall-Hannsson 2013	29 participants recruited from a physiotherapy clinic with chronic WAD/dizziness (Sweden)	Group-based vestibular rehabilitation program for twice a week for 6wk. The program consisting of exercises aimed to stimulate the vestibular system, using eye, head and trunk movements. The people were instructed to perform all exercises with optimal postural alignment	No intervention.	Dizziness handicap experienced at 3mo.	Dizziness Handicap Inventory (DHI) at 3mo	X	Statistically significant differences were found between the groups in Dizziness Handicap Inventory (DHI) total score as well as functional score at 6 weeks. For DHI physical score, there were statistically significant differences between the groups at 6 weeks as well as at 3 months. (5)
(Fitz-Ritson, 1995)	30 participants recruited from a physiotherapy centre with chronic complaints (Sweden)	Chiropractic therapy and phasic exercises that included rapid eye-head-neck-arm coordinated movements and were done 4x/wk for 8wk.	Same as intervention but exercises consisted of stretching, isometric, and isokinetic type exercises.	Neck disability at 8wk.	X	Neck Pain Disability Index (0-68)	Phasic exercises appear important in improving people with chronic WAD. Exercises not clearly described. The groups were not well matched. (4)

*Dizziness outcomes were prioritised for this PICO
^ data from Ekvall-Hannsson 2006 study

T.3.2. Effect on dizziness ability

Short-term outcomes (chronic WAD)

Included studies: Ekvall-Hannsson 2006

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Ekvall-Hannsson 2006 (intervention n=16, control n=13): Median difference (CI) at 3mo was statistically significant for Dizziness Handicap Inventory (DHI) physical score (-2, -4.0 to -0.0, p = 0.04).	⊕◯◯◯ Very low	CRITICAL
1	Serious[a]	Not serious	Not serious	Extremely serious[b]	n/a			
Insufficient information to produce forest plot.								

[a]Fair risk of bias (PEDRO = 5/10).
[b]Single study with sample size significantly below the threshold of imprecision.

T.3.3. Effect on neck disability

Short-term outcomes (Chronic WAD)

Included studies: Fitz-Ritson 1995

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Fitz-Ritson 1995 (Intervention n=15, control n=15): Control group improved 7.4% (p < 0.05) on Neck Pain Disability Index while intervention group improved 48.3% (p <0.001) at 8 weeks. MD in Neck Pain Disability Index -24.2 (-29.6, -18.8)	⊕◯◯◯ Very low	CRITICAL
1	Very serious[a]	Not serious	Not serious	Extremely serious[b]	n/a			
Insufficient information to produce forest plot.								

a. Significant risk of bias with 'fair' study quality (PEDRO = 4/10) and groups were not well matched.
b. Single study with sample size significantly below the threshold of imprecision.

Table 13: Evidence to decision framework (dizziness-specific exercises for acute and chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Trivial ○ Small ● Moderate (chronic)	No clinical trials in acute WAD. Chronic WAD:	Fair study quality with risk of bias presented in both studies.

○ Large ○ Varies ● Don't know (acute)	A vestibular program compared with no intervention was effective in reducing dizziness handicap in people with chronic WAD with concurrent dizziness (Ekvall-Hannsson 2006). Dizziness-specific exercises compared with general exercises resulted in clinically significant reductions in neck disability in people with chronic WAD (Fitz-Ritson 1995).	
Undesirable Effects How substantial are the undesirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Large ○ Moderate ○ Small ● Trivial ○ Varies ○ Don't know	No clinical trials in acute WAD. Chronic WAD trial showed no adverse effects (Ekvall-Hannsson 2013).	Dizziness-specific exercises are low load and are unlikely to have significant adverse effects. Healthcare professionals should take care in prescribing neck exercises and ensure adequate monitoring strategies (e.g., exacerbation of dizziness and/or neck pain).
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations
● Very low (chronic) ○ Low ○ Moderate ○ High ● No included studies (acute)	Very low certainty in the evidence for dizziness specific exercises for the management of people with chronic WAD, due to two studies with different primary outcomes and fair study quality.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations

○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ● Probably favours the intervention (acute and chronic) ○ Favours the intervention ○ Varies ○ Don't know	No clinical trials in acute WAD. Chronic WAD: Significant reductions in dizziness disability and clinically significant reductions in neck disability for dizziness-specific exercises. However, these findings were from two studies with small sample sizes.	Healthcare professionals should apply the following intervention for short periods, and in conjunction with other recommended treatments provided there is evidence of continuing measurable improvement in dizziness-specific outcomes and neck disability. Healthcare professionals should take care in prescribing neck exercises and ensure adequate monitoring strategies (e.g., exacerbation of dizziness and/or neck pain). Dizziness-specific exercises are used for the management of other dizziness-related conditions.
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Large costs ● Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	Interventions prescribed by PHCPs. Moderate costs associated with the dosage of intervention sessions for people with WAD: 2x/wk for 6wk (Ekvall-Hannsson 2013). 4x/wk for 8wk (Fitz-Ritson, 1995)	Can be conducted as part of routine consultation.
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations

○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness **Does the cost-effectiveness of the intervention favour the intervention or the comparison?**		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	Can be conducted as part of routine consultation.
Equity **What would be the impact on health equity?**		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ● Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know		Delivered by primary healthcare professionals (e.g., physiotherapists) who are reasonably distributed across Australia.
Acceptability **Is the intervention acceptable to key stakeholders?**		
Judgement	Research evidence	Additional considerations

○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	Ekvall-Hannsson 2013: High dropout rate with 11 dropouts in the study (8 dropped out in intervention and 3 in control): other sickness (n=3), lack of time (n=3), could not tolerate the treatment (n=1), unknown (n=4). Fitz-Ritson 1995: Follow-up rate >85%.	People accept the delivery of exercise-based interventions by primary healthcare professionals. Two weekly sessions for 6 weeks are acceptable. Four weekly sessions for 8 weeks may be unacceptable for supervised sessions.
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	No included evidence.	Provided that PHCPs have some training and have access to information on these exercises than they are feasible to implement. Exercises are freely available online on Whiplash Navigator.

T.3.4. Conclusions (dizziness-specific exercises for acute WAD and dizziness symptoms)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	○	●	○

Recommendations
The guideline panel suggests that healthcare professionals use dizziness-specific exercises (e.g., vestibular training, phasic head, and neck exercises) for the management of people with acute WAD and dizziness symptoms. *(Panel vote summary: 13/14 93% conditional for; 1/14 7% neutral)* **Justification**

- Dizziness-specific exercises resulted in reductions to dizziness disability and clinically significant reductions in neck disability in people with chronic WAD, without adverse effects reported.
- While these results were from two studies in chronic WAD with small sample sizes and fair study quality (risk of bias present), dizziness specific exercises are prescribed for other dizziness-related conditions in both acute and chronic phases.
- Dizziness-specific exercises are low load and are unlikely to have significant adverse effects.
- Dizziness-specific exercises can be prescribed as part of routine consultation.

Subgroup considerations

- People presenting with acute WAD and symptoms of dizziness, coordination deficits, and/or balance deficits.

Implementation

Indications:

- For people presenting with symptoms of dizziness, coordination deficits, and/ or balance deficits coordination deficits, and/or balance deficits.
- Provide intervention for short periods, and in conjunction with other recommended treatments.

Dose:

- 1-2x/wk for 6 weeks.
- Consider feasible/acceptable dosage for the person.

Training:

- Provided HCP's have some training and access to information on these exercises.

Considerations:

- Differential diagnosis – e.g., mild traumatic brain injury.
- Evaluate outcomes (dizziness-specific outcomes) and usual recommended outcomes regularly.
- Consider referral (to whiplash or dizziness expert) if outside HCP expertise.

T.3.5. Conclusions (dizziness-specific exercises for chronic WAD and dizziness symptoms)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	○	●	○

Recommendations
The guideline panel suggest that healthcare professionals use dizziness-specific exercises (e.g., vestibular training, phasic head, and neck exercises) for the management of people with chronic WAD and dizziness symptoms. *(Panel vote summary: 12/13 92% conditional for; 1/13 8% neutral)* **Justification** • Dizziness-specific exercises resulted in reductions to dizziness disability and clinically significant reductions in neck disability in people with chronic WAD, without adverse effects reported. • While these results were from two studies in chronic WAD with small sample sizes and fair study quality (risk of bias present), dizziness specific exercises are prescribed for other dizziness-related conditions in both acute and chronic phases. • Dizziness-specific exercises are low load and are unlikely to have significant adverse effects. • Dizziness-specific exercises can be prescribed as part of routine consultation. **Subgroup considerations** • People presenting with acute WAD and symptoms of dizziness, coordination deficits, and/or balance deficits. **Implementation considerations** *Indications:* • For people presenting with symptoms of dizziness, coordination deficits, and/ or balance deficits coordination deficits, and/or balance deficits. • Provide intervention for short periods, and in conjunction with other recommended treatments. *Dose:* 1-2x/wk for 6 weeks.

- Consider feasible/acceptable dosage for the person.

Training:

- Provided HCP's have some training and access to information on these exercises.

Considerations:

- Differential diagnosis – e.g., mild traumatic brain injury.
- Evaluate outcomes (dizziness-specific outcomes) and usual recommended outcomes regularly.
- Consider referral (to whiplash or dizziness expert) if outside HCP expertise.

T.4. Active: Multimodal physical therapy

Is multimodal physical therapy (e.g., exercise and manual therapy, and another treatment modality) compared with single interventions (e.g., advice for activity) effective for the management of acute or chronic WAD?

T.4.1. Executive summary

Multimodal physical therapy was defined as an intervention consisting of exercise and manual therapy, and another treatment modality (e.g., education). Multimodal physical therapy is commonly used by PHCPs (e.g., physiotherapists and chiropractors) for the management of musculoskeletal conditions. Seven and three clinical trials evaluated the effect of multimodal physical therapy on people with acute WAD and chronic WAD, respectively (Table 14). Table 15 and Table 16 outline the GRADE Evidence to Decision Framework decisions for the management of people with acute and chronic WAD, respectively.

Effect on neck pain (see T.4.2 for details)

Acute WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=6 trials (Cote 2019, Dehner 2009, McKinney 1989, Provinciali 1996, Scholten-Peeters 2006, Wiangkham 2019). Compared multimodal physical therapy consisting of exercise and manual therapy, education, psychological support, and/or electrotherapy with advice for activity (Dehner 2009, Scholten-Peeters 2006, Wiangkham 2019), rest (Mckinney 1989) or electrotherapy (Provinciali 1996). Multimodal physical therapy compared with advice for activity may result in small reductions in short-term neck pain in people with acute WAD.

Acute WAD long-term (>3 months to 12 months) (very low certainty in the evidence):

N=3 trials (Cote 2019, Provinciali 1996, ScholtenPeeters 2006). Compared multimodal physical therapy with advice (Scholten Peeters 2006) or electrotherapy techniques (Provinciali 1996). Multimodal physical therapy compared with advice may have little to no effect on long-term neck pain in people with acute WAD, but the evidence is very uncertain.

Chronic WAD short-term (2 weeks to 3 months) (moderate certainty in the evidence):

N=3 trials (Michaleff 2014, Soderlund 2001, Jull 2007). Compared multimodal physical therapy (exercise, psychological support, manual therapy) with exercise and advice. Multimodal physical therapy likely results in small reductions in short-term neck pain in people with chronic WAD.

Chronic WAD long-term (>3 months to 12 months) (low certainty in the evidence):

N=1 trial (Michaleff 2014). Multimodal physical therapy compared with exercise and advice may result in little to no difference in long-term neck pain in people with chronic WAD.

Effect on neck disability (see T.4.3 for details)

Acute WAD short-term (2 weeks to 3 months) (very low certainty in the evidence):

N=3 trials (Cote 2019, Wiangkham 2019, Scholten-Peeters 2006). Cognitive behavioural psychological support, exercise, and advice with exercise and advice (Wiangkham 2019) resulted in clinically significant reductions in short-term neck disability. Multimodal physical therapy resulted in little to no difference in with advice (Scholten Peeters 2006). Multimodal physical therapy compared with advice likely results in little to no difference in short-term neck disability in people with acute WAD, but the evidence is very uncertain.

Acute WAD long-term (> 3 months to 12 months) (moderate certainty in the evidence):

N=3 trials (Cote 2019, ScholtenPeeters 2006, Lamb 2012). Multimodal physical therapy compared with advice for activity likely results in small increases in long-term neck disability.

Chronic WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=2 trials (Michaleff 2014, Soderlund 2001). Compared multimodal physical therapy (Michaleff 2014: exercise, manual therapy, and psychological support; Soderlund 2001: exercise, dry-needling,

advice, psychological support, and electrotherapy) with exercise and advice (Michaleff 2014) and exercise, advice, and dry-needling (Soderlund 2001). Multimodal physical therapy compared with exercise and advice may result in little to no difference in short-term neck disability in people with chronic WAD.

Chronic WAD long-term (>3 months to 12 months) (low certainty in the evidence):

N=1 trial (Michaleff 2014). Multimodal physical therapy may result in little to no difference in long-term neck disability in people with chronic WAD.

Effect on psychological functioning (see T.4.4 for details)

Acute WAD short-term (2 weeks to 3 months) (very low certainty in the evidence):

N=3 trials (Cote 2019, Wiangkham 2019, ScholtenPeeters 2006). Multimodal physical therapy compared with advice for activity may result in little to no difference in short-term psychological functioning in people with acute WAD, but the evidence is very uncertain.

Acute WAD long-term (>3 months to 12 months) (high certainty in the evidence):

N=3 trials (Cote 2019, ScholtenPeeters 2006, Lamb 2012). Multimodal physical therapy compared with advice for activity results in little to no difference in long-term psychological functioning in people with acute WAD.

Chronic WAD short-term (2 weeks to 3 months) (very low certainty in the evidence):

N=2 trials (Michaleff 2014, Jull 2007). Multimodal physical therapy may result in little to no difference in short-term psychological functioning in people with chronic WAD, but the evidence is very uncertain.

Chronic WAD long-term (>3 months to 12 months) (low certainty in the evidence):

N=1 trial (Michaleff 2014). Multimodal physical therapy may result in little to no difference in long-term psychological functioning in people with chronic WAD.

Additional considerations: Adverse effects

Cote 2019 (Acute WAD): No adverse events

Dehner 2009: (Acute WAD): Not reported.

Lamb 2012 (Acute WAD): No adverse effects.

McKinney 1989 (Acute WAD): Not reported.

Provinciali 1996 (Acute WAD): Not reported.

ScholtenPeeters 2006 (Acute WAD): No adverse effects.

Wiangkham 2019 (Acute WAD): No adverse effects.

Jull 2007 (Chronic WAD): No adverse effects.

Michaleff 2014 (Chronic WAD): No adverse effects.

Soderlund 2001 (Chronic WAD): Not reported.

Table 14: Summary of included studies (multimodal physical therapy for acute and chronic WAD)

Author Year	Participants and setting (country)	Intervention (multimodal physical therapy)	Control (exercise and advice)	Outcomes included	Neck pain outcomes	Neck disability outcomes	Psych functioning outcomes	Summary (risk of bias PEDRO score)
(Côté et al., 2019) Acute	227 participants recruited from rehabilitation or GP clinics with acute WAD (Canada)*	Guideline rehab: Government regulated guidelines to ensure timely access to individually tailored multimodal rehab: education, clinic-based exercise, manual therapy, pain management modalities (e.g., massage). Physiotherapy-led 6 wk intervention – limit of 10 sessions in first 3 wk, then 3x/wk for 3 wk after. Occupational therapy for functional limitations and additional physio (2 wk extension) if required.	GP education: 2 sessions with GP in 6 wk. Education re prognosis, home exercises, and resuming activity. Pain management (medication) if required.	Neck pain, neck disability, and psychological functioning at 6wk, 3mo, 6mo, 9mo, and 12mo	NRS (0-10)	WDQ	SF-36, Centre for Epidemiological Studies-Depression Scale (CES-D)	Government regulated guideline rehabilitation program (physiotherapy led) was not more effective than an insurance preferred provider rehabilitation program (physiotherapy led) or education provided by a GP in improving short or long-term neck pain, neck disability, depressive symptoms, and quality of life in people with acute WAD. (7)
(Dehner et al., 2009) Acute	78 participants from a hospital emergency department	Two intervention groups (3x wk/7 wk): 'Active' group: manual therapy,	The 'Act-as-usual' group received a consultation session that recommended resuming usual	Neck pain at 8wk	VAS (0-100)	X	X	Small short-term reductions in pain intensity with active physiotherapy intervention compared with

	with acute WAD (Germany)	posture training, electrotherapy, coordination training, neck and head movement training, and cervical spine mobilization. 'Passive' group received electrotherapy, classic massage, and moist heat	duties without modification.					passive physiotherapy or act as usual advice in acute WAD. No differences were found in pain intensity between passive physiotherapy intervention and 'act as usual' advice. (5)
(Lamb et al., 2012) Castelnuovo 2013 ~ Acute	599 participants from a hospital emergency department with acute WAD (UK)	People provided with up to six physiotherapy sessions in 8 weeks, limited to manual therapy (joint mobilisations, excluding manipulation), other soft-tissue techniques, exercise, tips on management of pain and on resumption of normal activities, some simple psychological strategies to deal with travel anxiety, and a screen for post-traumatic stress.	Physiotherapists provided a 30–40 min session where they examined the person and provided advice.	Neck disability, and psychological functioning at 12mo	X	NDI (0-50)	SF-12, EQ-5D	A package of physiotherapy gave a modest acceleration to early recovery of persisting symptoms but was not cost effective from a UK NHS perspective. Usual consultations in emergency departments and a single physiotherapy advice session for persistent symptoms are recommended. (5)

(McKinney et al., 1989) Acute	170 participants from a hospital emergency department with acute WAD (Northern Ireland)	Two intervention groups: Group 2 – Participants received outpatient physiotherapy that might consist of the following depending on physiotherapists' clinical assessment – hot and cold applications, short-wave diathermy, hydrotherapy, traction and active and passive repetitive movements using the principles of McKenzie & Maitland, posture education, and exercise. Group 3 – Participants were assessed by the physiotherapist and were given verbal and reinforcing written instruction on posture correction, the use of analgesia and their collar, and instructions on the	Group 1 – general advice about mobilization after an initial rest period of 10-14 days.	Neck pain at 1mo and 2mo.	VAS (0-100)	X	X	Outpatient physiotherapy group were shown to have significant improvement in severity of neck pain at 1- and 2-months post-injury compared with people who received analgesia and a cervical collar. There appears to be no difference in effectiveness between outpatient physiotherapy and home mobilisation. (5)

		use of heat sources and muscle relaxation. People were encouraged to perform mobilizing exercises which were also demonstrated. This instruction session by the physiotherapist typically lasted 30 min.						
(Provincial i et al., 1996) 1996 Acute	60 participants with acute WAD (Italy)	Participants received multimodal treatment involving postural training, joint mobilisation techniques, relaxation exercises and psychological support	Participants received passive treatment involving passive electrotherapeutic modalities like TENS and ultrasound	Neck pain at 1mo and 6mo.	VAS (0-10)	X	X	Clinically and statistically significant benefit in favour of multimodal program in terms of pain and sick leave. (6)
(Scholten-Peeters et al., 2006) Acute	80 participants from primary care settings (general practitioner clinics or emergency departments) with acute WAD	Physiotherapist care that consisted of education, advice, graded activity, and exercise therapy. People performed graded activities at the PT practice, and PTs provided direct positive reinforcement to enhance an injured	General practitioner care consisted of education and advice, including advice on graded activity. People did not perform exercises at the GP practice. GPs primarily had a constructive and stimulating role.	Neck pain, neck disability, and psychological functioning at 12wk and 12mo	VAS (0-100)	NDI (0-50)	SF36, TSK, PCI	No difference in primary outcome measures at short- and long-term follow-up between multimodal physio and education from a GP on graded activity. (8)

	(Netherlands)	person's motivation and let people experience that it was safe to move. Exercise therapy included a broad scale of progressive loading exercises for cervical and shoulder muscle functions, articular functions, posture, and balance. Manual techniques were permitted but were not the first choice of treatment.						
(Wiangkham et al., 2019) Acute	28 participants from primary care (6 physiotherapy clinics) (UK)	Active behavioural physiotherapy intervention (ABPI) that included exercises, advice, and cognitive behavioural interventions. Exercises consisted of neck and shoulder exercises aiming to improve kinaesthetic sensibility and co-ordination. Advice related to rest, activity modification, posture, and load	Same as intervention minus cognitive behavioural interventions	Neck pain, neck disability, and psychological functioning at 3mo	VAS (0-100)	NDI (0-50)	IES, FABQ, EQ-5D	ABPI is feasible (with regard to procedures, sample size and modified collection of data for cost-effectiveness analysis) and valuable (higher proportion of completely recovered participants, fewer treatment sessions, and reduced physiotherapy management costs than the standard physiotherapy).

		management. Cognitive-behavioural interventions included learning of basic physical and psychological skills, application and generalisation of these basic skills in everyday activities, and maintenance of these skills.						(10)
(Jull et al., 2007) Chronic	71 participants from secondary referral sources with chronic WAD (Australia)	Physiotherapy program that consisted of specific low-load exercises aimed to re-train kinesthetic sense and re-educate neck and scapular region muscle control during posture and functional activities. The manipulative therapy included only low velocity mobilising techniques. Education and assurance was provided including ergonomic advice on activities of daily living, correct work	Self-management program that included education about the mechanism of whiplash, assurance on recovery and stressed the need to stay active. The ergonomic advice on activities of daily living, correct work practices and work environment was similar to that provided to the MPT group as was the description of the exercise program. Subjects were encouraged to perform the exercise program	Neck pain and psychological functioning at 10wk.	Northwich Park Neck Pain Index	X	TSK, IES	Physiotherapy group shows significant difference at 10 weeks in terms of primary outcome compared with self-management group. (8)

		practices and work environment. Subjects were encouraged to continue exercises at home and completed an exercise compliance diary.	at least twice per day and completed an exercise compliance diary.					
(Michaleff et al., 2014) Chronic	170 participants recruited from the public through advertisements, insurance companies and trial clinics with chronic WAD (Australia)	Physiotherapist-delivered exercise program, manual therapy across 20 sessions over 12 weeks. Also provided with a home exercise program targeting neck and shoulder muscles, postural re-education, and sensorimotor exercises. CBT was used in conjunction with exercise program to encourage skill acquisition by modelling, setting progressive goals, and self-monitoring, and to positively reinforce progress.	Participants received a 30 min consultation with a physiotherapist during which they read the educational booklet, practised the exercises with minimum guidance (verbal or physical) from the physiotherapist, and had any questions or concerns clarified. Participants were then required to implement the advice provided and practise the exercises independently at their own discretion. No additional supervision was provided. Participants had	Neck pain, neck disability, and psychological functioning at 12wk, 6mo, and 12mo	NRS (0-10)	NDI (0-50)	SF36, PCS, PDS	Simple advice was equally as effective as a more intense and comprehensive physiotherapy exercise program. (8)

			the opportunity to contact the physiotherapist by telephone on two occasions if they needed further verbal clarification of the information covered in the consultation.					
(Söderlund & Lindberg, 2001) Chronic	32 participants from an orthopaedic clinic with chronic WAD (Sweden)	Regular physiotherapy with integrated components of cognitive-behavioural interventions. Regular physiotherapy included neck, head, and shoulder coordination and strengthening exercises. People were given oral or written information (or both) to practice exercises independently. Other needling or electrotherapeutic adjunctive treatments were also provided at the clinic. Cognitive-behavioral interventions comprised four	Same as intervention but without cognitive-behavioural interventions.	Neck pain at 12wk, 6mo, and 12mo	NRS (0-10)	PDI (0-70)	X	Physiotherapy integrated with cognitive behavioural therapy improved people' perception of ability to perform daily activities three months post treatment. (6)

		phases that included learning of basic physical and psychological skills, application, and generalisation of these basic skills in everyday activities, and a phase for maintenance of these skills.						

SES, Self-Efficacy Scale; TSK, Tampa Scale of Kinesiophobia; NDI, Neck Disability Index; PDI, Pain Disability Index; SF12, Short Form 12; EQ-5D; CSQ, Coping Strategies Questionnaire; SF-36, Short Form 36; PDS, Post-traumatic Stress Diagnostic Scale; DASS, Depression Anxiety Stress Scale; PCS, Pain Catastrophizing Scale; PCI, Pain Coping Inventory

~ only used data from Lamb 2012 study; compared groups in Step 2 (physiotherapy package vs advice); SF12-mental scores

* only included participants from 2 out of the 3 groups: “Guideline rehab” and “GP education”

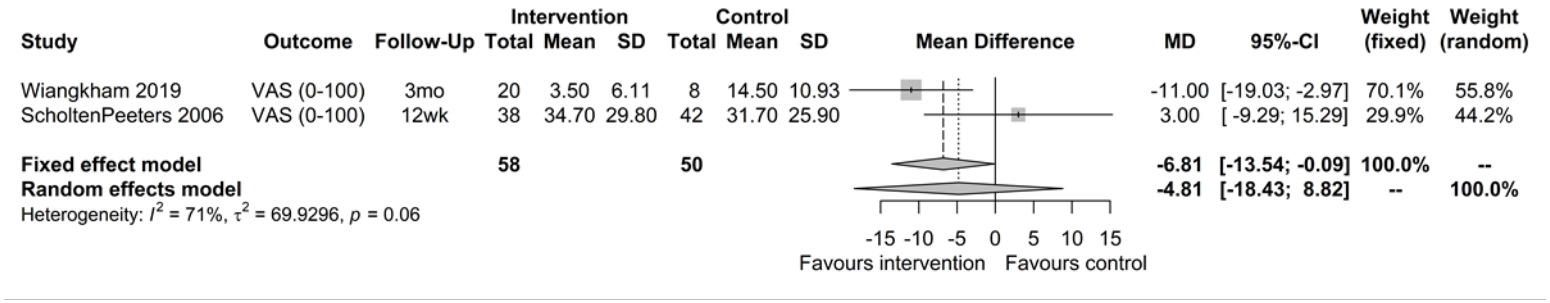
T.4.2. Effect on neck pain

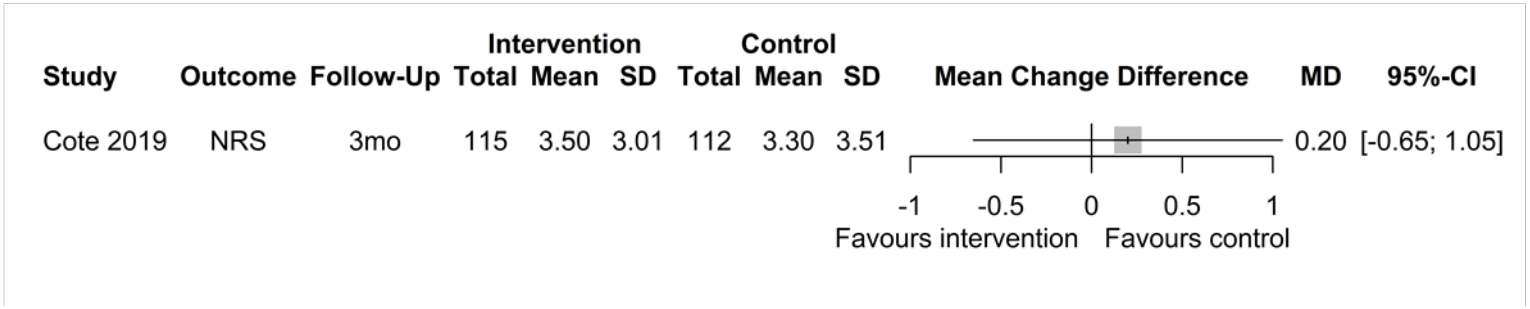
Short-term outcomes (acute WAD)

Included studies: Cote 2019, Dehner 2009, McKinney 1989, Provinciali 1996, ScholtenPeeters 2006, Wiangkham 2019

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Total N: I=191, C=160 See figure below: Wiangkham 2019 (intervention n=20, control n=8) and ScholtenPeeters 2006 (intervention n=38, control n=42): Meta-analysis -4.81 (-18.43, 8.82) **(1 trial clinically significant, 1 trial nil sig effect)** *Scholten Peeters: (subgroup consideration) People with initial neck pain intensity (>75 mm on VAS), PT was significantly more effective on neck pain than GP care at 12 weeks P = 0.013; mean VAS difference 40.4, (11.1, 69.7) Dehner 2009 (3 groups; 'Active' group n=32, 'Passive' group n=32, 'Act-as-usual' group n=14)*: 'Active' group saw a significantly greater median improvement in pain (ΔVAS = 50.5) than in the 'passive' group (ΔVAS = 39.2; p = 0.035) and the 'Act-as-usual' group (ΔPS = 28.8; p = 0.009). **Clinically significant** McKinney 1989 (3 groups; 'Rest' group n=33, 'Physiotherapy' group n=71, 'Advice' group n=66)*: All groups saw an improvement in median pain scores. Pain score improvement between 'Physiotherapy' and 'Advice' groups were	⊕⊕◯◯ Low	CRITICAL
6	Not serious[a]	Serious[b]	Not serious[c]	Serious[d]	n/a			

						comparable at 2mo (-3.38 vs -3.48). Pain was significantly improved in 'Physiotherapy' and 'Advice' groups compared to 'Rest' group (p <0.001): median change difference from baseline to 2mo (-0.78 and -0.88, respectively). **Small effect** Provinciali 1996 median change difference from baseline to 1mo -1.7 (VAS 0-10), p <0.001. Note: this value was estimated from Figure 1 in the manuscript. **Moderate effect** Cote 2019 mean change difference was 0.20 (95% CI -0.65, 1.05) **No significant effect**		





Note (Scholten Peeters 2006): Adjusted mean change difference from baseline to 12wk is 1.7 (-9.3, 12.7)

* unable to meta-analyze because intervention and control group means and standard deviation were not obtainable

[a]Risk of bias PEDRO scores: 'fair' (Dehner 2009, McKinney 1989), 'good' (Cote, 2019, Provinciali 1996, Scholten Peeters 2006), 'excellent' (Wiangkham, 2019).

[b]Unable to meta-analyze all studies because intervention and control group means and standard deviation were not obtainable. However, there were inconsistent findings across studies with effects ranging from non significant to clinically significant.

[c]Multimodal physiotherapy interventions and advice/education comparators are available in an Australian context.

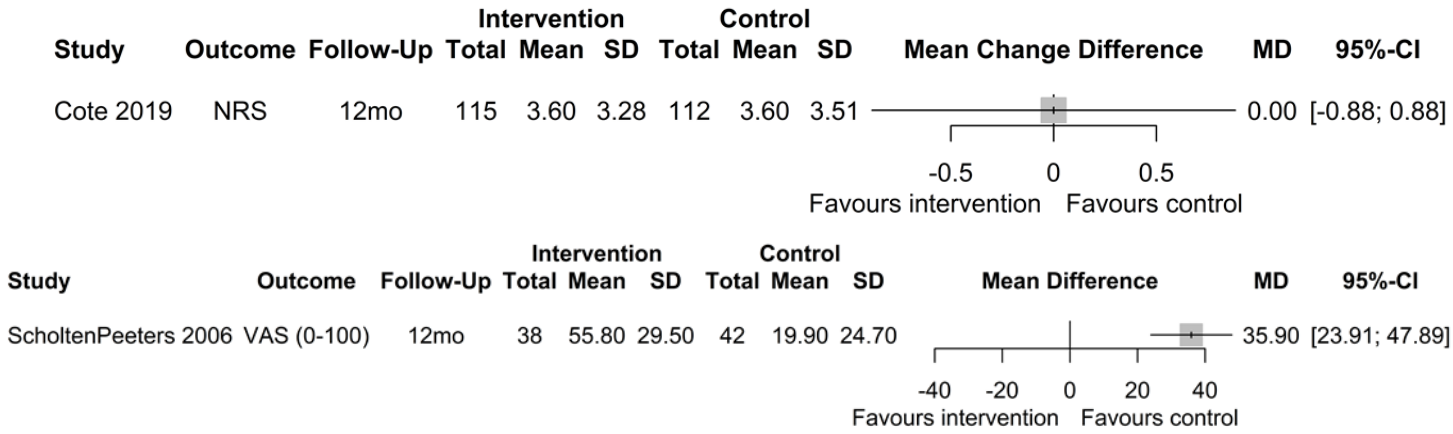
[d]Total participants below threshold for precision. Confidence intervals cross clinically significant threshold and 0 (Scholten Peeters 2006).

Long-term outcomes (acute WAD)

Included studies: Cote 2019, Provinciali 1996, ScholtenPeeters 2006

GRADE Certainty Assessment						No of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Total people (N=140)	⊕◯◯◯ Very low	CRITICAL

3	Not serious[a]	Serious[b]	Serious[c]	Serious[d]	n/a	ScholtenPeeters 2006 intervention n=38, control n=42): Mean difference I-C in neck pain VAS (0-100) at 12mo -0.2 (-12.2, 11.9) Provinciali 1996 (intervention n=30, control n=30) I-C median change difference from baseline to 6mo -2.3 (VAS 0-10), p <0.001 Cote 2019 mean change difference was 0.00 (95% CI -0.88, 0.88)		

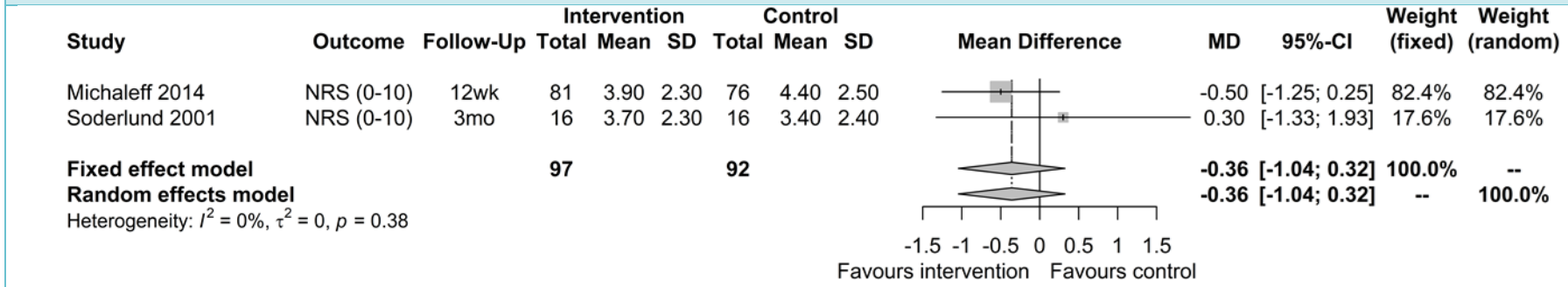


[a]Low risk of bias: 'good' PEDRO scores for all three studies.
[b]Unable to be meta-analysed, however, clinically significant effect vs no effect across studies.
[c]Study by Provinciali (1996) evaluated the effect of multimodal physiotherapy compared with electrotherapy techniques which is not commonly used as a primary treatment modality by Australian physiotherapists.
[d]Total participants below the threshold for precision (N=140).

Short-term outcomes (chronic WAD)

Included studies: Jull 2007, Michaleff 2014, Soderlund 2001

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Total number of people N=260 Meta-analysis (see below): NRS (0-10) mean difference I-C: -0.36 (-1.04, 0.32) Jull 2007 (intervention n=36, control n=35)*: mean % change difference in Northwich Park Neck Pain Index I-C: -5.8, (-8.76, -2.84), p =0.04. Note: clinically significant difference in Northwick Park Neck Pain Index is 8%.	⊕⊕⊕◯ Moderate	CRITICAL
3	Not serious[a]	Not serious[b]	Not serious[c]	Serious[d]	n/a			



* unable to meta-analyze because intervention and control group means and standard deviation were not obtainable.

[a]Low risk of bias: 'good' PEDRO scores for all studies.

[b]Homogenity between findings (no effect) presented in meta-analysis.

[c]All three studies included multimodal physiotherapy compared with exercise and advice.

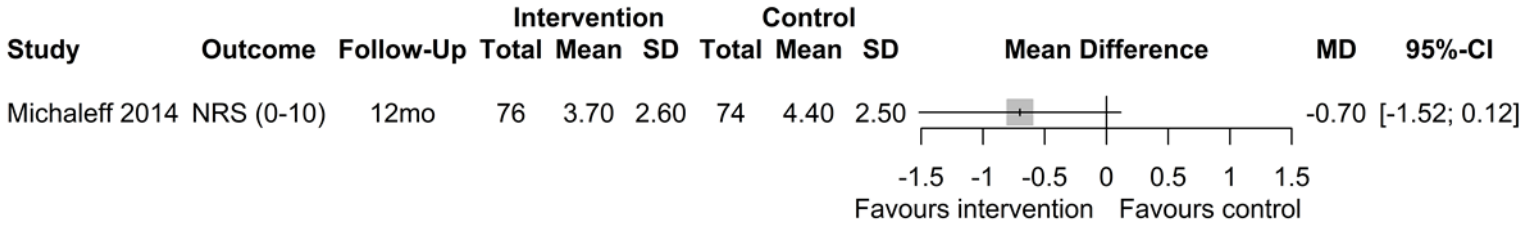
[d]Total participants below the threshold for precision (N=260).

Long-term outcomes (chronic WAD)

Included studies: Michaleff 2014

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Michaleff 2014 (intervention n=81, control n=76): -0.70 NRS (-1.52, 0.12)	⊕⊕◯◯	CRITICAL

1	Not serious[a]	Serious[b]	Not serious[c]	Serious[d]	n/a	See figure below.	Low	



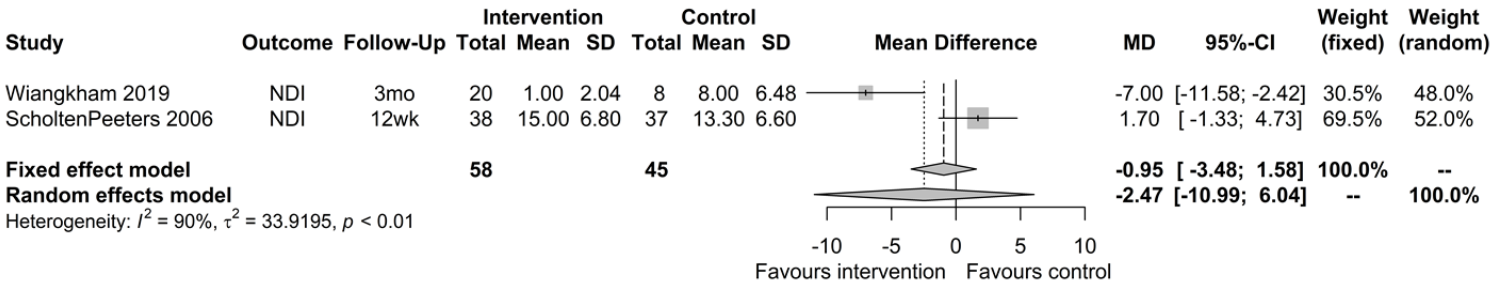
[a]Low risk of bias: 'good' PEDRO score (8/10).
[b]Findings base on a single study.
[c]Intervention and control was consistent with an Australian context and the clinical question.
[d]Total participants below the threshold for precision (N=157).

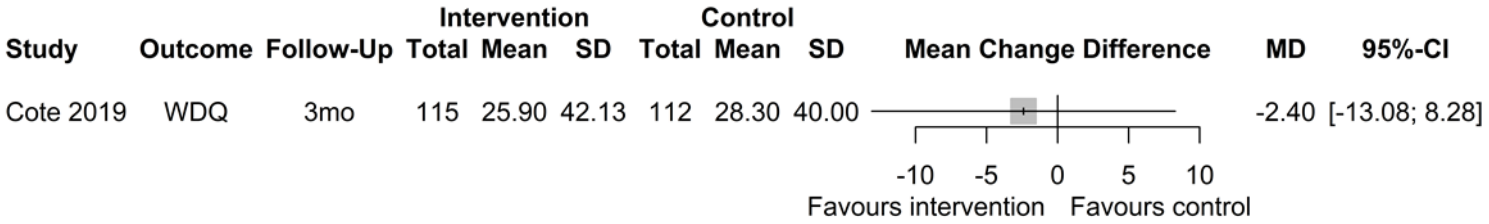
T.4.3. Effect on neck disability

Short-term outcomes (acute WAD)

Included studies: Cote 2019, Wiangkham 2019, ScholtenPeeters 2006

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other			
3	Not serious[a]	Serious[b]	Not serious	Very serious[c]		Wiangkham 2019 (intervention n=20, control n=8) and ScholtenPeeters 2006 (intervention n=38, control n=42): -2.47 (-10.99, 6.04) Cote 2019 mean change difference was 2.40 (95% CI -13.08, 8.28)	⊕◯◯◯ Very low	CRITICAL



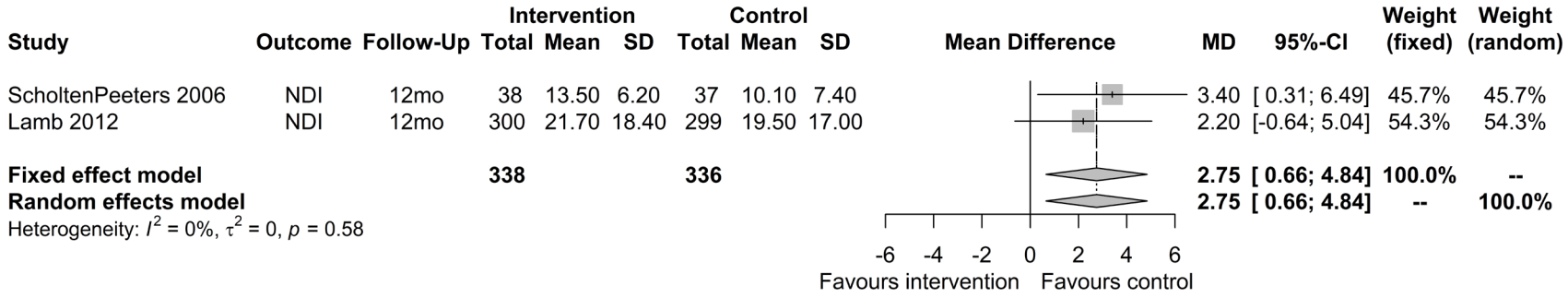


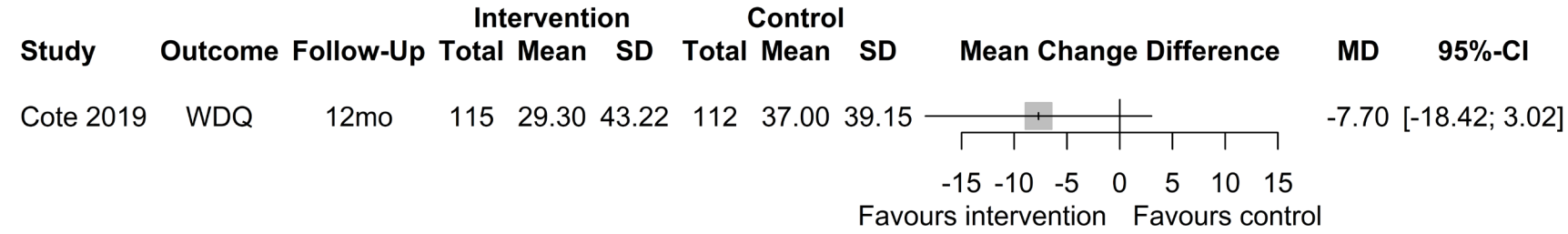
[a]Low risk of bias: 'good' (Cote 2019; Scholten Peeters, 2006) and 'excellent' (Wiangkham, 2019) PEDRO scores.
[b]High heterogenity between findings presented in meta-analysis.
[c]Total participants below the threshold for precision (N=103) and confidence intervals cross the clinically significant threshold and zero.

Long-term outcomes (acute WAD)

Included studies: Cote 2019, ScholtenPeeters 2006, Lamb 2012

GRADE Certainty Assessment						No of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	ScholtenPeeters 2006 (intervention n=38, control n=42), Lamb 2012 (intervention n=300, control n=299): Meta-analysis 2.75 (0.66, 4.84) Small benefits favouring control. Cote 2019 mean change difference was -7.70 (95% CI -18.42, 3.02)	⊕⊕⊕◯ Moderate	CRITICAL
3	Not serious	Seriousa	Not serious	Not serious	No publication bias			



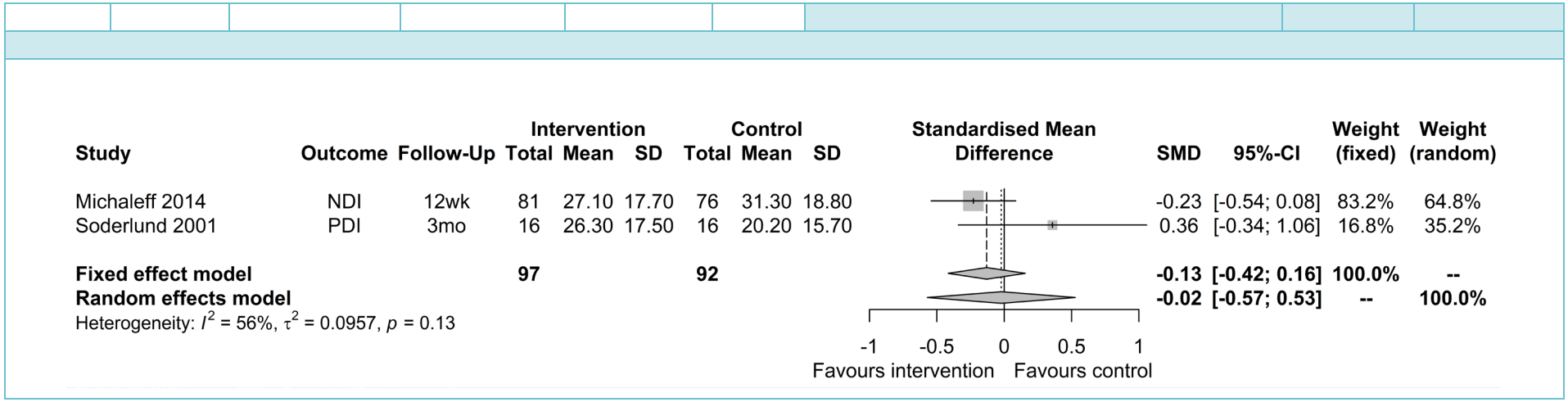


[a]Study quality determined as appropriate: 'good' (Cote 2019; Scholten Peeters, 2006) and 'fair' (Lamb, 2012) PEDRO scores.
[b]Study findings were homogenous in the meta-analysis, I^2 = 0%, however, these findings were not consistent with the study by Cote (2019). While the WDQ findings were non significant, the point estimate was in the opposite direction, in favour of the intervention.
[c]Total participants was above the threshold for precision and pooled mean difference was between zero and the clinical significance cut-off.

Short-term outcomes (chronic WAD)

Included studies: Michaleff 2014, Soderlund 2001

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Michaleff 2014 (intervention n=81, control n=76), Soderlund 2001 (intervention n=16, control n=16): Meta-analysis -0.02 (-0.57, 0.53)	⊕⊕◯◯ Low	CRITICAL
2	Not serious[a]	Serious[b]	Not serious[c]	Serious[d]	n/a			

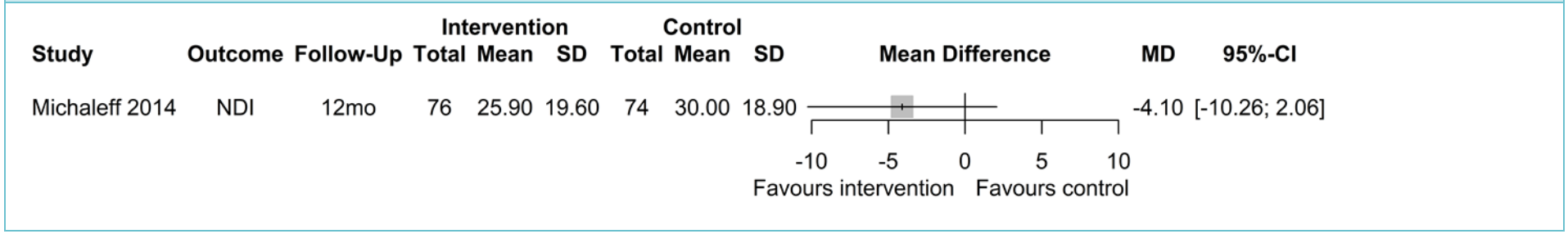


[a]Low risk of bias: 'good' PEDRO scores for both studies.
[b]Moderate heterogenity between findings presented in meta-analysis I^2=56%.
[c]Intervention and control modalities are consistent with techniques that can be used by Australian physiotherapists.
[d]Total participants below the threshold for precision (N=189). Confidence intervals between clinical significant thresholds.

Long-term outcomes (chronic WAD)

Included studies: Michaleff 2014

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Michaleff 2014 (intervention n=81, control n=76): mean difference I-C: -4.10 (-10.26, 2.06)	⨁⨁◯◯ Low	CRITICAL
1	Not serious[a]	Not serious	Not serious[b]	Very serious[c]	n/a			



[a]Low risk of bias: 'good' PEDRO score (8/10).

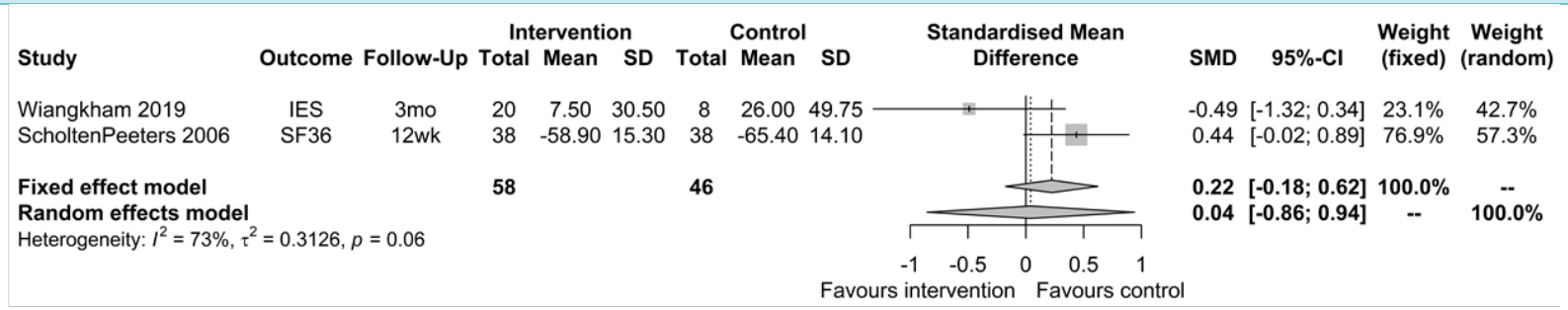
[b]Intervention and control modalities are consistent with techniques that can be used by Australian physiotherapists.
[c]Total participants below the threshold for precision (N=189). Confidence intervals cross zero and the clinically significant threshold for NDI. Single study was rated down for inconsistency for neck pain, however, we decided that low certainty in the evidence was appropriate given the study quality and appropriateness for an Australian context.

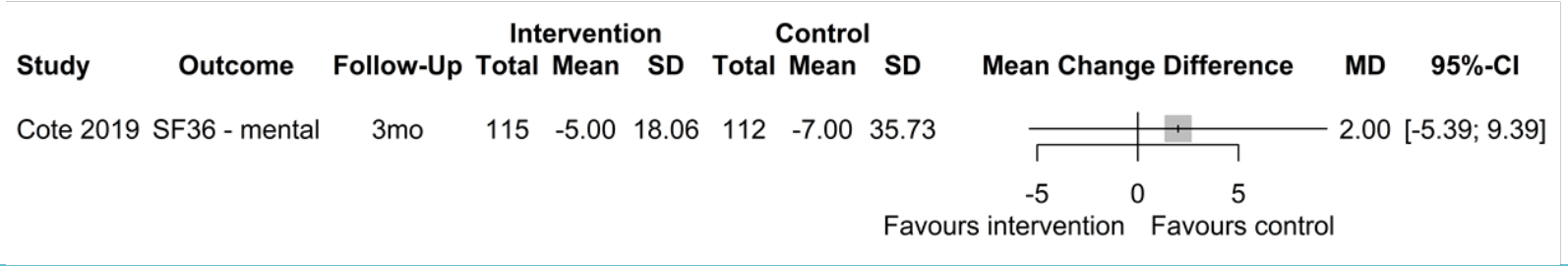
T.4.4. Effect on psychological functioning

Short-term outcomes (acute WAD)

Included studies: Cote 2019, Wiangkham 2019, ScholtenPeeters 2006

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Wiangkham 2019 (intervention n=20, control n=8) and Scholten Peeters 2006 (intervention n=38, control n=42): 0.04 (-0.86, 0.94) Cote 2019 mean change difference was 2.00 (95% CI -5.39, 9.39)	⊕◯◯◯ Very low	CRITICAL
3	Not serious[a]	Serious[b]	Not serious[c]	Very serious[d]	n/a			



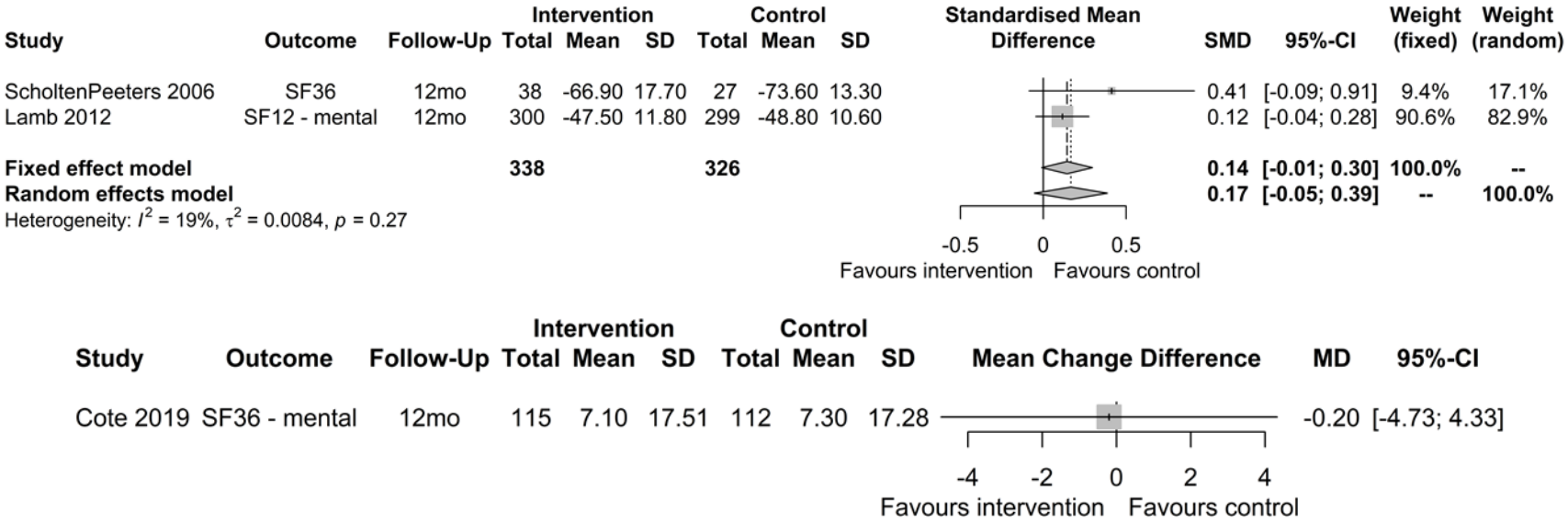


[a] Low risk of bias: 'good' (Cote 2019; Scholten Peeters, 2006) and 'excellent' (Wiangkham, 2019) PEDRO scores.
[b]Moderate heterogenity present between study findings (I^2=73%).
[c]Intervention and control modalities are consistent with techniques that can be used by Australian physiotherapists.
[d]Confidence intervals cross the clinically significant threshold above and below zero.

Long-term outcomes (acute WAD)

Included studies: Cote 2019, ScholtenPeeters 2006, Lamb 2012

GRADE Certainty Assessment						No of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Scholten Peeters 2006 (intervention n=38, control n=42), Lamb 2012 (intervention n=300, control n=299): Meta-analysis 0.17 (-0.05, 0.39). Cote 2019 mean change difference was -0.20 (95% CI -4.72, 4.33)	⊕⊕⊕⊕ High	CRITICAL
3	Not serious[a]	Not serious[b]	Not serious	Not serious	n/a			

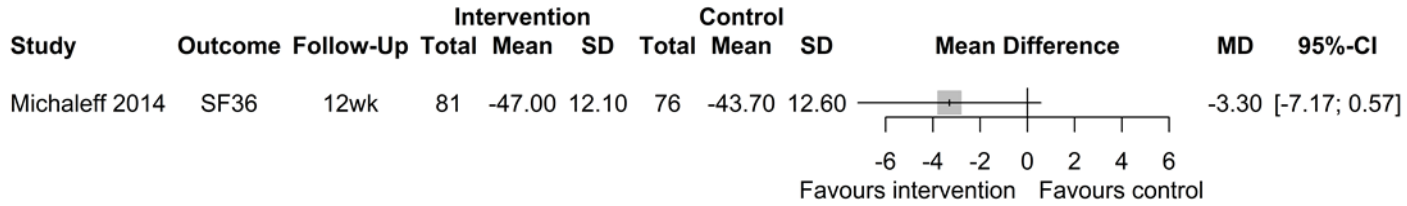


[a]Study quality determined as appropriate: 'good' (Scholten Peeters, 2006) and 'fair' (Lamb, 2012) PEDRO scores.
[b]Low heterogenity between study findings (see meta-analysis), I^2 = 19%. All three studies found non significant results.
[c]Total participants was above the threshold for precision and SMD below the clinically significant threshold in the meta-analysis.

Short-term outcomes (chronic WAD)

Included studies: Michaleff 2014, Jull 2007

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Michaleff 2014 (intervention n=81, control n=76): -3.3 (-7.17, 0.57) Jull 2007 (intervention n=36, control n=35)*: no differences between the groups for changes in IES scores (p = 0.15) although there were differences in TSK scores where the changes were significantly greater in the control group (p = 0.02).	⊕◯◯◯ Very low	CRITICAL
2	Not serious[a]	Serious[b]	Not serious[c]	Very serious[d]	n/a			

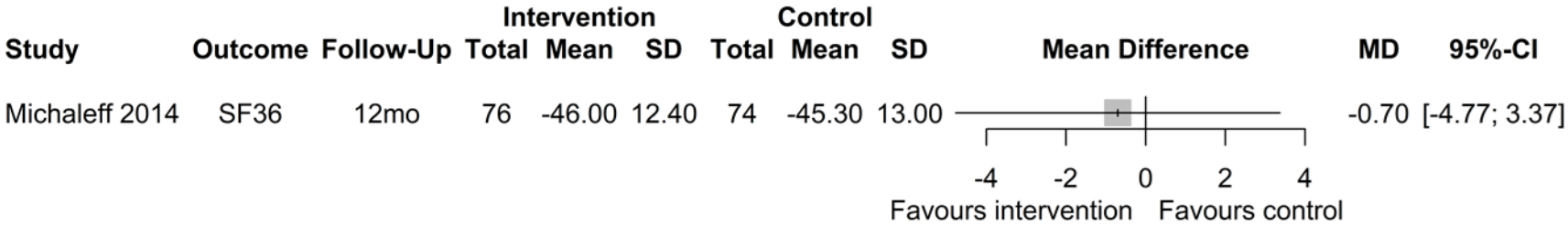


[a]Low risk of bias: 'good' PEDRO scores for both studies.
[b]Unable to meta-analyze because intervention and control group means and standard deviation were not obtainable. However, inconsistency in study findings is present.
[c]Intervention and control modalities are consistent with techniques that can be used by Australian physiotherapists.
[d]Total participants below the threshold for precision (N=189). Confidence intervals cross zero and the clinically significant threshold for SF36 mental component summary score in the study by Michaleff (2014).

Long-term outcomes (chronic WAD)

Included studies: Michaleff 2014

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Michaleff 2014 (see figure below) mean difference in SF-36 mental score I-C: -0.70 (-4.77, 3.37)	⊕⊕◯◯ Low	CRITICAL
1	Not serious[a]	Serious[b]	Not serious[c]	Serious[d]	n/a			



[a]Low risk of bias: 'good' PEDRO score (8/10).
[b]Findings base on a single study.
[c]Intervention and control was consistent with an Australian context and the clinical question.
[d]Total participants below the threshold for precision (N=157).

Table 15: Evidence to decision framework (multimodal physical therapy for acute WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Trivial ● Small ○ Moderate ○ Large ○ Varies ○ Don't know	Variable overall effects with small reductions (ranged from non-significant to clinically significant) in short-term neck pain and little to no difference in other critical outcomes. Additional note: People with initial neck pain intensity (>75 mm on VAS 0-100), multimodal physical therapy was significantly more effective on neck pain than GP advice at 12 weeks P = 0.013; mean VAS (0-100) difference 40.4, (11.1, 69.7) (Scholten Peeters 2006).	Heterogeneity in study intervention designs and minimal detail on the proportions of each mode of intervention delivery by the physiotherapists. Study by Scholten Peeters (2006) did not have a set intervention timeframe - varied between intervention and control (greater intervention dosage compared with control).
Undesirable Effects **How substantial are the undesirable anticipated effects?**		
Judgement	Research evidence	Additional considerations

○ Large ○ Moderate ● Small ○ Trivial ○ Varies ○ Don't know	Multimodal physiotherapy (manual therapy focused in addition to exercise and advice) compared with advice for activity resulted in small increases in long-term neck disability. Dehner 2009: (Acute WAD): Not reported. Lamb 2012 (Acute WAD): No adverse effects. McKinney 1989 (Acute WAD): Not reported. Provinciali 1996 (Acute WAD): Not reported. ScholtenPeeters 2006 (Acute WAD): No adverse effects.	Study by Scholten Peeters (2006) did not have a set intervention timeframe - varied between intervention and control (greater intervention dosage compared with control). However, people with initial neck pain intensity (>75 mm on VAS), multimodal physical therapy was significantly more effective on neck pain than GP education at 12 weeks P = 0.013; mean VAS difference 40.4, (11.1, 69.7). (Scholten-Peeters 2006). Low dosage for Lamb study (6 sessions in 8 weeks).
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations
● Very low ○ Low ○ Moderate ○ High ○ No included studies	Overall certainty of evidence was very low, however, certainty in critical outcomes varied from very low to high for short- and long-term acute WAD outcomes.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations

○ Favours the comparison ○ Probably favours the comparison ● Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ○ Don't know	Small improvements in neck pain compared with advice for activity, with trivial adverse effects in the short-term. However, small increases in neck disability in long-term compared with control.	Control groups were primarily advice for activity. Heterogeneity in study intervention designs and minimal detail on the proportions of each mode of intervention delivery by the physiotherapists. Older studies where physiotherapy care included a greater proportion of manual/passive therapies in addition to exercise. Stratified care approach needed. E.g., higher pain group in Scholten Peeters (2006) - showed short-term clinically significant benefits. Some people (e.g., low risk) may require less care (e.g., advice for activity).
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Large costs ● Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	Dehner (2009): 3xwk/7wk. Lamb (2012): 6 sessions over 8wk. McKinney (1989): 3x40min sessions/wk for 6wk. Provinciali (1996): 10x1h sessions over 2 wk. Scholten Peeters (2006): Mean treatment sessions in the multimodal physical therapy group was 12.7±12.1 and treatment episode was 19.9±13.5 wk.	Moderate costs associated with treatment dosage.
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations

○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness **Does the cost-effectiveness of the intervention favour the intervention or the comparison?**		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ● Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ○ No included studies	A package of physiotherapy gave a modest acceleration to early recovery of persisting symptoms but was not cost effective from a UK NHS perspective. Cost-effectiveness was evaluated using incremental cost per Quality-Adjusted-Life-Year (QALY). Physiotherapy psychologically informed exercise package was associated with higher mean NHS costs (£414·73 for the physiotherapy package vs £356·37 for advice) and lower mean QALYs (0·691 for the physiotherapy package vs 0·702 for advice). Using the usual UK metrics, the program was not cost effective compared with advice (Lamb 2012).	Interventions can be beneficial to participants without being cost effective. NHS - different system to an Australian context. Cost effectiveness likely depends on a risk stratified care approach.
Equity **What would be the impact on health equity?**		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ● Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know		Delivered by HCPs (physiotherapists) who are reasonably distributed across Australia.
Acceptability **Is the intervention acceptable to key stakeholders?**		
Judgement	Research evidence	Additional considerations

○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	4/7 studies had follow-up rates >85%.	People accept the delivery of this intervention by PHCPs for the management of whiplash injury and other musculoskeletal conditions in an Australian context.
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	Dehner (2009): 3xwk for 7wk, physiotherapy clinic. Modes of delivery: manual therapy, neck mobilisation, postural training, electrotherapy, neck-specific exercises. Lamb (2012): 6 sessions over 8wk: Modes of delivery: manual therapy (e.g., neck mobilisation, soft tissue), education on pain management, exercise, psychological support (anxiety strategies). McKinney (1989): 3x 40min sessions/wk for 6wk: passive therapy (heat/cold/traction), electrotherapy, manual therapy, neck-specific exercise (e.g., mckenzie/maitland principles), education. Provinciali (1996): 10x 1h sessions over 2 weeks. Relaxation training (breathing techniques), manual therapy, psychological support, exercise, dizziness-specific exercises Scholten Peeters (2006): The mean number of treatment sessions for the GP group (control) was 3.9 (±2.9), and mean treatment episode was 18.8 (±15.2) weeks. The mean number of treatment sessions in the PT group was 12.7 (±12.1), and treatment episode was 19.9 (±13.5) weeks.	Feasibility is dependent upon dosage. HCPs like physiotherapists and chiropractors are trained in most modalities presented in the interventions but may require some additional training to implement psychological components.

T.4.5. Conclusions (multimodal physical therapy for acute WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	●	○	○

Recommendations
The guideline panel cannot recommend for or against multimodal physical therapy consisting of exercise, manual therapy, and one or more additional treatment modalities (e.g., psychological support, electrotherapy, education) for the management of people with acute WAD. *(Panel vote summary: 7/13 54% neutral; 4/13 31% conditional for; 2/13 15% strong for)* **Justification** • Small reduction in short-term on neck pain, but small undesirable effects on neck disability in long-term. • Control groups included advice to be active and management strategies for WAD. • Heterogeneity was present in treatment effects and interventional designs. • Studies included under this clinical question are generally older with a higher proportion of manual/passive therapies in addition to exercise, when compared with current clinical practice that favours active therapies. **Subgroup considerations** • Stratified care approach needed. E.g., higher pain group in Scholten Peeters (2006) showed short-term clinically significant benefits. Some people (e.g., low risk) may require less care (e.g., advice for activity). **Implementation** *Indications:* • Provide interventions based on clinical presentation. Consider for people at medium/high risk of poor recovery. • For people at low risk (of poor outcome) consider unimodal and/or less dosage of care. *Considerations:* • Consider in relation to other recommended treatment interventions in these guidelines (e.g., psychologically informed exercise interventions). • Provide manual therapy (e.g., mobilisations) as an adjunct therapy, but only for short-periods of time (4-6wk, 1-2x/wk), providing there is evidence of clinical benefit. • HCPs are trained to perform multimodal physical therapy. • Injured person's preference should determine modes chosen.

Table 16: Evidence to decision framework (multimodal physical therapy for chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Trivial ● Small ○ Moderate ○ Large ○ Varies ○ Don't know	Small reductions in short-term neck pain, and little to no difference in other critical outcomes.	Heterogeneity in study intervention designs and minimal detail on the proportions of each mode of intervention delivery by the physiotherapists. Control groups were active, exercise-based interventions, rather than advice alone.
Undesirable Effects How substantial are the undesirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Large ○ Moderate ○ Small ● Trivial ○ Varies ○ Don't know	Jull 2007 (Chronic WAD): No adverse effects. Michaleff 2014 (Chronic WAD): No serious adverse events were reported. I (n=5), C (n=4) adverse effects. Adverse effects were headache (n=4), musculoskeletal symptoms (n=3), exacerbation of existing symptoms (n=1), and stiffness (n=1). None of the people withdrew from the trial because of adverse effects. Soderlund 2001 (Chronic WAD): Not reported.	
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations

● Very low ○ Low ○ Moderate ○ High ○ No included studies	Overall certainty of evidence was very low, however, certainty of critical outcomes ranged from very low to moderate for chronic WAD trials.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ● Probably favours the intervention ○ Favours the intervention ○ Varies ○ Don't know	Small short-term benefits in neck pain, with trivial adverse effects.	Heterogeneity in study intervention designs and minimal detail on the proportions of each mode of intervention delivery by the physiotherapists. Included addition of psychological support components – multimodal physical therapy cannot be considered in isolation to other treatment interventions that are prescribed by HCPs. See recommendation for psychologically informed exercise interventions. Control groups were active, exercise-based interventions, rather than advice alone.
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Large costs ● Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	Jull (2007): 10 wk: 10-15 treatment sessions. Michaleff (2014): median (IQR) sessions for intervention 17 (13–20) of the maximum 20 sessions. Soderlund (2001): 12 sessions max, median sessions 11.	Moderate costs associated with multimodal physical therapy treatment dosage.

Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	
Equity What would be the impact on health equity?		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ● Probably no impact ○ Probably increased ○ Increased ○ Varies		Delivered by healthcare professionals (e.g., physiotherapists, chiropractors) who are reasonably distributed across Australia.

○ Don't know		
Acceptability **Is the intervention acceptable to key stakeholders?**		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know		People accept the delivery of this intervention by HCPs for the management of whiplash injury and other musculoskeletal conditions in an Australian context.
Feasibility **Is the intervention feasible to implement?**		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	Jull (2007): 10 wk: 10-15 treatment sessions. neck-specific exercises, manipulation (low velocity), education. Michaleff (2014): 20 sessions/12 wk. Neck-specific exercises, psychological support (CBT), manual therapy. Jull and Michaleff trials were conducted in Australia. Soderlund (2001): 12 sessions max, median sessions 11. Neck-specific exercises, education, needling, electrotherapy, psychological support (CBT intervention).	Dependent upon dosage. Physiotherapists are trained in all modalities presented in the interventions.

T.4.6. Conclusions (multimodal physical therapy for chronic WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	○	●	○

Recommendations
The guideline panel suggest that healthcare professionals use multimodal physical therapy consisting of exercise and manual therapy and one or more other treatment modalities (e.g., education, psychological support) for the management of people with chronic WAD. *(Panel vote summary: 9/12 75% conditional for; 2/12 17% neutral; 1/12 8% strong for)* **Justification** • Small short-term benefits in neck pain, with trivial adverse effects, when compared with advice for activity. • Trivial adverse effects associated with the interventions. • Multimodal physical therapy can't be seen in isolation to other treatments. When considered in relation to other treatment interventions, healthcare professionals delivering exercise interventions have been shown to be effective (e.g., psychologically informed exercise approaches, neck-specific exercise). • People accept the delivery of this intervention by HCPs for the management of whiplash injury and other musculoskeletal conditions in an Australian context. **Implementation considerations** *Indications:* • Multimodal physical therapy can't be seen in isolation to other recommended treatments. When considered in relation to other treatment interventions, HCP's delivering exercise interventions have been shown to be effective (e.g., psychologically informed exercise approaches, neck-specific exercise). *Dose:* • 1 session wk/10wk (3mo), however, consider who may require more/less sessions based on a stratified care approach (e.g., moderate/severe disability subgroup in chronic WAD). *Considerations:* • Should focus on active physical therapy and psychological support in the chronic phase of whiplash injury. • HCP's may provide manual therapy (e.g., mobilisations) as an adjunct therapy but only for very short periods of time during this phase, providing there is evidence of clinical benefit. *Outcomes:* • HCPs should consider key outcomes of self-management and self-confidence (efficacy) in people with chronic WAD, rather than just changes to neck pain and disability. • Healthcare professionals could consider interdisciplinary care.

9. Psychological treatment recommendations

T.5. Psychological: Trauma-focussed cognitive behavioural therapy

Is trauma focussed cognitive behavioural therapy in addition to usual care effective for the management of people with chronic WAD and post-traumatic stress disorder?

T.5.1. Executive summary

Two clinical trials evaluated the effect of trauma focused cognitive behavioural therapy (CBT) on people with chronic WAD with motor vehicle crash-related post-traumatic stress (Table 17). Table 18 outlines the GRADE Evidence to Decision Framework decisions for the management of people with chronic WAD and PTSD.

Effect on neck pain (see T.5.2 for details)

Chronic WAD short-term (2 weeks to 3 months) (very low certainty in the evidence):

N=3 trials (Andersen 2021/2022; Dunne 2012). Compared CBT with no intervention (Andersen 2022; Dunne 2012) and psychologically informed exercise (Andersen 2021). Cognitive behavioural therapy may result in little to no difference in short-term neck pain in people with chronic WAD and post-traumatic stress disorder, but the evidence is very uncertain.

Chronic WAD long-term (>3 months to 12 months) (moderate certainty in the evidence):

N=2 trials (Andersen 2021/2022). Cognitive behavioural therapy likely results in little to no difference in long-term neck pain in people with chronic WAD and post-traumatic stress disorder.

Effect on neck disability (see T.5.3 for details)

Chronic WAD short-term (2 weeks to 3 months) (moderate certainty in the evidence):

N=3 trials (Andersen 2021/2022; Dunne 2012). Cognitive behavioural therapy likely results in little to no difference in short-term neck disability in people with chronic WAD and post-traumatic stress disorder.

Chronic WAD long-term (>3 months to 12 months) (moderate certainty in the evidence):

N=2 trials (Andersen 2021/2022). Cognitive behavioural therapy likely results in little to no difference in long-term neck disability in people with chronic WAD and post-traumatic stress disorder.

Effect on psychological functioning (see T.5.4 for details)

Chronic WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=3 trials (Andersen 2021; Andersen 2022; Dunne 2012). Cognitive behavioural therapy in addition to usual care may result in clinically significant reductions in short-term post-traumatic stress in people with chronic WAD and post-traumatic stress disorder.

Chronic WAD long-term (> 3 months to 12 months) (low certainty in the evidence):

N=3 trials (Andersen 2021; Andersen 2022). Cognitive behavioural therapy may result in little to no difference in long-term post-traumatic stress in people with chronic WAD and post-traumatic stress disorder.

Additional considerations: Adverse effects

Dunne 2012: Not reported.

Andersen 2021: no adverse events.

Andersen 2022: no adverse events.

Table 17: Summary of included studies (trauma-focussed cognitive behavioural therapy for acute and chronic WAD)

Author Year	Participants and setting (country)	Intervention (CBT)	Control (no intervention)	Outcomes included	Neck pain outcomes	Neck disability outcomes	Psych functioning outcomes	Summary (risk of bias PEDRO score)
(Dunne et al., 2012)	25 participants recruited from an outpatient clinic with acute WAD (Australia)	10 weekly 1-hour sessions with a psychologist consisting of trauma focused CBT: psychoeducation, anxiety management (deep breathing and progressive muscle relaxation), cognitive restructuring, imaginal exposure, graded in vivo exposure, and relapse prevention.	Participants were allocated to a waitlist group.	Neck pain, neck disability, and psychological functioning at 10-12wk.	NRS (0-10)	NDI	Posttraumatic Stress Diagnostic Scale (PDS) 0-51 DASS-21	Cognitive behavioural therapy for people with chronic WAD with post-traumatic stress resulted in clinically significant reductions in short-term post-traumatic stress symptoms, but no significant differences in neck pain and neck disability were found. (5)
(Andersen et al., 2021)	103 participants recruited from advertisements and clinical practices with chronic WAD (Australia/Denmark)	Psychologists provided 10 wks of trauma focused CBT, consisting of psychoeducation, exposure, cognitive restructuring, and anxiety management techniques. Physiotherapists delivered a 6wk long exercise program	10 wks (60 min session wkly) of supportive therapy, consisting of psychoeducation, discussion of current issues and problem solving, and home tasks (e.g., diary of mood). Avoidance of exposure, cognitive restructuring, and	Neck pain, neck disability, and psychological functioning at 10/16wk, 6mo, and 12mo.	NRS (0-10)	NDI	PCL-5, CAPS-5, DASS-21, SF-12, PCS, TSK	Combined TF-CBT and exercise was found to be equally effective as ST and exercise for people with chronic WAD and comorbid PTSD. (8)

		comprising exercises to improvement movement, strength, and endurance of the neck and shoulder girdle muscles, as well as exercises to improve eye/head coordination.	anxiety management techniques.					
(Andersen et al., 2022)	99 recruited from Injured person register with chronic WAD (Denmark)	Values-based CBT (V-CBT) delivered 1 week post randomisation. V-CBT consisted of 10 weekly 1-h sessions of individually delivered interventions. V-CBT combines elements from motivational interviewing and acceptance-based CBT approaches with the primary aim of reducing pain-related disability and how pain interfered with the person's daily life activities.	Same V-CBT intervention delivered 3mo week post randomisation.	Neck pain, neck disability, and psychological functioning at 3-, 6-, 9-, and 12-months.	NRS (0-10)	NDI*	TSK, PCS, HADS-D, HADS-A, PTSS	An early V-CBT intervention delivered within 6 months post-injury (mean days 117) was effective in reducing pain-related disability and psychological distress compared to the control group that received the intervention later after a three months wait-list period. (8)

*NDI extracted for consistency with Andersen 2021a and Dunne 2012.
SES, Self-Efficacy Scale; TSK, Tampa Scale of Kinesiophobia; NDI, Neck Disability Index; PDI, Pain Disability Index; SF12, Short Form 12; EQ-5D; CSQ, Coping Strategies Questionnaire; SF-36, Short Form 36; PDS, Post-traumatic Stress Diagnostic Scale; DASS, Depression Anxiety Stress

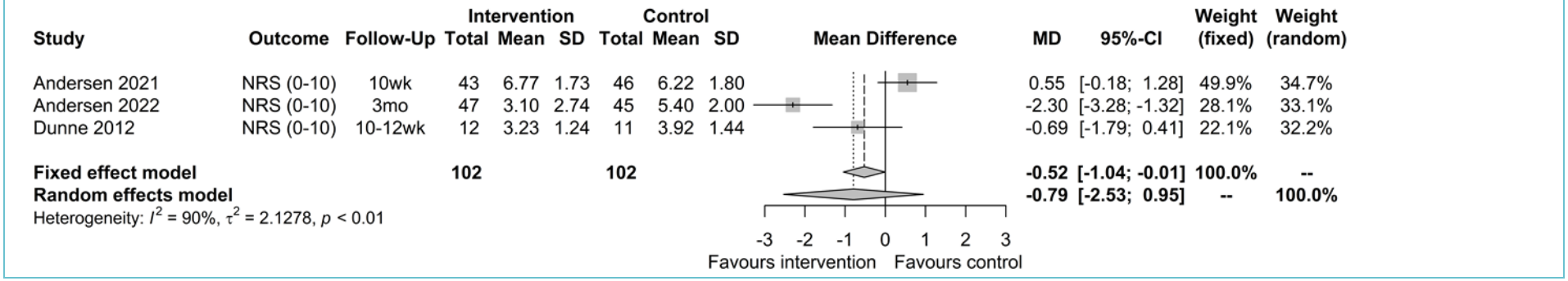
Scale; PCS, Pain Catastrophizing Scale; PCI, Pain Coping Inventory; HADS, Hospital Anxiety and Depression Scale; PIPS, Psychological Inflexibility in Pain Scale; CES-D, Centre for Epidemiological Studies – Depression Scale; WDQ, Whiplash Disability Questionnaire; PFActS-C, Pictorial Fear of Activity Scale-Cervical; Pain Self-Efficacy Questionnaire

T.5.2. Effect on neck pain

Short-term outcomes (chronic WAD)

Included studies: Andersen 2021, Dunne 2012

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	See meta-analysis below.	⊕◯◯◯ Very low	CRITICAL
3	Not serious[a]	Very serious[b]	Not serious[c]	Serious[d]	n/a			



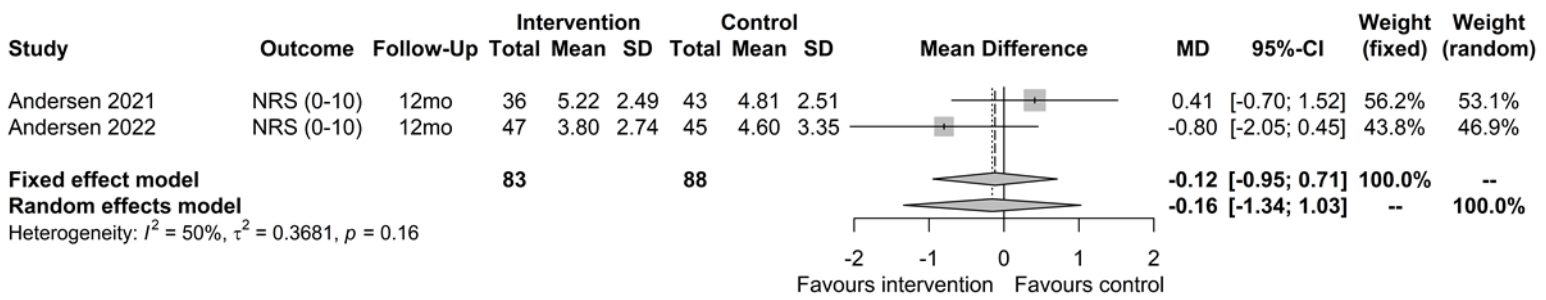
[a]'Good' PEDro scores for both studies by Andersen (8/10), which constituted the majority of total participants across the 3 studies.
[b]High heterogeneity between studies (I^2=90%), with clinically significant and non-significant effects found.
[c]Studies are highly applicable to the PICO question as it was performed in South-East Queensland, Australia (Dunne 2012) and a mixed cohort from Australia/Denmark (Andersen 2021).
[d]Total participant sample size below the threshold for precision.

Long-term outcomes (chronic WAD)

Included studies: Andersen 2021, Andersen 2022

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	See meta-analysis below.	⊕⊕⊕◯ Moderate	CRITICAL

2	Not serious[a]	Not serious[b]	Not serious[c]	Serious[c]	n/a			



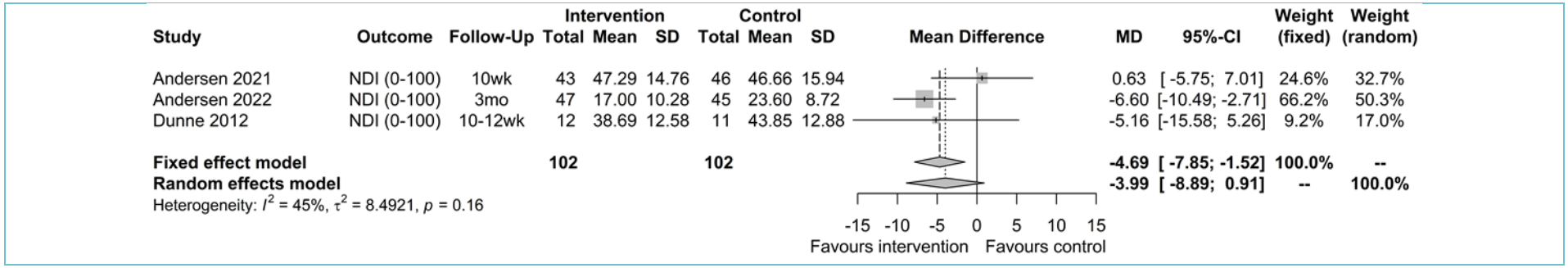
[a]'Good' PEDRO scores for both studies (8/10).
[b]While heterogeneity was moderate between trials, the comparator intervention in the study by Andersen (2021) was psychologically informed exercise, which is likely to not exhibit clinically significant differences between CBT and exercise. As a result, inconsistency was deemed as not serious.
[c]Studies are applicable to an Australian context.
[d]Pooled sample size below the threshold for precision.

T.5.3. Effect on neck disability

Short-term outcomes (chronic WAD)

Included studies: Andersen 2021, Andersen 2022, Dunne 2012

GRADE Certainty Assessment						No of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	See figure below.	⨁⨁⨁◯ Moderate	CRITICAL
3	Not serious[a]	Not serious	Not serious[b]	Serious[c]	n/a			

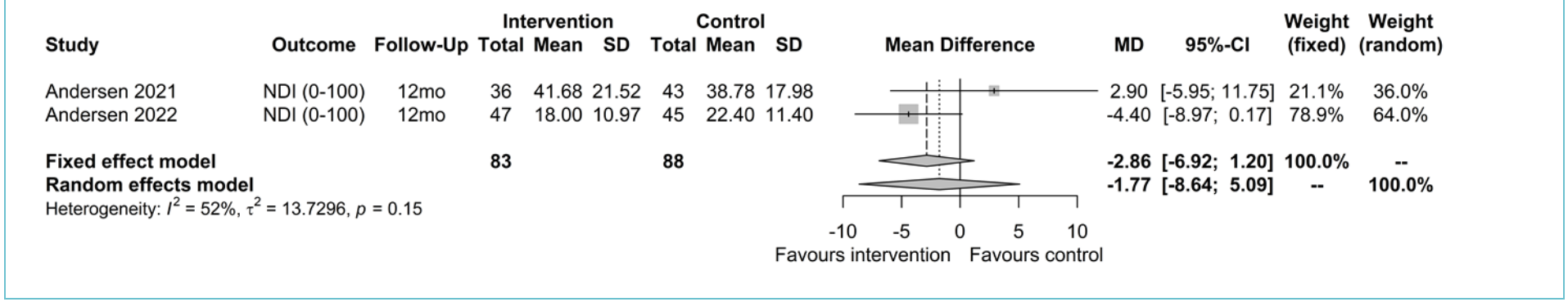


[a]'Good' PEDro scores for both studies by Andersen (8/10), which constituted the majority of total participants across the 3 studies.
[b]Low heterogeneity in study findings.
[c]Studies are highly applicable to the PICO question as it was performed in South-East Queensland, Australia (Dunne 2012) and a mixed cohort from Australia/Denmark (Andersen 2021).
[d]Total participant sample size below the threshold for precision.

Long-term outcomes (chronic WAD)

Included studies: Andersen 2021, Andersen 2022

GRADE Certainty Assessment						No of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	See figure below.	⊕⊕⊕◯ Moderate	CRITICAL
2	Not serious[a]	Not serious[b]	Not serious[c]	Serious[c]	n/a			



[a]'Good' PEDRO scores for both studies (8/10).

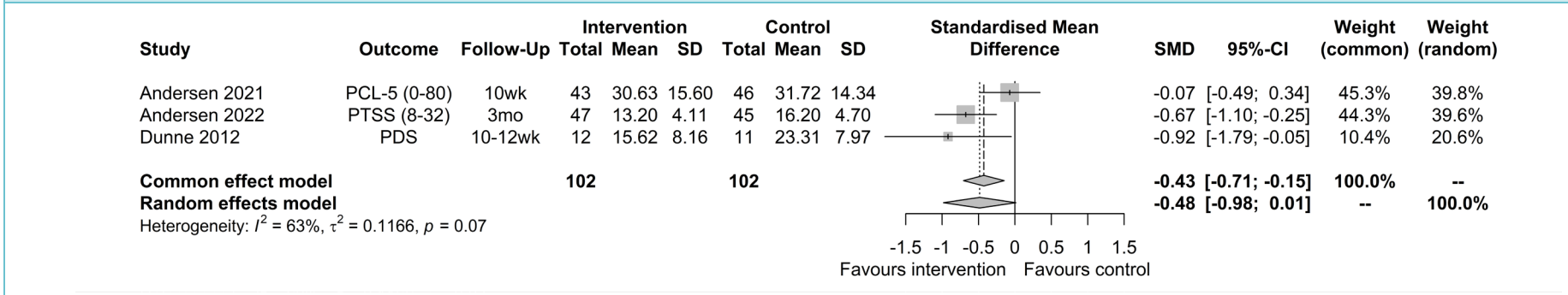
[b]While heterogeneity was moderate between trials, the comparator intervention in the study by Andersen (2021) was psychologically informed exercise, which is likely to not exhibit clinically significant differences between CBT and exercise. As a result, inconsistency was deemed as not serious.
[c]Studies are applicable to an Australian context.
[d]Pooled sample size below the threshold for precision.

T.5.4. Effect on psychological functioning

Short-term outcomes (chronic WAD)

Included studies: Andersen 2021, Andersen 2022, Dunne 2012

GRADE Certainty Assessment						No of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	See meta-analysis below. Dunne (2012): DASS total (10-12wk) mean difference I-C: -20.77 (-34.21, -7.33)	⨁⨁◯◯ Low	CRITICAL
3	Not serious[a]	Serious[b]	Not serious	Serious[c]	n/a			

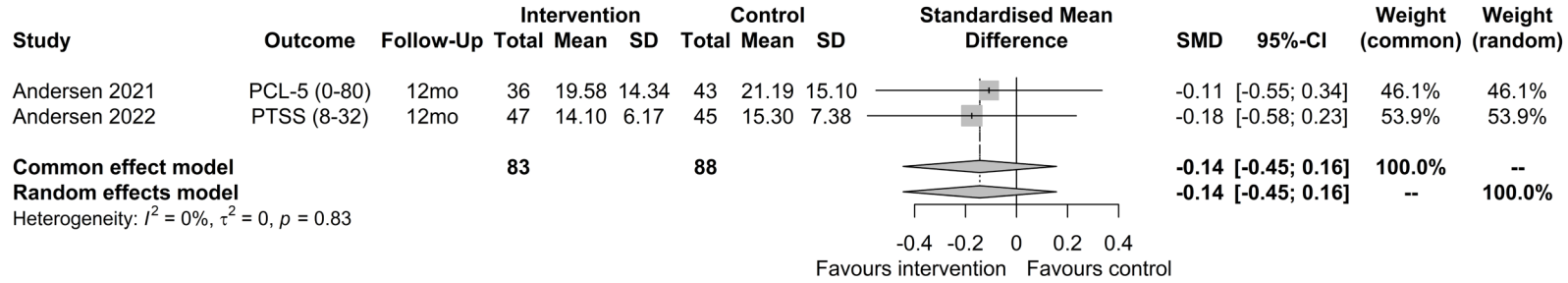


[a]Low risk of bias overall as 2/3 studies (Andersen 2021; Andersen 2022) that made up the majority of the total sample size had 'good' PEDro scores (8/10).
[b]Moderate heterogeneity in the findings presented in the meta-analysis.
[c]Number of total participants below the threshold for precision. Confidence intervals were wide, crossing the clinical threshold and zero. However, the study by Andersen 2021 had a psychologically informed exercise control intervention, which is a recommended intervention in these guidelines. CBT in addition to usual care (advice/exercise), rather than against another psychologically informed approach, would be more preferrable for evaluating treatment effects. As a result, we decided not to rate imprecision down further.

Long-term outcomes (chronic WAD)

Included studies: Andersen 2021; Andersen 2022

GRADE Certainty Assessment						No of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	See meta-analysis below.	⊕⊕◯◯ Low	CRITICAL
2	Not serious[a]	Not serious	Not serious	Very serious[c]	n/a			



[a]Low risk of bias with 'good' PEDro scores (8/10) (Andersen 2021; Andersen 2022).
[b]Findings were homogenous across the two studies.
[c]Total number of participants below the threshold for precision and confidence intervals crossed the clinical threshold and zero.

Table 18: Evidence to decision framework (trauma-focussed cognitive behavioural therapy for chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Trivial ○ Small ● Moderate ○ Large ○ Varies ○ Don't know	Chronic (n=3 trials): Compared CBT with no intervention (Andersen 2022; Dunne 2012) and psychologically informed exercise (Andersen 2021) in people with chronic WAD and post-traumatic stress disorder. Pooled analyses showed benefit to short-term post-traumatic stress symptoms only, that were clinically significant.	Subgroup of people with chronic WAD and PTSD. Study by Andersen 2021 had a psychologically informed exercise control intervention, which is a recommended intervention in these guidelines. CBT in addition to usual care (advice/exercise), rather than against another psychologically informed approach, would be more preferrable for evaluating treatment effects.
Undesirable Effects How substantial are the undesirable anticipated effects?		

Judgement	Research evidence	Additional considerations
○ Large ○ Moderate ○ Small ● Trivial ○ Varies ○ Don't know	Dunne 2012: Not reported. Andersen 2021: no adverse events. Andersen 2022: no adverse events.	There could be an increase in psychological distress, but the intervention is conducted by a psychologist who is trained to manage this.
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations
● Very low ○ Low ○ Moderate ○ High ○ No included studies	Certainty in the evidence ranged from very low to moderate for critical outcomes.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations

○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ● Probably favours the intervention ○ Favours the intervention ○ Varies ○ Don't know	Clinically significant reductions in short-term post-traumatic stress symptoms with trivial expected adverse effects.	Subgroup of people with chronic WAD with PTSD. Broader evidence for the effectiveness of trauma focused CBT to manage PTSD in general.
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Large costs ● Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	10 weekly 1-hour one-on-one CBT sessions with a psychologist for all three studies.	Core competency of a registered psychologist would involve these interventional components.
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations

○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	
Equity What would be the impact on health equity?		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ● Probably no impact ○ Probably increased	No included evidence.	Only for subgroup of people with chronic WAD and PTSD. These services are available via telehealth for regional/rural people.

○ Increased ○ Varies ○ Don't know		
Acceptability Is the intervention acceptable to key stakeholders?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know	Dunne (2012): all participants (n=12) who underwent the intervention completed the follow-up assessment vs 2/13 in waitlist (1 declined to participate, 1 was unable to be contacted). High follow-up rate in the study by Andersen 2022.	Psychological intervention for people with PTSD is accepted and currently performed in an Australian context.
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	Study by Dunne (2012) was carried out in South-East Queensland, Australia. Treatment dosage: 10 one-on-one sessions by a psychologist.	- WAD grade II and diagnostic criteria for current MVC-related PTSD - Full diagnostic criteria are not met until at least six months after the trauma (DSM-5) - Psychologist performs diagnosis of PTSD - Psychologists are trained in trauma focussed CBT techniques - Availability of psychologists to provide 10 sessions.

T.5.5. Conclusions (trauma-focused cognitive behavioural therapy for chronic WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	○	●	○

Recommendations
The guideline panel suggests that healthcare professionals (psychologists) use trauma-focussed cognitive behavioural therapy for the management of people with chronic WAD and diagnosed motor vehicle collision-related post-traumatic stress disorder. *(Panel vote summary: 13/16 81% conditional for; 3/16 19% neutral)* **Justification** • Cognitive behavioural therapy in addition to usual care may result in clinically significant reductions in short-term post-traumatic stress in people with chronic WAD and post-traumatic stress disorder. Little to no difference in other outcomes was observed, however, the comparison intervention in the study by Andersen 2021 was psychologically informed exercise and not usual care (exercise/advice). • Certainty in the evidence ranged from very low to moderate for critical outcome effects. • No adverse effects reported in the included studies. • There could be an increase in psychological distress, but the intervention is conducted by a psychologist who is trained to manage this. • This evidence is considered in conjunction with the broader evidence for the effectiveness of CBT to manage PTSD in general. • Psychological intervention for people with PTSD is accepted and currently performed in an Australian context. • Feasibility depends on availability of psychologists to provide 10 sessions. **Subgroup considerations** • Chronic WAD grade II-III and diagnostic criteria for current MVC-related PTSD. **Implementation considerations** *Indications:* • People with full diagnostic criteria for MVC-related PTSD are not met until at least six months after the trauma. However, choice to provide the intervention should be based on the persons individual clinical presentation. The intervention therefore could be provided earlier, based on persons levels of distress and loss of function. *Dose:* • Australian psychologists are mental health professionals trained in CBT techniques. In the studies, the intervention was provided 1x/week for 10 weeks. Appropriate dosage should be considered in accordance with the Clinical Framework for the Delivery of Health Services (https://www.tac.vic.gov.au/providers/working-with-the-tac/clinical-framework). *Considerations:* • HCPs are recommended to use the PCL-5 to screen for post-traumatic stress symptoms in the sub-acute phase (>1month). Scores of 31-33 or higher suggests that the person may benefit from PTSD treatment and is considered as a threshold for referral to psychologists.

More information on the checklist for the DSM-5 (the PCL-5) can be found on the US Depart of Veterans Affairs National Centre for PTSD website (https://www.ptsd.va.gov)

- However, HCPs should consider the individual elements in the tool and severity of symptoms when determining whether or not to refer.
- Psychologists are recommended to use the DSM-5 to diagnose PTSD.

T.6. Psychological: Exposure therapy

Is exposure therapy for fear of neck movement in addition to usual care effective for the management of subacute/chronic WAD?

T.6.1. Executive summary

Exposure therapy is a type of psychological therapy that involves systematic exposure to the feared stimuli over time with the aim of reducing the person's fearful reaction to the stimulus (e.g., neck movement). There was one study included to evaluate the effect of exposure therapy compared with advice for people with subacute WAD. A summary of the included study is detailed in Table 19. This form of therapy is only applicable for people with subacute (>1-month post-injury) or chronic WAD. Table 20 outlines the GRADE Evidence to Decision Framework decisions for the management of people with subacute/chronic WAD and fear of neck movement.

Effect on neck pain (see T.6.2 for details)

Subacute/Chronic WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=1 trial (Robinson 2013). Compared exposure therapy with a psychologist with an informational booklet in people with high initial pain intensity and fear of movement. The evidence suggests that exposure therapy may result in a moderate reduction in short-term neck pain in acute WAD compared with standard education.

Effect on neck disability (see T.6.3 for details)

Subacute/Chronic WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=1 trial (Robinson 2013). The evidence suggests that Exposure therapy may result in a moderate reduction in short-term neck disability in acute WAD compared with standard education.

Effect on psychological functioning (see T.6.4 for details)

Subacute/Chronic WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=1 trial (Robinson 2013). The evidence suggests that exposure therapy may result in a moderate reduction in short-term psychological functioning (depressive symptoms) compared with standard education.

Additional considerations: Adverse effects

Robinson, 2013: Not reported.

Table 19: Summary of included studies (exposure therapy for subacute/chronic WAD)

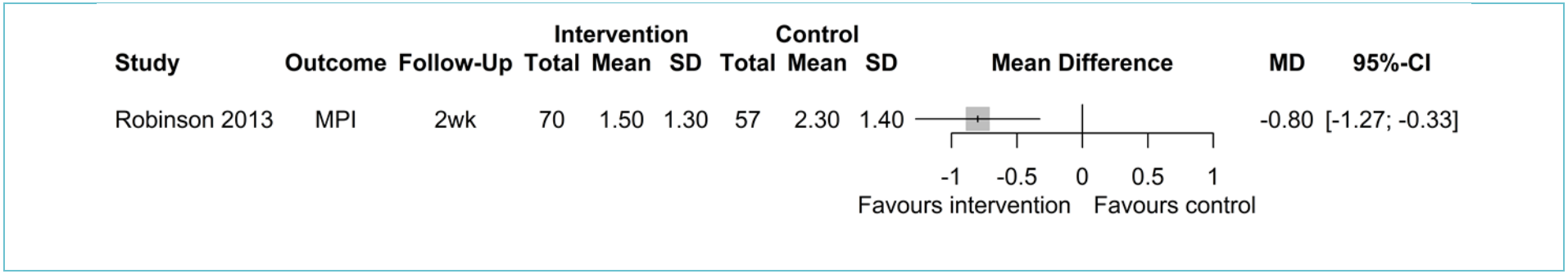
Author Year	Participants and setting (country)	Intervention (exposure therapy)	Control (usual care)	Outcomes included	Neck pain outcomes	Neck disability outcomes	Psych functioning outcomes	Summary (risk of bias PEDRO score)
Robinson 2013	127 participants with subacute WAD (>1mo post MVC), high initial pain intensity and fear of neck-specific movements in primary care (USA)	Informational booklet + 3 skills training and exposure therapy sessions (imaginal and in vivo desensitisation techniques, including relaxation techniques) sessions in a one-on-one format.	Standard education via an informational booklet: information regarding motor vehicle crashes, whiplash injuries, associated pain problems, and advice in favour of early neck movement.	Neck pain, neck disability, and psych functioning at ~2wk.	Intensity – multidimensional pain inventory (0-6)	NDI (0-100)	PTSD symptom score (PCLC)	Exposure therapy resulted in moderate reductions in short-term neck disability, and reductions in neck pain and psychological functioning (depressive symptoms) compared with advice via an educational booklet. (6)

T.6.2. Effect on neck pain

Short-term outcomes (acute WAD)

Included studies: Robinson 2013

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Exposure therapy (n=70), advice (n=57) MD 0.8 MPI lower (1.27 lower to 0.33 lower)	⨁⨁◯◯ Low	CRITICAL
1	Serious[a]	not serious	not serious	Serious[b]	None			
(Acute WAD) short-term neck pain (follow-up: range 2 weeks to 3 months; assessed with: Multidimensional Pain Inventory pain severity subscale; Scale from: 0 to 6)								



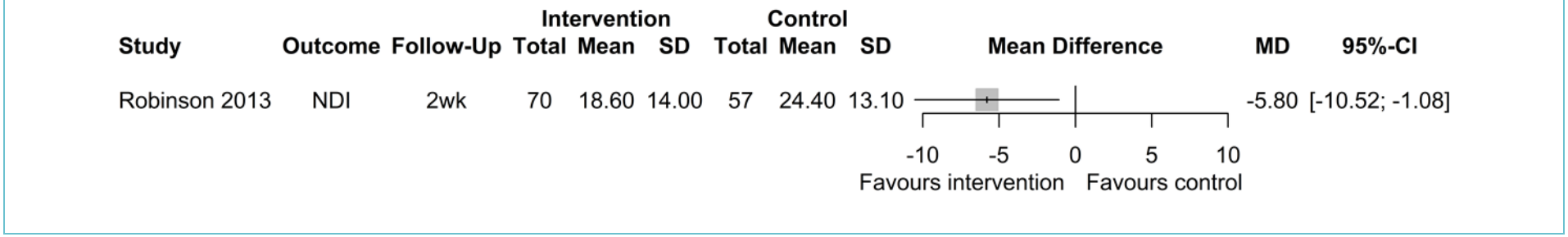
a. PEDRO 6/10, however, concealed allocation, blinding procedures were not reported.
b. Total number of observations below the adequate threshold for precision (n=127).

T.6.3. Effect on neck disability

Short-term outcomes (acute WAD)

Included studies: Robinson 2013

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Exposure therapy (n=70), advice (n=57) MD 5.8 NDI lower (10.52 lower to 1.08 lower)	⊕⊕◯◯ Low	CRITICAL
1	Serious[a]	not serious	not serious	Serious[b]	None			
(Acute WAD) short-term neck disability (follow-up: range 2 weeks to 3 months; assessed with: NDI)								



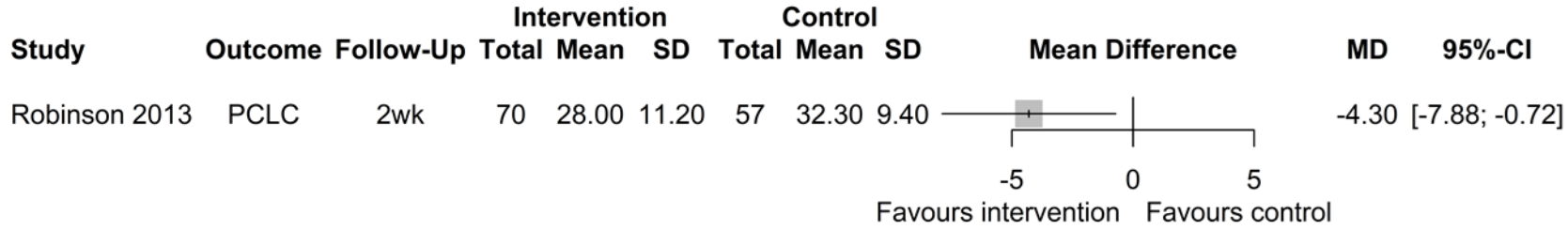
a. PEDRO 6/10, however, concealed allocation, blinding procedures were not reported.
b. Total number of observations below the adequate threshold for precision (n=127).

T.6.4. Effect on psychological functioning

Short-term outcomes (acute WAD)

Included studies: Robinson 2013

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	See figure below	⊕⊕◯◯ Low	CRITICAL
1	Serious[a]	not serious	not serious	Serious[b]	None			
(Acute WAD) short-term psychological functioning (assessed with: PTSD Checklist (PCL-C))								



a. PEDRO 6/10, however, concealed allocation, blinding procedures were not reported.
b. Total number of observations below the adequate threshold for precision (n=127).

Table 20: Evidence to decision framework (exposure therapy for subacute/chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Trivial ○ Small ● Moderate ○ Large ○ Varies ○ Don't know	Exposure therapy may result in moderate reductions in short-term neck pain, neck disability, and psychological functioning compared with usual care (advice for activity) (Robinson 2013).	Intervention provided at least 1 month following injury (subacute phase). Participants had high initial pain intensity (≥4/10) and significant fear of neck-specific movements (defined as fear ratings of at least 4 of 10 on 3 or more of the Pictorial Fear of Activities Scale [PFActS-C].

		Fear of cervical movements is prevalent in WAD grade I/II: 87% (196 of 226) of the people with persistent WAD symptoms reported significant fear of some cervical movements (Robinson 2013).
Undesirable Effects How substantial are the undesirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Large ○ Moderate ● Small ○ Trivial ○ Varies ○ Don't know	Not reported (Robinson, 2013).	Instances where exposure to movements, images, and/or discussion of the incident could incite further psychological distress. Healthcare professionals should provide information to the person about risks/ benefits. Contraindications: significant life event occurring.
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations
○ Very low ● Low ○ Moderate ○ High ○ No included studies	Findings from a single study with overall low certainty in the evidence.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations

○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ● Probably favours the intervention ○ Favours the intervention ○ Varies ○ Don't know	Moderate reductions in short-term neck disability, neck pain, and psychological functioning compared with advice.	Adverse effects not reported. Improvements were found in participants with high initial pain intensity (≥4/10) and significant fear of neck-specific movements (defined as fear ratings of at least 4 of 10 on 3 or more of the Pictorial Fear of Activities Scale [PFActS-C]. Prolonged exposure therapy and narrative exposure therapy are recommended treatments for managing PTSD in the Australian PTSD Guidelines (Phoenix Australia).
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Large costs ● Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	Three one-one-one sessions with a trained healthcare professional (psychologist).	Costs dependent upon session dosage.
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		

Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	
Equity **What would be the impact on health equity?**		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ○ Probably no impact ○ Probably increased ○ Increased ● Varies ○ Don't know	No included evidence.	Intervention was provided in the subacute period (>1 month) post injury. Not all areas in Australia can psychologists provide care within this timeframe. Exposure therapy could be considered remotely via video/telehealth depending on the person's presentation and access.
Acceptability **Is the intervention acceptable to key stakeholders?**		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	Although a slightly greater number of participants dropped out of the ET group (n = 11, 16%) compared information booklet (n = 3, 5%) group. No reasons for dropout reported.	A person's understanding and commitment will influence acceptability. This therapy requires full involvement and healthcare professional's need to provide information about risks/ benefits.
Feasibility **Is the intervention feasible to implement?**		

Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	No included evidence.	Accessibility of psychologists in a short timeframe in regional/remote areas in Australia. Exposure therapy remotely via video/telehealth. Approval for treatment in subacute phase (insurance).

T.6.5. Conclusions (exposure therapy for subacute/chronic WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	●	○	○

Recommendations
The guideline panel cannot recommend for or against exposure therapy for managing fear of neck movement in people with subacute or chronic WAD. *(Panel vote summary: 8/15 53% neutral; 7/15 47% conditional for – no strong opposition for neutral recommendation)* **Justification** • There was low certainty in the evidence that exposure therapy may result in moderate reductions in short-term neck pain, neck disability, and psychological functioning compared with advice. However, findings were from a single study. • Improvements were shown in participants with high initial pain intensity and significant fear of neck-specific movements. • There may be instances where exposure to movements, images, and/or discussion of the incident could incite further psychological distress. • Prolonged exposure therapy and narrative exposure therapy are recommended treatments for managing PTSD in the Australian PTSD Guidelines (Phoenix Australia). **Subgroup considerations** • People with moderate pain intensity and/or significant fear of neck-specific movements.

Implementation considerations

Indications:

- People with moderate pain intensity (VAS ≥4/10) and or significant fear of neck-specific movements (defined as fear ratings of at least 4/10 on 3 or more of the Pictorial Fear of Activities Scale (PFActS-C).
- Provide from sub-acute phase onwards (1-month post-injury).

Dose:

- 3 sessions were used in the included study, however, consider feasible/acceptable dosage for the person.

Considerations:

- Persons understanding and commitment needs to be considered.
- This therapy technique requires full involvement and information about risks/ benefits, where the person should drive the need.
- Evaluate outcomes regularly.

Contraindications:

- Significant life event occurring.

10. Education treatment recommendations

T.7. Education: Specific education

Are specific education interventions compared with general advice effective for the management of acute or chronic WAD?

T.7.1. Executive summary

Four clinical trials evaluated the effect of whiplash education interventions (e.g., educational videos) compared with general advice for the management of acute WAD (Table 21). No clinical trials were included for chronic WAD. Table 22 and Table 23 outline the GRADE Evidence to Decision Framework decisions for the management of people with acute and chronic WAD, respectively.

Effect on neck pain (see T.7.2 for details)

Acute WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=3 trials (Brison 2005, Ferrari 2005, Oliveira 2006). Compared video-based educational interventions with general advice (e.g., GP, instruction sheet) (Brison 2005; Oliveira 2006) or compared an educational pamphlet with general advice (instruction sheet) (Ferrari 2005). Specific educational interventions (video-based) result in small reductions in short-term neck pain in acute WAD.

Acute WAD long-term (>3 months to 12 months) (low certainty in the evidence):

N=3 trials (Brison 2005, Rydman 2020, Oliveira 2006). Specific educational interventions (video-based) result in little to no difference in long-term neck pain.

Effect on neck disability (See T.7.3 for details)

Acute WAD long-term (>3 months to 12 months) (low certainty in the evidence):

N=1 trial (Rydman 2020). A specific educational intervention (video) compared with general advice results in little to no difference on long-term neck disability in acute WAD.

Additional considerations: Adverse effects

Brison 2005 (acute): Not reported.

Ferrari 2005 (acute): Not reported.

Oliveira 2006 (acute): Not reported.

Rydman 2020 (acute): Not reported.

Table 21: Summary of included studies (specific information for acute and chronic WAD)

Author Year	Participants and setting (country)	Intervention (specific education)	Control (general advice)	Outcomes included	Neck pain outcomes	Neck disability outcomes	Psych functioning outcomes	Summary (risk of bias PEDRO score)
(Brison et al., 2005)	405 participants recruited from the tertiary care emergency departments with acute WAD (Canada)	Participants were shown an educational video developed based on Quebec Task Force recommendations and best available evidence (20min). Education provided regarding posture, early return to regular ADLs, ROM exercises, pain-relief methods (e.g., ice). Video sent to participant's home.	No educational content provided. Participants were encouraged to follow up with physician.	Neck pain at 12wk and 52wk.	6-point ordinal pain score (0-5) for pain frequency and severity	X	X	Trend for small long-term clinical reductions in persistent WAD pain symptoms were observed in participants who received a WAD educational video compared with those who did not receive educational material. (8)
(Ferrari et al., 2005)	112 participants from a hospital emergency department with acute WAD (Canada)	Participants provided with educational pamphlet: one-page evidence-based whiplash prevention pamphlet with information regarding the injury, reassurance, and the importance of mobilisation and continuation of normal activities.	Participants provided with emergency department information sheet that contained the definition of whiplash, symptoms, possible symptoms, and signs to return to hospital. No evidence-based advice provided on sheet.	Neck pain at 3mo.	3-point ordinal pain score (minor, moderate, severe)	X	X	No difference in the proportion of participants that reported neck pain at 3 months when comparing the provision of an evidence based educational pamphlet versus an emergency department information sheet. (7)

(Oliveira et al., 2006)	126 participants recruited from primary settings (emergency departments and urgent care) with acute WAD (USA)	Participants viewed a cervical strain psychoeducational video via TV/VCR on a portable cart that was easily transported to the person's bedside. Immediately after this, the experimental participants completed a pain knowledge evaluation form, given in the format of a "pop quiz," which was also given to the controls as a manipulation check. They were then discharged to home with a neck strain aftercare instruction sheet.	Participants were discharged to home with a neck strain aftercare instruction sheet.	Neck pain at 3mo and 6mo	11-point Verbal Rating Scale (0-10)	X	X	Significant improvement in pain rating at 3/12 and 6/12 favouring video group. (3)
(Rydman et al., 2020)	203 participants recruited from a hospital emergency department with acute WAD (Sweden)	15 min educational video with interviews of experienced medical personnel; orthopaedic surgeon, physiotherapist, and psychologist. Explanation of pathophysiology of	Information sheet provided which detailed six simple exercises for staying active and encouraging motion of the cervical spine and musculoskeletal system.	Neck pain and neck disability at 6 mo.	NRS (0-10)	Whiplash Disability Questionnaire (WDQ)	X	No significant differences in recovery rate, disability, and pain severity between educational video with multidisciplinary advice and a brief information sheet at 6mo.

		whiplash injury and recommendations regarding activity, pain responses, and exercise (focus on deep cervical flexor training).						(8)

SES, Self-Efficacy Scale; TSK, Tampa Scale of Kinesiophobia; NDI, Neck Disability Index; PDI, Pain Disability Index; SF12, Short Form 12; EQ-5D; CSQ, Coping Strategies Questionnaire; SF-36, Short Form 36; PDS, Post-traumatic Stress Diagnostic Scale; DASS, Depression Anxiety Stress Scale; PCS, Pain Catastrophizing Scale; PCI, Pain Coping Inventory; HADS, Hospital Anxiety and Depression Scale; PIPS, Psychological Inflexibility in Pain Scale; CES-D, Centre for Epidemiological Studies – Depression Scale; WDQ, Whiplash Disability Questionnaire; PFActS-C, Pictorial Fear of Activity Scale-Cervical; Pain Self-Efficacy Questionnaire

T.7.2. Effect on neck pain

Short-term outcomes (acute WAD)

Included studies: Brison 2005, Ferrari 2005, Oliveira 2006

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Total people N=643 Video: Brison 2005 (n=405)*: Median change difference in pain score (6-point ordinal pain scale with consideration of severity and frequency of pain, 0-5) at 12wk I = -2 vs C = -1 (p =0.03). Pamphlet: Ferrari 2005 (n=112)*: No statistically significant or clinically important differences between groups at 3mo. Video: Oliveira 2006 (126)*: Significant improvement in pain rating using a 10-point verbal rating scale (0-10) at 3mo (mean difference I-C = -3.1, p <0.001).	⊕⊕◯◯ Low	CRITICAL
3	Serious[a]	Serious[b]	Not serious[c]	Not serious[d]	n/a			

[a]Low risk of study bias (PEDRO=8/10).
[b]Unable to meta-analyze because intervention and control group means and standard deviation were not obtainable, however, study findings were variable: clinically significant (Oliveira 2006), moderate (Brison 2005), and no effects (Ferrari 2005).
[c]Interventional designs are applicable to an Australian context and the clinical question.
[d]Adequate total number of participants for precision (N=643).

Long-term outcomes (acute WAD)

Included studies: Brison 2005, Rydman 2020, Oliveira 2006

GRADE Certainty Assessment						No of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Total N=734 Brison 2005 (n=405): Median difference in pain score (6-point ordinal pain scale, 0-5) for intervention and control groups at 52wk compared to baseline was I = -3 vs C = -2 (p =0.07).	⊕⊕◯◯ Low	CRITICAL
3	Serious[a]	Serious[b]	Not serious[c]	Not serious[d]	n/a			

						Oliveira 2006 (n=126): Significant improvement in pain rating using a 10-point verbal rating scale (0-10) at 6mo (mean difference I-C = -4.1, p <0.001). Rydman 2020 (n=203): Mean difference (I-C) in NRS at 6mo was -0.3 (95% CI, -1.0 to 0.4, p =0.35).		

[a]Study by Oliveira (2006) had high risk of bias (PEDRO=3/10).
[b]Unable to meta-analyze because intervention and control group means and standard deviation were not obtainable, however, study findings were variable: clinically significant (Oliveira 2006) and no effect (Brison 2005; Rydman 2020).
[c]Interventional designs are applicable to an Australian context and the clinical question.
[d]Adequate total number of participants for precision (N=734).

T.7.3. Effect on neck disability

Long-term outcomes (acute WAD)

Included studies: Rydman 2020

GRADE Certainty Assessment						No of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Rydman 2020 (n=203)*: Mean difference (I-C) in Modified 12-item Whiplash Disability Questionnaire (0-120) at 6 mo was -3.7 (95% CI, -12.7 to 5.4, p =0.42).	⊕⊕◯◯ Low	CRITICAL
1	Not serious[a]	Not serious	Not serious[b]	Very serious[c]	n/a			

* unable to meta-analyze because intervention and control group means and standard deviation were not obtainable.
[a]Low risk of study bias (PEDRO=8/10).
[b]Intervention design is applicable to an Australian context.
[c]Total number of participants (n=203) lower than the threshold for precision and confidence intervals crossed the clinically significant threshold and zero.

Table 22: Evidence to decision framework (specific information for acute WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations

○ Trivial ● Small ○ Moderate ○ Large ○ Varies ○ Don't know	N=4 acute WAD trials. Specific educational interventions (short video-based resources) result in small overall reductions in short-term neck pain in acute WAD. These interventions result in little to no difference in long-term neck pain and neck disability. Educational components: Education regarding pathophysiology of whiplash injury. Advice about activity and exercise. Education about how psychological distress influences pain and physical function.	Video-based educational resources were developed from previous whiplash guidelines recommendations e.g., Quebec Task Force e.g., education provided regarding posture, early return to regular ADLs, ROM exercises, pain-relief methods (e.g., ice).
Undesirable Effects How substantial are the undesirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Large ○ Moderate ○ Small ● Trivial ○ Varies ○ Don't know	Adverse effects were not reported in all four trials.	No significant adverse effects expected. Educational interventions align with best practice recommendations for managing WAD at the time of their development.
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations
○ Very low ● Low ○ Moderate ○ High ○ No included studies	Low certainty evidence for short-term neck pain and long-term neck pain and neck disability. Appropriate total sample size for neck pain outcomes.	

Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ● Probably favours the intervention ○ Favours the intervention ○ Varies ○ Don't know	Small benefits in short-term neck pain with no expected adverse effects from a short educational intervention in the acute phase following whiplash injury.	
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Large costs ○ Moderate costs ● Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	Costs associated with development of educational content. Rydman (2020): experienced medical personnel; orthopaedic surgeon, physiotherapist, and psychologist involved in developing the educational video. Cost-effective per person once the resources are developed.	Educational videos can be developed in a cost-effective manner.
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations

○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	Educational videos can be developed in a cost-effective manner.
Equity What would be the impact on health equity?		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ● Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know		Producing educational content in different languages may be required to ensure equity for all Australians. Poor access to internet in rural areas. Health literacy needs to be considered when developing content.
Acceptability Is the intervention acceptable to key stakeholders?		

Judgement	Research evidence	Additional considerations
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know	A 15-20min educational video is acceptable to people with acute WAD.	
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know	No included evidence.	Educational videos are feasible to implement in an online format. E.g., implementing on Whiplash Navigator website, SIRA website, Pain Australia website. Can also be advertised and presented through social media communications. These resources can be revisited at any time by people with acute WAD.

T.7.4. Conclusions (specific education interventions for acute WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	○	●	○

Recommendations
The guideline panel suggest that specific education interventions, such as video-based educational resources, be used for the management of people with acute WAD. *(Panel vote summary: 13/16 81% conditional for; 2/16 13% strong for; 1/16 6% neutral)*

Justification

- Small benefits in short-term neck pain compared with general advice with no expected adverse effects from a short educational intervention in the acute phase following whiplash injury.
- Development of video-based educational content is low cost and easily accessible if distributed online.
- Education is a key element for management of other musculoskeletal conditions.

Implementation considerations

Include education on:

- Pathophysiology of whiplash injury.
- Advice about activity and exercise.
- How psychological distress influences pain and physical function.
- Prognostic risk-based advice.

Considerations:

- Could be presented in tertiary (e.g., emergency) or primary/secondary care settings.
- Specific advice on whiplash injury management (concepts listed above) has been shown to be just as effective delivered orally compared with a written pamphlet for the management of people with acute WAD (Kongsted et al., 2008).
- Appropriate stakeholder consultation when developing information videos.

Table 23: Evidence to decision framework (specific education for chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Trivial ○ Small ○ Moderate ○ Large ○ Varies ● Don't know	No clinical trials in chronic WAD that have compared education with no intervention. However, trials have used advice/education as a comparator (e.g., vs multimodal physio, neck-specific exercises). Advice to stay active and exercise and addressing modifiable psychosocial factors of poor prognosis in advice sessions have been carried out in chronic WAD studies as the control intervention e.g., Michaleff 2014, Stewart 2007. These	May have a different educational focus to that of acute WAD. Likely to favour pain education in this phase as it is the most prevalent symptom in people with chronic WAD. Considerable number of chronic pain educational resources are available to people (e.g., NSW ACI Chronic Pain website, Pain Australia).

	interventions have shown no significant differences with exercise-based interventions across critical outcomes such as short- and long-term neck pain (Michaleff 2014).	
Undesirable Effects How substantial are the undesirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Large ○ Moderate ○ Small ● Trivial ○ Varies ○ Don't know		No significant adverse effects expected. Educational interventions align with best practice recommendations for managing WAD at the time of their development.
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ●No included studies	No included evidence.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations

○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ● Probably favours the intervention ○ Favours the intervention ○ Varies ○ Don't know	No included evidence for chronic WAD. Oral advice interventions with primary healthcare professionals have shown some effectiveness for the management of chronic WAD compared with active interventions (e.g., see multimodal physical therapy section).	May have a different educational focus to that of acute WAD. Likely to favour pain education in this phase as it is the most prevalent symptom in people with chronic WAD. Considerable number of chronic pain educational resources are available to people (e.g., NSW ACI Chronic Pain website, Pain Australia).
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Large costs ○ Moderate costs ● Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	No included evidence.	Educational videos can be developed in a cost-effective manner. Cost-effective per person.
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		

Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	Educational videos can be developed in a cost-effective manner and implemented widely.
Equity What would be the impact on health equity?		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ● Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Producing educational content in different languages may be required to ensure equity for all Australians. Poor access to internet in rural areas. Health literacy needs to be considered when developing content.
Acceptability Is the intervention acceptable to key stakeholders?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know	A 15-20min educational video is acceptable to people (based on acute WAD studies).	
Feasibility Is the intervention feasible to implement?		

Judgement	Research evidence	Additional considerations
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know	No included evidence.	Educational videos are feasible to implement in an online format. E.g., implementing on Whiplash Navigator website, SIRA website, Pain Australia website. Social media communications. These resources can be revisited at any time by people with acute WAD.

T.7.5. Conclusions (specific education interventions for chronic WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	○	●	○

Recommendations
The guideline panel suggest that specific education interventions, such as video-based educational resources, be used for the management of people with chronic WAD. *(Panel vote summary: 12/16 75% conditional for; 3/16 19% neutral; 1/16 6% strong for)* **Justification** • Oral advice interventions with healthcare professionals have shown some effectiveness for the management of chronic WAD compared with active interventions (e.g., see T.4, multimodal physical therapy). • No expected adverse effects from a short educational intervention in the chronic phase following whiplash injury. • Development of video-based educational content is low cost and easily accessible if distributed online. • Education is a key element for management of other musculoskeletal conditions. **Implementation considerations** *Include education on:*

- Advice about activity and exercise.
- How psychological distress influences pain and physical function.
- Emphasis on how to manage chronic pain.
- Emphasis on developing self-efficacy.

Considerations:

- Separate education in chronic vs acute WAD.
- Appropriate stakeholder consultation when developing information videos.

T.8. Education: Healthcare professional implementation strategy

Are implementation strategies involving education compared with dissemination of clinical practice guidelines effective for the management of acute or chronic WAD?

T.8.1. Executive summary

One trial evaluated the effect of a clinical implementation strategy compared to guidelines dissemination on the management of acute WAD and healthcare professional knowledge of guidelines recommendations (Table 24). Table 25 outlines the GRADE Evidence to Decision Framework decisions for the management of people with acute and chronic WAD.

Effect on neck disability (see T.8.2 for details)

Acute WAD short-term (2 weeks to 3 months) (very low certainty in the evidence):

N=1 trial (Rebbeck 2006). A clinical implementation strategy compared with guidelines dissemination may result in little to no difference in short-term neck disability, but the evidence is very uncertain.

Acute WAD long-term (>3 months to 12 months) (very low certainty in the evidence):

N=1 trial (Rebbeck 2006). A clinical implementation strategy compared with guidelines dissemination may result in little to no difference in short-term neck disability.

Effect on healthcare professional specific outcomes* (see T.8.3 for details)

*The guideline panel agreed to include healthcare professional specific outcomes as a critical outcome for this question as it was specific to educating healthcare professionals who manage people with WAD and holds implications for implementation of these guidelines.

Acute WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N= 1 trial (Rebbeck 2006). A clinical implementation strategy compared with guidelines dissemination may result in significant improvements in short-term healthcare professional knowledge and implementation of whiplash guidelines recommendations.

Additional considerations: Adverse effects

Rebbeck 2006: Not reported.

Table 24: Summary of included studies (healthcare professional implementation strategy for acute and chronic WAD)

Author Year	Participants and setting (country)	Intervention (Healthcare professional implementation strategy)	Control (Whiplash management guidelines)	Outcomes included	Neck disability outcomes	Healthcare professional knowledge of guidelines	Summary (risk of bias PEDRO score)
(Rebbeck et al., 2006)	99 participants recruited from an outpatient physiotherapy clinic with acute WAD (Australia)	Intervention for the implementation group consisted of dissemination of guidelines, initial education by opinion leaders one-day (8 hour) workshop, and follow-up educational outreach session ~6mo post (2-hours).	Intervention for the dissemination group consisted of dissemination of guidelines by mail, i.e., physiotherapists in this group were given but not directed to use the guidelines.	Neck disability at 3mo and 12mo.	Functional Rating Index (0-40)	Custom questionnaire (0-28)	Active implementation program did not affect injured person's outcomes which may have been due to high quality of treatment prescription at baseline by both groups. Physiotherapist knowledge and implementation of guidelines significantly improved with targeted education compared with (6)

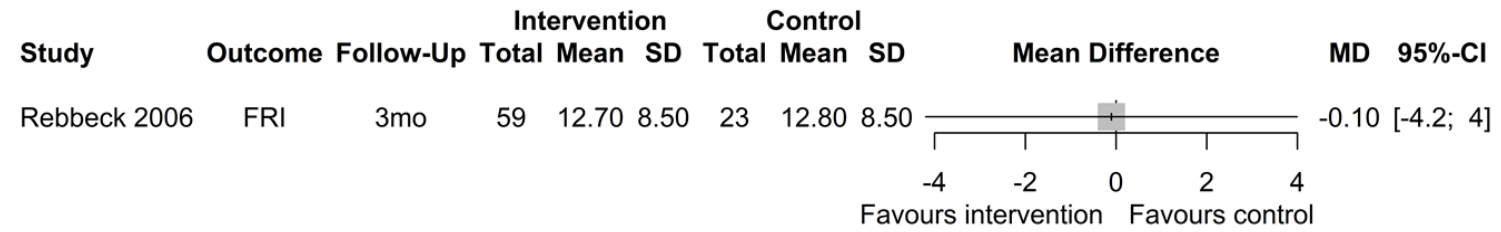
SES, Self-Efficacy Scale; TSK, Tampa Scale of Kinesiophobia; NDI, Neck Disability Index; PDI, Pain Disability Index; SF12, Short Form 12; EQ-5D; CSQ, Coping Strategies Questionnaire; SF-36, Short Form 36; PDS, Post-traumatic Stress Diagnostic Scale; DASS, Depression Anxiety Stress Scale; PCS, Pain Catastrophizing Scale; PCI, Pain Coping Inventory; HADS, Hospital Anxiety and Depression Scale; PIPS, Psychological Inflexibility in Pain Scale; CES-D, Centre for Epidemiological Studies – Depression Scale; WDQ, Whiplash Disability Questionnaire; PFActS-C, Pictorial Fear of Activity Scale-Cervical; Pain Self-Efficacy Questionnaire

T.8.2. Effect on neck disability

Short-term outcomes (acute WAD)

Included studies: Rebbeck 2006

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Rebbeck 2006: See figure below. FRI: Functional Rating Index (0-40)	⊕◯◯◯ Very low	CRITICAL
1	Not serious[a]	Not serious	Not serious[b]	Extremely-serious[c]	n/a			

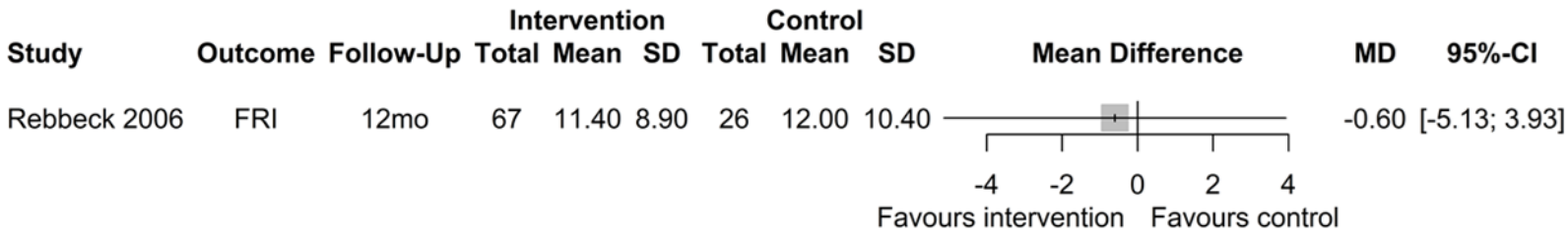


[a]Adequate study design with 'good' PEDRO score (6/10).
[b]Study was carried out in NSW and ACT, Australia, with physiotherapists (primary healthcare professionals who treat people with WAD).
[c]Total participants was significantly below the threshold for precision and confidence intervals crossed zero and the clinically significant threshold on both sides (≥10% change in neck disability).

Long-term outcomes (acute WAD)

Included studies: Rebbeck 2006

GRADE Certainty Assessment						No of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Rebbeck 2006: See figure below. FRI: Functional Rating Index (0-40)	⊕⊕◯◯ Low	CRITICAL
1	Not serious[a]	Not serious	Not serious[b]	Very serious[c]	n/a			



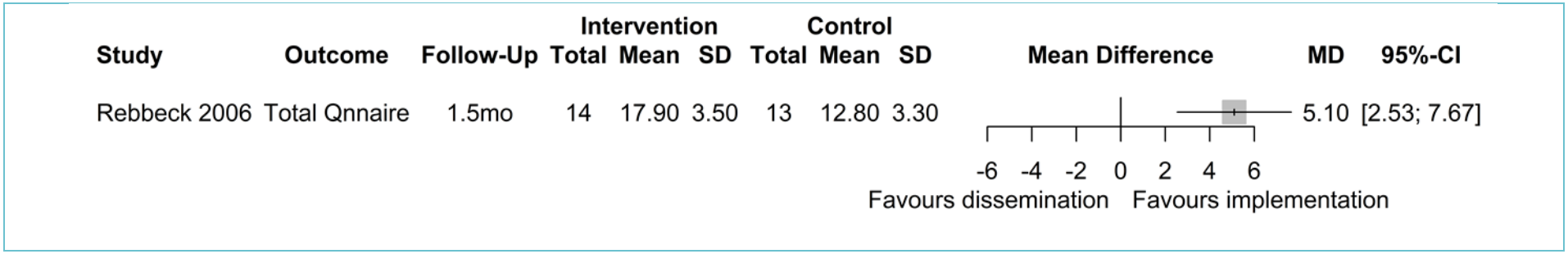
[a]Adequate study design with 'good' PEDRO score (6/10).
[b]Study was carried out in NSW and ACT, Australia, with physiotherapists (primary healthcare professionals who treat people with WAD).
[c]Total participants were significantly below the threshold for precision and confidence intervals crossed zero and the clinically significant threshold in favour of the intervention. Total participants at long-term follow-up were slightly greater than short-term follow-up outcomes.

T.8.3. Effect on healthcare professional specific outcomes

Short-term outcomes (acute WAD)

Included studies: Rebbeck 2006

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Total Healthcare professional Knowledge Questionnaire (0-28): *see figure below* Specific outcomes: Self-rated understanding of guidelines (mean change difference (I-C) mean (95% CI)): 1.5 (0.7 to 2.3), p = 0.001 Ability to identify yellow flags (mean change difference (I-C): p = 0.02 Self-rated use of functional outcome after trial: I:77% vs c:20% p = 0.01	⨁⨁◯◯ Low	HIGH
1	Not serious[a]	Not serious	Not serious[b]	Very serious[c]	n/a			



[a]Adequate study design with 'good' PEDRO score (6/10).
[b]Study was carried out in NSW and ACT, Australia, with physiotherapists (primary healthcare professionals who treat people with WAD).
[c]Total participants was significantly below the threshold for precision, however, improvements in healthcare professional knowledge outcomes were clinically and statistically significant in favour of the implementation group.

Table 25: Evidence to decision framework (healthcare professional implementation strategy for managing people with acute and chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Trivial ○ Small ● Moderate ○ Large ○ Varies ○ Don't know	One trial (Rebbeck 2006) evaluated the effect of a clinical implementation strategy compared to guidelines dissemination on the management of people with acute WAD and healthcare professional knowledge and implementation of clinical practice guidelines recommendations. Little to no difference on injured person's short- and long-term neck disability was found between groups. A clinical implementation strategy compared with guidelines dissemination may result in significant improvements in short-term healthcare professional knowledge and implementation of whiplash guidelines recommendations. Outcomes that significantly improved between groups included: • Total custom questionnaire score. • Self-rated understanding of guidelines. • Ability to identify yellow flags. • Self-rated use of functional outcome.	Implementation program did not affect an injured person's outcomes which may have been due to high quality of treatment prescription at baseline by both groups (e.g., most physiotherapists prescribed exercise in-line with guidelines recommendations before, during, and after the trial in both groups).

	Advice to people to act as usual.	
Undesirable Effects How substantial are the undesirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Large ○ Moderate ○ Small ● Trivial ○ Varies ○ Don't know	No adverse effects reported (Rebbeck 2006).	Educational interventions would not have undesirable effects on primary healthcare professionals. Healthcare professional implementation sessions were developed based on guidelines recommendations and therefore unlikely to have undesirable effects on people if implemented effectively.
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations
● Very low ○ Low ○ Moderate ○ High ○ No included studies	Certainty of evidence ranged from very low for an injured person's neck disability outcomes, to low certainty for healthcare professional outcomes.	Certainty of evidence limited by sample size (single study).
Values Is there important uncertainty about or variability in how much people value the main outcomes?		
Judgement	Research evidence	Additional considerations
○ Important uncertainty or variability ○ Possibly important uncertainty or variability ○ Probably no important		High importance for healthcare professional specific knowledge outcomes.

uncertainty or variability ● No important uncertainty or variability		
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ● Probably favours the intervention ○ Favours the intervention ○ Varies ○ Don't know	Significant improvements in healthcare professional knowledge of guidelines recommendations and improvements in implementation of practice recommendations.	Single study with small sample of physiotherapist participants. Educational sessions were developed around guidelines recommendations from version 1 of the NSW acute WAD guidelines. Evidence-based recommendations developed from these guidelines may differ.
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Large costs ● Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	Moderate costs would be associated with educational workshop session (8-hour/1day) and follow-up education session (2-hour). (Rebbeck 2006)	Healthcare professionals may require some additional training to effectively implement recommendations developed in these guidelines. Cost of educational sessions not detailed in the study.
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations

● Very low ○ Low ○ Moderate ○ High ○ No included studies	No included evidence.	
Cost effectiveness **Does the cost-effectiveness of the intervention favour the intervention or the comparison?**		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ● Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ○ No included studies	The total cost of care for people in the implementation group was $255 (95% CI –1505 to 996) less than for people in the control group. The cost per one-point improvement on the Functional Rating Index was $116 for the implementation group vs $189 for control group (p = 0.55).	
Equity **What would be the impact on health equity?**		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ○ Probably no impact ● Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Improved PHCP knowledge and implementation of the recommendations developed in the guidelines will likely improve health outcomes after whiplash injury.
Acceptability **Is the intervention acceptable to key stakeholders?**		

Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know		Primary healthcare professionals require ongoing CPD points for accreditation. Educational sessions would be acceptable but not necessarily for a total of 10-hours. Online training modules could be considered.
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	Study was carried out in NSW and ACT, Australia, with physiotherapists (Rebbeck 2006).	Primary HCPs would need to be prepared to undertake the training. Primary HCPs require ongoing CPD points for accreditation. Costs associated with developing and delivering clinical implementation education sessions. Possible online modules/online delivered educational sessions. Could be applied to different healthcare professionals impacted by these guidelines.

T.8.4. Conclusions (healthcare professional implementation strategy for managing people with acute and chronic WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	○	●	○

Recommendations
The guideline panel suggest that implementation strategies for healthcare professionals, involving education on clinical practice recommendations and their implementation, be used for the management of people with acute or chronic WAD. *(Panel vote summary: 8/14 57% conditional for; 4/14 29% strong for; 2/14 14% neutral)* **Justification** • Significant improvements in healthcare professional knowledge and implementation of clinical practice guidelines recommendations with an implementation education session. • Cost-effective per-person compared with dissemination of guidelines, however, costs associated with development and delivery of educational workshop. • Educational interventions would not have undesirable effects on primary healthcare professionals. • Healthcare professional implementation sessions were developed based on guidelines recommendations and therefore unlikely to have undesirable effects on people if implemented effectively. **Subgroup considerations** • Education would be tailored to included specific subgroup recommendations that are presented in these guidelines. **Implementation** *Indications:* • For HCP's who are less familiar or unclear about evidence-based interventions for whiplash injury. *Dose:* • Interactive education provided by opinion leaders (over 1–2-day workshops) resulted in change in PHCP behaviour to be more consistent with guidelines. *Considerations:* • Feasible as HCPs require CPD for registration. • Time and costs associated with developing and delivering clinical education sessions. • Possible future modes of delivery could include online delivery. • Tailor to HCP's impacted by these guidelines.

11. Manual therapy treatment recommendations

T.9. Manual therapy: Manipulation (high-velocity low-amplitude)

Is manipulation (high-velocity low amplitude thrust) of the spine compared with usual care effective for the treatment of acute or chronic WAD?

T.9.1. Executive summary

One trial evaluated the effect of manipulation techniques (high-velocity low-amplitude) compared with usual care on people with acute WAD (Table 26). No clinical trials for chronic WAD were included. Table 27 outlines the GRADE Evidence to Decision Framework decisions for the management of people with acute and chronic WAD.

Effect on neck pain (see T.10.2 for details)

Acute WAD short-term (2 weeks to 3 months) (very low certainty in the evidence):

N=1 trial (Fernandez de las Pen 2004). Compared manipulations to the cervical spine, thoracic spine, and pelvis, and massage, to multimodal care. Trivial reductions in neck pain were found for the intervention compared with the control. Manipulation of the cervical and thoracic spine may have trivial non-clinically significant reductions in short-term neck pain compared with multimodal care, but the evidence is very uncertain.

Table 26: Summary of included studies (HVLA manipulation for acute and chronic WAD)

Author Year	Participants and setting (country)	Intervention (HVLA manipulation)	Control (usual care)	Outcomes included	Neck pain outcomes	Neck disability outcomes	Psych functioning outcomes	Summary (risk of bias PEDRO score)
(Fernández-de-las-Peñas et al., 2004)	380 participants with acute WAD in primary care (Spain)	1 session/wk for 4wk of high velocity low amplitude manipulation (cervical, thoracic, pelvic girdle) and myofascial trigger point massage.	5 sessions/wk for 20 sessions of multimodal care over 1mo consisting of: ultrasound, active home exercises, multimodal therapy (postural training, manual therapy, psychological support), and electromagnetic therapy	Neck pain at 1mo.[a]	VAS (0-10)	x	x	Manipulation techniques and trigger point massage therapy resulted in trivial reductions in short-term neck pain compared with multimodal care. (3)

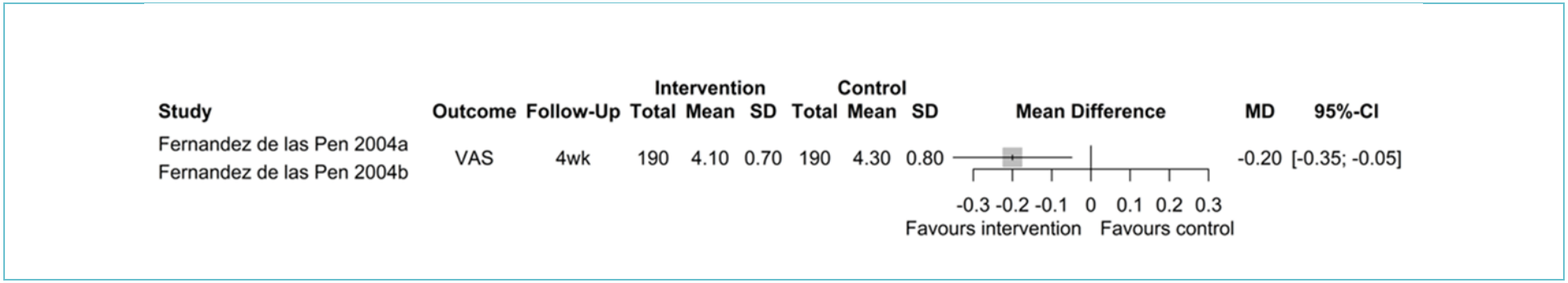
a. Follow-up timepoints differed between the intervention and control groups. One-month follow-up corresponded to follow-up timepoint 1 for the intervention group (4 sessions) and follow-up timepoint 2 for the control group (20 sessions).

T.9.2. Effect on neck pain

Short-term outcomes (acute WAD)

Included studies: Fernandez de las Pen 2004

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	I-C (4wk): MD 0.2 VAS (0-10) lower (0.35 lower to 0.05 lower)	⊕◯◯◯ Very low	CRITICAL
1	Very serious[a]	not serious	Very serious[b]	Serious[c]	None			
(Acute WAD) Short-term neck pain (follow-up: mean 1 months; assessed with: VAS; Scale from: 0 to 10)								



[a]High risk of study bias (PEDRO 3/10).
[b]Comparator intervention (includes ultrasound in cervical soft tissues, exercise, low energy high frequency pulsed electromagnetic therapy) is not consistent with current usual care in an Australian context.
[c]Number of total observations were below the threshold for precision (N=380).

Table 27: Evidence to decision framework (manual therapy manipulation for acute and chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
● Trivial ○ Small ○ Moderate ○ Large ○ Varies ○ Don't know	Acute: Fernandez de las Pen 2004: Manipulation of the cervical and thoracic spine may have trivial non-clinically significant reductions in short-term neck pain compared with multimodal care (exercise and electrotherapy), but the evidence is very uncertain. Chronic: Don't know.	High risk of bias in study by Fernandez de las Pen (2004): inconsistency in follow-up time. Comparator intervention (includes ultrasound in cervical soft tissues, exercise, low energy high frequency pulsed electromagnetic therapy) which is not consistent with current usual care in an Australian context. Manipulation of the cervical and thoracic spine and pelvis was performed.
Undesirable Effects How substantial are the undesirable anticipated effects?		
Judgement	Research evidence	Additional considerations

○ Large ○ Moderate ● Small ○ Trivial ○ Varies ○ Don't know	Fernandez de las Pen 2004: Not reported.	Whiplash injury increases the risk of vascular accident in the cervical region. Acute: Low risk of harm associated with cervical manipulation, e.g., exacerbation of symptoms. Very rare risk of significant adverse events (e.g., stroke and vertebral artery dissection). Chronic: Dependency on passive care in the chronic phase.
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations
● Very low ○ Low ○ Moderate ○ High ○ No included studies	High risk of bias and comparator intervention (includes ultrasound in cervical soft tissues, exercise, low energy high frequency pulsed electromagnetic therapy) is not consistent with current usual care in an Australian context. Chronic: no included studies.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ● Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ○ Don't know	No clinically significant effects were found between two interventions. Chronic: don’t know.	Whiplash injury increases the risk of vascular accident in the cervical region. Possible small undesirable effects with manipulation of the cervical spine. Very rare risk of significant adverse events (e.g., stroke and vertebral artery dissection). Inform person that while significant adverse events (stroke and vertebral artery dissection) are very rare, some risk

		with cervical manipulation may be present. Contraindications to care need to be considered, such as, osteoporosis, acute radiculopathy.
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Large costs ○ Moderate costs ● Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	Fernandez de las Pen 2004: 1 session/wk for 4wk is cheaper than 20 sessions in the control group.	The control group was not consistent with usual care in Australia. HLVA manipulation be included as part of multimodal care by trained PHCPs.
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies		
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		

Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	
Equity **What would be the impact on health equity?**		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ● Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Primary HCPs in Australia are registered (GP, physiotherapist, chiro, osteopath) to perform manipulation techniques. Access to manipulative care and referral pathways need to be considered for equity.
Acceptability **Is the intervention acceptable to key stakeholders?**		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ○ Probably yes ○ Yes ● Varies ○ Don't know	No data on follow-up rates from single trial.	The injured person's preference needs to be considered, and risks versus potential benefits. Some stakeholders may not find this intervention acceptable given the small risk of significant harm.
Feasibility **Is the intervention feasible to implement?**		

Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	No included evidence.	Can be included as part of multimodal care by PHCPs. Manipulations should only be provided by registered healthcare professionals (GP, physiotherapist, chiro, osteopath, specialist surgeons) trained in the specific methods and in accordance with current professional standards.

T.9.3. Conclusions (high-velocity low-amplitude thrust manipulation for acute WAD)

Type of recommendation (high-velocity low-amplitude thrust manipulation of the cervical* spine for acute WAD)

Strong recommendation against the intervention	Conditional recommendation against the intervention	Neither for or against the intervention	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	●	○	○	○

*The guideline panel agreed on providing two separate recommendations for cervical and thoracic manipulation of the spine.

Type of recommendation (high-velocity low-amplitude thrust manipulation of the thoracic spine for acute WAD)

Strong recommendation against the intervention	Conditional recommendation against the intervention	Neither for or against the intervention	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	●	○	○

Recommendations
Cervical manipulation
The guideline panel suggest that healthcare professionals do not use high-velocity low-amplitude manipulation of the cervical spine for the management of people with acute WAD. *(Panel vote summary: 8/13 62% conditional against; 3/13 23% strong against; 2/13 15% neutral)*
Thoracic manipulation

The guideline panel could not recommend for or against high-velocity low-amplitude manipulation of the thoracic spine for the management of people with acute WAD.

(Panel vote summary: 12/13 92% neutral; 1/13 8% conditional against)

Justification

- Trivial non-clinically significant benefits shown in a single study in Spain comparing manipulation of the spine compared with multimodal care; differences in comparator intervention (includes ultrasound in cervical soft tissues, exercise, low energy high frequency pulsed electromagnetic therapy), which were not consistent with current usual care in an Australian context.
- Very rare risk of significant adverse events (e.g., stroke and vertebral artery dissection).

Subgroup considerations

- WAD grade III (radiculopathy, decreased or absent tendon reflexes and/or weakness and sensory deficit) osteoporosis, vascular conditions (e.g., history of stroke), or dizziness may be a contraindication for manipulation.

Implementation considerations

Considerations (adapted from previous guidelines):

- Healthcare professionals could provide thoracic spinal manipulation for the treatment of acute WAD.
- HVLA manipulations should only be provided by registered healthcare professionals trained in the specific methods and in accordance with current professional standards.
- Inform person that while significant adverse events (stroke and vertebral artery dissection) are very rare, some risk with manipulation may be present.

Dose:

- Manipulation could be provided for up to 4-6wk provided there is meaningful clinical benefit.
- Spinal manipulation should not be used in isolation for the management of people with acute WAD, but as an adjunct to the recommended treatments.

T.9.4. Conclusions (high-velocity low-amplitude thrust manipulation for chronic WAD)

Type of recommendation (high-velocity low-amplitude thrust manipulation of the spine* for chronic WAD)

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	●	○	○	○

*The guidelines panel agreed on a single recommendation for cervical and thoracic manipulation of the spine for chronic WAD.

Recommendations
Cervical/thoracic manipulation The guideline panel suggests that primary healthcare professionals do not use high-velocity low-amplitude manipulation of the spine for the management of people with chronic WAD. *(Panel vote summary: 8/13 62% conditional against; 3/13 23% strong against; 2/13 15% neutral)* **Justification** • No clinical trials for the use of manipulation techniques of the spine for the management of chronic WAD. • May increase dependency on passive care in the chronic phase. • Passive treatment in the chronic phase of the condition differs from recommendations of an active and biopsychosocial approach to management of whiplash injury in this phase.

T.10. Manual therapy: Massage

Are massage techniques in addition to usual care effective for the management of people with acute or chronic WAD?

T.10.1. Executive summary

One clinical trial was included in version 3 of the NSW acute WAD guidelines that evaluated the effectiveness of massage techniques (Picelli et al., 2011). While this study did evaluate critical outcomes of interest (NDI and VAS) no between group statistics or point estimates at follow-up were presented, and therefore, the study was excluded from these guidelines. Table 28 outlines the GRADE Evidence to Decision Framework decisions for the management of people with acute and chronic WAD.

Table 28: Evidence to decision framework (massage for acute and chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Trivial ○ Small ○ Moderate ○ Large ○ Varies ● Don't know	No clinical trials for acute or chronic WAD.	Massage is known to give short-term pain relief for some people. Massage has been included as part of multimodal care in WAD clinical trials (see T.4 for details).
Undesirable Effects **How substantial are the undesirable anticipated effects?**		
Judgement	Research evidence	Additional considerations
○ Large ○ Moderate ○ Small ○ Trivial ● Varies ○ Don't know	No included evidence.	In some people with high pain sensitivity (hot/cold hyperalgesia, pressure hyperalgesia, allodynia) could have undesirable effects. There is potential for exacerbation of symptoms. Whiplash can result in vascular accident to the cervical region.
Certainty of evidence **What is the overall certainty of the evidence of effects?**		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies		

Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● Don't know	No clinical trials in acute or chronic WAD.	Variable adverse effects depending on the phase and severity of whiplash injury, and the clinical presentation of the person (e.g., pain hypersensitivity). The Low Back Pain Clinical Care Standard (Australian Commission on Safety and Quality in Health Care, 2022) emphasises that people with low back pain should prioritise active management strategies over passive strategies such as massage.
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Large costs ○ Moderate costs ● Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	No included evidence.	HCPs in Australia are able to provide massage techniques during multimodal treatment. Additional costs for the person with WAD if seeking out massage therapy in addition to other care.
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations

○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	
Equity What would be the impact on health equity?		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ● Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Available to everyone in an Australian context.
Acceptability		

Is the intervention acceptable to key stakeholders?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know	No included evidence.	The injured person's preference needs to be considered, but massage is generally accepted by people with musculoskeletal conditions.
Feasibility **Is the intervention feasible to implement?**		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know	No included evidence.	Readily available treatment in an Australian context. Can be implemented as part of multimodal care by healthcare professionals.

T.10.2. Conclusions (massage for acute and chronic WAD)

Type of recommendation*

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	●	○	○

*The guidelines panel agreed on a single recommendation for massage for managing people with acute or chronic WAD.

Recommendations
The guideline panel cannot recommend for or against the use of massage techniques in addition to usual care for the management of people with acute or chronic WAD. *(Panel vote summary: 8/13 62% neutral; 3/13 23% conditional against; 2/13 15% conditional for)*

Justification

- Trivial adverse effects expected, and variable short-term improvements shown in other neck pain conditions, however, no clinical trials evaluating the effectiveness of massage techniques in isolation for the management of people with acute or chronic WAD.
- Massage has been included in multimodal physical therapy clinical trials (see T.4 for details).
- Emphasis on active therapies in other musculoskeletal condition guidelines (e.g., Low Back Pain Clinical Care Standard) over passive therapies like massage.
- Some instances where massage could exacerbate symptoms in people with pain hypersensitivity (e.g., pressure hyperalgesia).

Subgroup considerations

- In some people with high pain sensitivity (hot/cold hyperalgesia, pressure hyperalgesia, allodynia) massage could have undesirable effects.
- Consider risk stratification: overtreating of low-risk injured people with manual therapies may result in no additional benefits, poorer long-term outcomes, and/or less confidence in self-managing pain.

Implementation considerations

Indications:

- Not recommended as primary treatment but could be provided in conjunction with other recommended treatments provided there is clinical benefit.
- More likely to be beneficial in the acute phase of whiplash injury for symptom management compared with the chronic phase.

Dose:

- Short-term treatment 1-2x/wk for 4-6wk.

Considerations:

- Vascular structures and risks associated with pressure applied to these regions when performing massage to the cervical region.
- More likely to be beneficial in the acute phase of whiplash injury for symptom management.
- HCPs are able to provide massage techniques during multimodal care.

12. Passive therapy treatment recommendations

T.11. Cervical soft collar

Is intermittent use of a cervical soft collar in addition to usual care effective for the management of acute WAD?

T.11.1. Executive summary

There were 8 studies included to determine the effect of intermittent soft collar use for people with acute whiplash (Bonk et al., 2000; Borchgrevink et al., 1998; Crawford et al., 2004; Dehner et al., 2006; Kongsted et al., 2007; Mealy et al., 1986; Pennie & Agambar, 1990; Vassiliou et al., 2006). A summary of the included studies is detailed in Table 29. Study populations and intervention characteristics were applicable to an Australian context. The evidence suggests that intermittent immobilisation with soft collar in people with acute WAD results in little to no difference in short- and long-term critical outcome effects. Table 30 outlines the GRADE Evidence to Decision Framework decisions for the management of people with acute WAD.

Effect on neck pain (see T.11.2 for details)

Short-term (2 weeks to 3 months) (low certainty in the evidence):

All 8 trials that were included evaluated short-term neck pain in people with acute WAD. The evidence suggests that intermittent immobilisation with soft collar results in little to no difference in short-term neck pain compared with a period of immobilisation with soft collar in acute WAD.

Long-term (>3 months to 12 months) (low certainty in the evidence):

6 trials were included that evaluated long-term neck pain outcomes in acute WAD. The evidence suggests that early neck movement results in little to no difference in long-term neck pain compared with a period of immobilisation with soft collar in acute WAD.

Effect on neck disability (see T.11.3 for details)

Short-term (2 weeks to 3 months) (low certainty in the evidence):

3 trials examined short-term neck disability outcomes. The evidence suggests that early neck movement results in little to no difference in long-term neck disability compared with immobilisation with soft collar in acute WAD.

Long-term (>3 months to 12 months) (low certainty in the evidence):

3 trials examined short-term neck disability outcomes. The evidence suggests that early neck movement results in little to no difference in long-term neck disability compared with immobilisation with soft collar in acute WAD.

Effect on psychological functioning (see T.11.4 for details)

Long-term (>3 months to 12 months) (low certainty in the evidence):

1 trial examined long-term psychological functioning outcomes. The evidence suggests that early neck movement results in little to no difference in long-term psychological functioning compared with immobilisation with soft collar in acute WAD.

Table 29: Summary of included studies (intermittent immobilisation with soft collar)

Author Year	Participants and setting (country)	Intervention (neck movement)*	Control (intermittent immobilisation with soft collar)	Outcomes included	Neck pain outcomes	Neck disability outcomes	Psych functioning outcomes	Summary (risk of bias PEDRO score)
(Bonk et al., 2000), Giebel 1997	97 participants with acute WAD in primary care (Germany)	10min ice, movement, strengthening and isometric exercises of the neck muscles with physiotherapist over 3wk; 3 sessions in week 1, and 2 sessions/wk for weeks 2-3. Home exercises and education regarding posture for an additional 3 wk.	Instructed to wear collar for three weeks. No active therapy or immobilisation.	Neck pain at 12wk	Prevalence of pain (%)	x	x	Physiotherapy consisting of active neck movement and exercises had no significant effect on short-term neck pain prevalence compared with collar use in acute WAD. (5)
(Borchgrevink et al., 1998)	178 participants with acute WAD in primary care (Norway)	Instructions for self-training of the neck. Received no sick leave or collar.	Instructions for self-training of the neck. Immobilisation with soft neck collar for 2wk (2 hours on/off during the day and on during the night).	Neck pain at 2wk and 6 mo.	VAS (0-100)	x	x	Trivial reductions in long-term neck pain were found with early neck movement compared with collar use in acute WAD. (6)

(Crawford et al., 2004)	108 participants with acute WAD in primary care (UK)	Soft collar use immediately following accident. Following hospital discharge were advised to mobilise freely out of the collar immediately and provided with advice sheet on neck movement exercises.	Standard soft collar for 3wk then advice as per intervention.	Neck pain at 12wk and 12 mo.	VAS (0-10)	x	x	No benefit of early neck movement compared with soft collar use for short- or long-term neck pain in acute WAD. (5)
(Dehner et al., 2006)	64 participants with acute WAD in primary care (Germany)	At 24h post injury, soft collar use for 2d and NSAIDs. Post 7d: physiotherapy program 2-3 sessions/wk for 6wk consisting of soft-tissue treatment, joint mobilisation, strengthening and stabilisation exercises of C-spine.	As per intervention, except 10 d of soft collar use.	Neck pain and neck disability at 2- and 6-mo.	VAS (0-100)	Disability VAS score (0-100)	x	No significant differences in neck pain and disability when comparing neck immobilisation with soft collar for 2 d or 10 d prior to physiotherapy intervention in acute WAD. (4)

(Kongsted et al., 2007)	309 participants with acute WAD in primary care (Denmark)	Education session to stay active in spite of symptoms and resume normal activities.	Neck collar during all waking hours for 2 wk. Physiotherapy consultation after 2wk to begin active movement program.	Neck pain, neck disability, and psych functioning at 1 y.	NRS (0-10)	Copenhagen Neck Functional Disability Scale	SF-36 Mental Summary	No significant differences in long effects on neck pain, disability, and psych functioning were shown between education to stay active and collar use in acute WAD. (8)
(Mealy et al., 1986)		- Maitland mobilizations and exercise - ice in the first 24 hours and then neck mobilization using the Maitland technique and daily exercises of the cervical spine - analgesia prn	- Standard management - received a soft cervical collar and were advised to rest for two weeks before beginning gradual mobilisation. - analgesia	Neck pain at 8wk.	NRS (0-10)	x	x	Clinically significant treatment effect in favour of active treatment over collar immobilisation. (6)
(Pennie & Agambar, 1990)	135 participants with acute WAD in primary care (UK)	Active treatment for 5mo: Bi-weekly traction (30s on 30s off for 10mins), neck/shoulder exercises, and advice on neck care and sleeping posture	2wk rest in either a soft collar or a molded thermoplastic polyethylene foam collar, followed by active treatment.	Neck pain at 6-8wk and 5 mo.	Average pain reduction (% on 0-100 scale)	x	x	No clinically significant differences between active treatment and collar use for 2wk prior to active treatment in short- and long-term neck pain in acute WAD. (3)

(Vassiliou et al., 2006) (incorporates Schnabel 2004)	200 participants with acute WAD in primary care (trauma outpatient department, Germany)	- 10 sessions of physical therapy and active exercises within the first 14 days after whiplash injury. - application of heat pack to neck, lymph drainage for, massage, and 10 min active exercises with an elastic resistance exercise band - Performed at home for first 14/7 after injury for 20mins daily - Diclofenac and ranitidine administered according to control group procedure - Soft collar prn within first 2/7 after injury	A soft collar had to be worn continuously after the injury during the first seven days in addition to oral medication with diclofenac (50 mg three times daily) and ranitidine (150 mg twice daily)	Neck pain and neck disability at 6wk and 6mo.	NRS (0-10)	Disability NRS (0-10)	x	Physical therapy regimen which includes active exercises is superior in reducing pain 6 weeks and 6 months after whiplash injury compared to the current standard treatment with a soft collar. (4)

*Note that the intervention in this case was active neck movement as per the study designs, which is more consistent with usual care. However, the clinical question is specific to the control interventions which involve intermittent soft collar use.

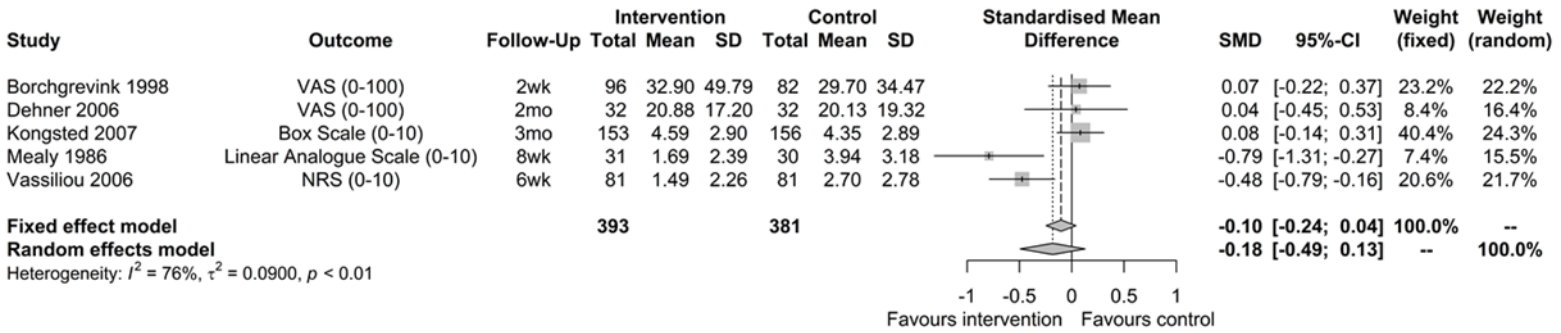
T.11.2. Effect on neck pain

Short-term outcomes (acute WAD)

Included studies: Bonk 2000; Borchgrevink 1998; Crawford 2004; Dehner 2006; Kongsted 2007; Pennie 1990; Mealy 1986; Vassilou 2006

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Indeterminant effect on short-term neck pain between early neck movement and cervical immobilisation with soft collar. 1) SMD neck pain: -0.18 (-0.49, 0.13) (meta-analysis of 5 studies). 2) Prevalence of pain I-C: RR 0.13 (0.02, 1.02) (Bonk 2000). 3) MD VAS (0-10) I-C: -0.6, p =0.34 (Crawford 2004). 4) Reduction in pain (% on 0-100 scale) I: 68% vs C: 64% (Pennie 1990).	⊕⊕◯◯ Low	CRITICAL
8	Serious[a]	Serious[b]	Not serious	Not serious[c]	None			

Meta-analysis: 5/8 trials Acute WAD - short-term neck pain (follow-up: range 2 weeks to 3 months)



I: intervention group (neck movement), C: control group (immobilisation), SMD: standardised mean difference, RR: relative risk, MD: mean difference

[a]Risk of bias ranged from 3/10-9/10 (1 study high, 5 studies moderate, and 1 study low risk of bias.

[b]5/8 trials were able to be meta-analysed with an indeterminate pooled effect and high heterogeneity. Relative risk of pain prevalence favoured the intervention in the study by Bonk 2000, however, the confidence intervals likely crossed the clinically important threshold and zero. As a result, inconsistency was deemed as serious overall.

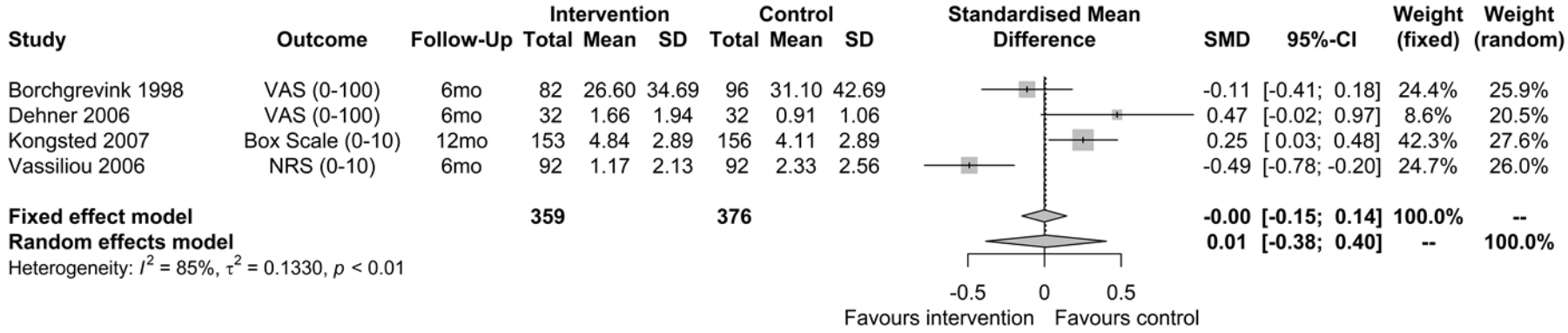
[c]Total number of observations was adequate (>400) and the pooled treatment effect was within the clinically important threshold. Only one of the remaining three studies showed imprecision in the relative risk of pain prevalence between groups (Bonk 2000). As a result, the imprecision was deemed as not serious.

Long-term outcomes (acute WAD)

Included studies: Borchgrevink 1998; Crawford 2004; Dehner 2006; Kongsted 2007; Pennie 1990; Vassilou 2006

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Early neck movement (n=383) and cervical immobilisation with soft collar (n=411). 1) SMD neck pain: 0.01 (-0.38, 0.40) (meta-analysis of 4 studies). 2) MD VAS (0-10) I-C: 0.67 (p =0.07) (Crawford 2004). 3) Reduction in pain (% on 0-100 scale): I 90% vs C 88% (Pennie 1990).	⊕⊕◯◯ Low	CRITICAL
6	Serious[a]	Serious[b]	not serious	Not serious	None			

Meta-analysis: 3/5 trials Acute WAD - long-term neck pain (follow-up: range >3 months to years)



[a]Risk of bias ranged from 3/10-8/10 (1, 3, and 1 study assessed as having high, moderate, and low risk of bias). Kongsted et al. (2007) had low risk of bias (8/10) and represented a significant proportion of all observations (n=309), and therefore, it was not deemed as very serious.
[b]4/6 trials were meta-analysed with treatment effects indeterminant and high heterogeneity (85%). The remaining two studies showed no significant difference in long-term neck pain outcomes between groups (Crawford 2004; Pennie 1990). The overall outcome was deemed as indeterminant and therefore inconsistency was only rated down to serious.

T.11.3. Effect on neck disability

Short-term outcomes (acute WAD)

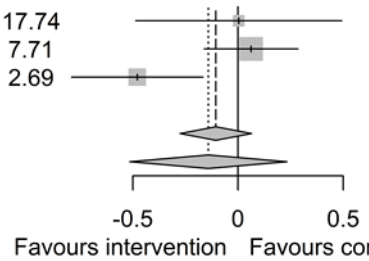
Included studies: Dehner 2006; Kongsted 2007; Vassilou 2006

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Indeterminant effect.	⊕⊕◯◯ Low	CRITICAL

3	Not serious[a]	Serious[b]	Not serious	Serious[c]	None			
Meta-analysis: 3/3 trials Acute WAD - short-term neck disability (follow-up: range 2 weeks to 3 months; assessed with Copenhagen Neck Functional Disability Scale, Disability VAS Score, Disability NRS)								

Study	Outcome	Follow-Up	Intervention Total	Intervention Mean	Intervention SD	Control Total	Control Mean	Control SD	SMD	95%-CI	Weight (fixed)	Weight (random)
Dehner 2006	VAS (0-100)	2mo	32	15.39	15.90	32	15.33	17.74	0.00	[-0.49; 0.49]	12.1%	25.7%
Kongsted 2007	CNFDS	3mo	153	11.67	8.29	156	11.17	7.71	0.06	[-0.16; 0.29]	58.2%	39.5%
Vassiliou 2006	NRS (0-10)	6wk	81	1.31	2.19	81	2.49	2.69	-0.48	[-0.79; -0.17]	29.7%	34.8%
Fixed effect model			**266**			**269**			**-0.11**	**[-0.28; 0.06]**	**100.0%**	**--**
Random effects model									**-0.14**	**[-0.51; 0.23]**	**--**	**100.0%**

Heterogeneity: I^2 = 75%, τ^2 = 0.0791, p = 0.02

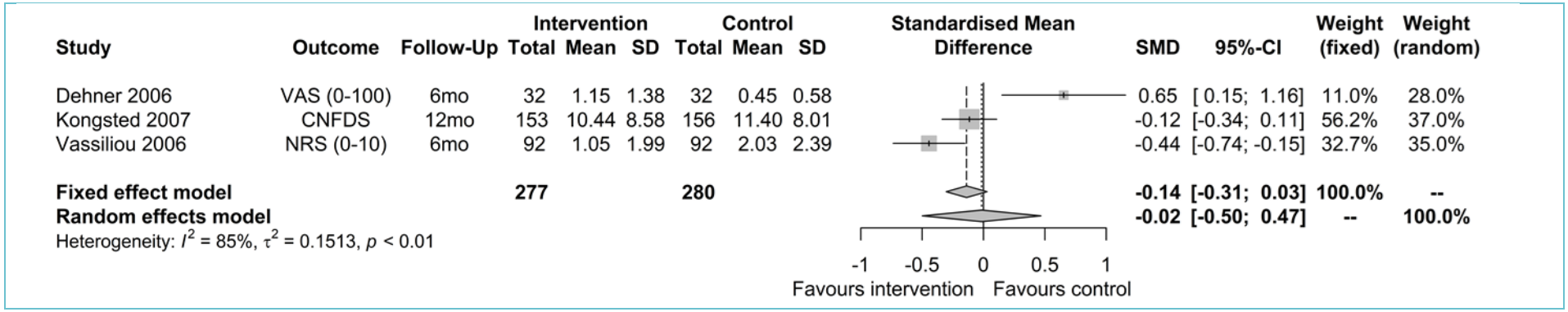


[a]Risk of bias was low as the study by Kongsted et al. (2007) had low risk of bias (8/10) and represented a significant proportion of all observations (n=309).
[b]Study findings were inconsistent with high heterogeneity.
[c]The total number of observations was above the adequate threshold, however, confidence intervals were wide.

Long-term outcomes (acute WAD)

Included studies: Dehner 2006; Kongsted 2007; Vassilou 2006

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Indeterminant effect.	⊕⊕◯◯ Low	CRITICAL
3	Not serious[a]	Serious[b]	not serious	Serious[c]	None			
Meta-analysis: 3/3 trials Acute WAD - short-term neck disability (follow-up: range 2 weeks to 3 months; assessed with Copenhagen Neck Functional Disability Scale, Disability VAS Score, Disability NRS)								



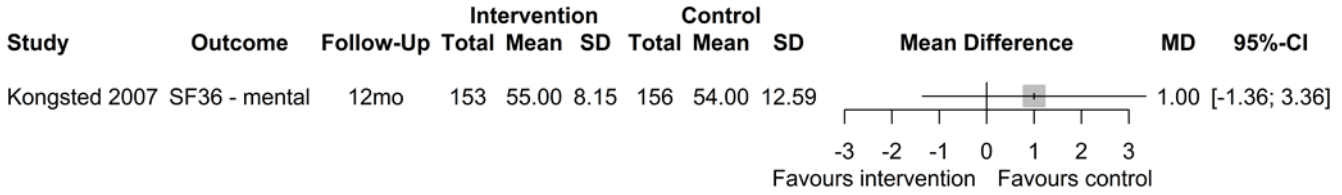
[a]Risk of bias was low as the study by Kongsted et al. (2007) had low risk of bias (8/10) and represented a significant proportion of all observations (n=309).
[b]High heterogeneity was found between studies.
[c]The total number of observations was above the adequate threshold, however, confidence intervals were wide.

T.11.4. Effect on psychological functioning

Long-term outcomes (acute WAD)

Included studies: Kongsted 2007

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Early neck movement (n=153) and cervical immobilisation with soft collar (n=156). MD 1 SF-36 Mental higher (1.36 lower to 3.36 higher)	⊕⊕◯◯ Low	CRITICAL
1	Not serious	Not serious	not serious	Very serious[a]	None			



[a]The total number of observations was below the adequate threshold and findings were based on a single trial. Confidence intervals, however, were within the clinically significant threshold and zero.

Table 30: Evidence to decision framework (intermittent use of soft collar for acute WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
● Trivial ○ Small ○ Moderate ○ Large ○ Varies ○ Don't know	The evidence suggests that neck movement compared with a period of immobilisation with soft collar followed by neck movement in acute WAD results in little to no difference in short- and long-term neck pain and disability, and long-term psychological functioning.	Immobilisation with soft collar is usually prescribed for short-term use and people commence active neck movement following removal of the collar.
Undesirable Effects **How substantial are the undesirable anticipated effects?**		
Judgement	Research evidence	Additional considerations
○ Large ○ Moderate ○ Small ● Trivial ○ Varies ○ Don't know	No adverse effects reported in clinical trials in either group.	Potential for exacerbation of pain symptoms with early movement of the neck in people with high initial pain intensity.
Certainty of evidence **What is the overall certainty of the evidence of effects?**		
Judgement	Research evidence	Additional considerations
○ Very low ● Low ○ Moderate ○ High ○ No included studies	Certainty of evidence was low for all short/long-term critical outcomes, primarily due to inconsistent findings and wide pooled confidence intervals.	Heterogeneity was present in treatment and control interventions.
Balance of effects **Does the balance between desirable and undesirable effects favour the intervention or the comparison?**		
Judgement	Research evidence	Additional considerations

○ Favours the comparison ○ Probably favours the comparison ● Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ○ Don't know	Similar treatment effects and low risk for adverse effects in early movement versus a period of immobilisation if neck movement was integrated after a period of intermittent immobilisation. In the study that included neck immobilisation for 1wk and analgesia as the control group, no specific treatment was specified after this period (Vassiliou 2006). This resulted in small non-clinically significant short- and long-term increases in neck pain and neck disability.	Can't be seen in isolation to other recommended active treatments for management of people with acute WAD. Heterogeneity was present in treatment and control interventions, many of which had a greater emphasis on passive therapies in addition to active, which is not consistent with recommended treatments in these guidelines.
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Large costs ○ Moderate costs ● Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	No included evidence.	Intermittent immobilisation with soft collar for a period is then followed by active therapy and is unlikely to incur further costs than usual care.
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	

Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	
Equity What would be the impact on health equity?		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ● Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Can be provided in emergency departments or primary care settings.
Acceptability Is the intervention acceptable to key stakeholders?		
Judgement	Research evidence	Additional considerations

○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	Conducted in primary care settings in a variety of countries across the 8 clinical trials.	The injured person's level of pain and psychological distress, healthcare professional assessment of the injured person's clinical presentation, and site of presentation of their ED vs primary care settings, needs to be considered when determining whether intermittent cervical soft collar use is acceptable.
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know	No included evidence.	Can be provided in emergency departments or primary care settings.

T.11.5. Conclusions (intermittent use of soft collar for acute WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	●	○	○

Recommendations
The guideline panel cannot recommend for or against intermittent use of a cervical soft collar in addition to usual care (advice and exercise) for the management of people with acute WAD. *(Panel vote summary: 8/10 80% neutral; 2/10 20% conditional for)* **Justification** • The evidence suggests that intermittent immobilisation of the neck with a soft collar in acute WAD results in little to no difference in short- and long-term neck pain and disability, and long-term psychological functioning (low to moderate certainty in the evidence of critical outcome effects).

- Potential inactivity during a period of immobilisation, compared with physical activity, could result in small non-clinically significant increases in neck pain (Mealy et al., 1986).
- Active therapy is recommended for management of people with acute WAD (see sections: neck-specific exercises, psychologically informed exercise interventions, dizziness-specific exercises, specific-education).
- No adverse effects reported with intermittent soft collar use, and trivial adverse effects are expected.

Subgroup considerations

- There may be some instances where it is clinically indicated (e.g., high initial pain intensity) for a soft collar to be used for a short period of time in people with acute WAD.

Implementation considerations

Indications:

- There may be some instances where use of a soft collar is indicated (e.g., high initial pain). In these instances, use for a short period only (up to two weeks) and at intervals throughout the day.

Dose:

- Short period only (up to two weeks) and at intervals throughout the day.

Considerations:

- Early movement and return to usual activities are recommended as part of active treatment for the management of acute WAD, given the overall benefits of movement and physical activity over inactivity.
- Contextual factors of the injured person such as pain, disability, and psychological distress if considering prescribing intermittent soft collar use.
- HCPs should advise their injured people to mobilise the neck as tolerated when the soft collar is not worn.

T.12. Passive: Electrotherapy

Are electrotherapy techniques in addition to usual care effective for the management of acute or chronic WAD?

T.12.1. Executive summary

There were five clinical trials evaluating the effect of electrotherapy techniques for the management of people with acute WAD (Table 31). No clinical trials for chronic WAD were included. No trials were conducted in an Australian setting. Table 32 outlines the GRADE Evidence to Decision Framework decisions for the management of people with acute and chronic WAD.

One trial was included in the existing acute WAD guidelines that evaluated the effect of pulsed low energy low frequency magnetic fields for the management of whiplash injury (Thuile et al., 2002). However, the duration of WAD symptoms was not outlined in the study and key details regarding participant randomisation methods and blinding of participants/assessors were missing. The study was evaluated as high risk of bias with a PEDRO score of 2/10 and treatment effects were only evaluated immediately after the intervention with no follow-up timepoints. Given the study limitations and unspecified chronicity, the study was excluded from these guidelines.

Electrotherapy techniques

- Ultra-reiz: also called ultra-stimulation current, is an interrupted direct current of low frequency applied via medium sized electrodes supported on a thick moist sponge. These electrodes are placed near the spinal column along the neck and upper back region.
- Transcutaneous electrical nerve stimulation (TENS): gentle electric current to stimulate nerves around the pain site, with the goal of interrupting nociceptive signalling.
- Low-energy high frequency pulsed electromagnetic therapy (PEMT).
- High powered laser therapy.
- Ultrasound: ultrasound energy applied to the skin to increase blood circulation to the injured tissue.

Effect on neck pain (see T.12.2 for details)

Acute WAD short-term (2 weeks to 3 months) (very low certainty in the evidence):

N=5 trials. Conforti 2013: Compared high powered laser therapy to multimodal physical therapy.

Foley-Nolan 1992: High frequency pulsed electromagnetic therapy (PEMT) within a collar and advice for mobilisation compared with standard collar, analgesia, and advice for mobilisation.

Hendriks 1996: low frequency ultra-reiz therapy in addition to exercise and immobilisation with collar.

Provinciali 1996: TENS and ultrasound compared with multimodal physical therapy.

Ruiz-Molinero 2014: Ultrasound in addition to manual therapy and exercise.

Electrotherapy techniques may result in little to no effect on short-term neck pain in people with acute WAD, but the evidence is very uncertain.

Acute WAD long-term (>3 months to 12 months) (very low certainty in the evidence):

N=1 trial. Provinciali 1996: Electrotherapy techniques compared with usual care may result in increases in long-term neck pain in people with acute WAD, but the evidence is very uncertain.

Additional considerations: Adverse effects

Acute WAD:

Conforti 2013: Not reported.

Foley-Nolan 1992: Not reported.

Hendriks 1996: Not reported.

Provinciali 1996: Not reported.
Ruiz-Molinero 2014: Not reported.

Chronic WAD:
No studies included.

Table 31: Summary of included studies (electrotherapy techniques for acute and chronic WAD)

Author Year	Participants and setting (country)	Intervention (Electrotherapy)	Control (mixed comparators)	Outcomes included	Neck pain outcomes	Neck disability outcomes	Psych functioning outcomes	Summary (risk of bias PEDRO score)
(Conforti & Fachinetti, 2013) Acute	134 participants recruited with acute WAD (Italy)	High powered laser therapy (HPLT-FP3 system, class IV laser therapy) over trigger point areas (lower cervical and shoulders) for 5 min (5x 40 sec applications during session) sessions, once daily, 5 days. Did not exceed skin temperature increases of more than 2.5°C.	Participants were treated with conventional simple segmental physical rehabilitation based on an active injured person involvement and education, minimizing manual therapy procedures, and using primarily self-treatment strategies.	Neck pain at 1mo	VAS (0-100)	X	X	Participants who underwent high powered laser therapy had greater reductions in pain severity and earlier RTW compared with participants who underwent physical therapy. (4)
(Foley-Nolan et al., 1992) Acute	40 participants recruited from a hospital A&E department with acute WAD (Ireland)	Collar with low-energy high frequency pulsed electromagnetic therapy (PEMT) worn 8h per day for 12wk. Participants were referred for physio if they were unhappy with their progress after 4wk	Standard collar plus non-steroidal anti-inflammatories. Collar was worn 8h per day for 12wk. Participants were referred for physio if they were unhappy with their progress after 4wk	Neck pain at 12wk.	VAS (0-10)	X	X	PEMT shown to be beneficial, but subjects required to wear collar for 8 hours per day for 12 weeks. At 4 weeks, 9 people in the PEMT group and 12 people in the placebo group were referred for mobilising physiotherapy. (9)
(Hendriks, 1996)	16 participants	Multimodal (ice, neck ROM	Multimodal (ice, neck ROM	Neck pain at 6wk	VAS (0-100)	X	X	Ultra-reiz, as an adjunct to standard

Acute	recruited from an emergency department with acute WAD (Ireland)	exercises and advice regarding neck care, posture, and use of collar) and 5 treatments of ultra-reiz therapy (interrupted low frequency direct current (143 Hz)).	exercises and advice regarding neck care, posture, and use of collar).					physiotherapy treatment, is an effective method of decreasing or eliminating pain of the acute, uncomplicated person with whiplash. (3)
(Provincial i et al., 1996) Acute	60 participants with acute WAD, unknown setting, (Italy)	Participants received multimodal treatment involving postural training, joint mobilisation techniques, relaxation exercises and psychological support.	Participants received passive treatment involving passive electrotherapeutic modalities like TENS and ultrasound*	Neck pain at 1mo and 6mo.	VAS (0-10)	X	X	Clinically and statistically significant benefit in favour of multimodal program in terms of pain and sick leave. (6)
(Ruiz-Molinero et al., 2014) Acute	54 participants recruited from a private physiotherapy clinic with acute WAD (Spain)	Active ultrasound, and massage and active range of motion exercises for the cervical spine	Same as intervention except ultrasound was off	Neck pain at 1mo	VAS (0-100)	X	X	Active ultrasound was no more effective than placebo in reducing pain and increasing joint mobility, but at discharge (20 days after completing the implementation of US), the active ultrasound was more effective than placebo in reducing pain, but not for increasing joint mobility, in acute

								traumatic cervical sprain grades I and II. (8)

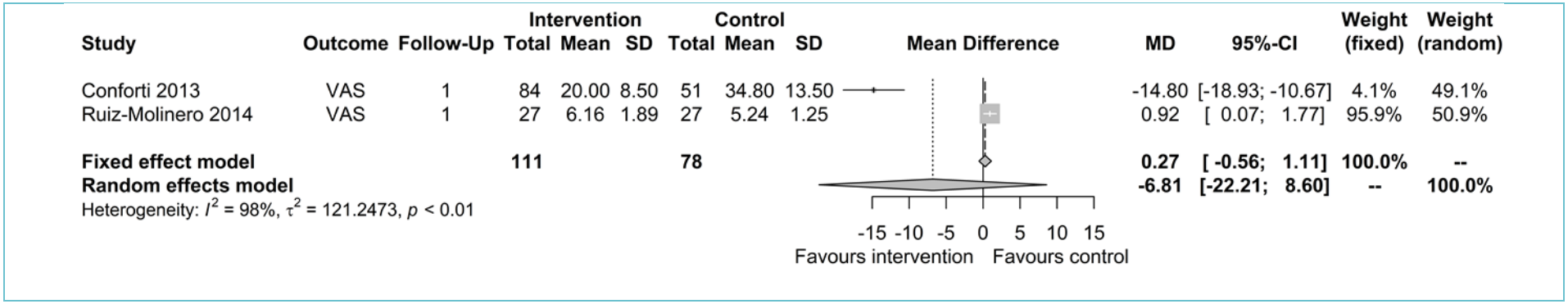
*Control group was electrotherapy and was therefore considered as the intervention for the purpose of this PICO.
VAS, visual analog scale

T.12.2. Effect on neck pain

Short-term outcomes (acute WAD)

Included studies: Conforti 2013, Foley-Nolan 1992, Hendriks 1996, Provinciali 1996, Ruiz-Molinero 2014.

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Total N = 305 (intervention ~169, control ~136) Conforti 2013, Ruiz-Molinero 2014: see figure below. Foley-Nolan 1992 (Intervention group n=20, control group n=20): No significant differences in median pain scores on VAS (0-10) at 12wk^ Hendriks 1996 (no specification of n per group, total N=16): Intervention group achieved statistically significant greater improvement compared to control group over 6wk. T-value for difference between groups was 3.2 (<0.005). Inclusion of Provinciali (1996): (N=60) Median pain scores of intervention group (usual care) was lower compared to control group (electrotherapy) at 1 month post intervention (intervention 3.0, control 5.25) and this difference was statistically significant (P <0.001).	⊕◯◯◯ Very low	CRITICAL
5	Serious[a]	Serious[b]	Serious[c]	Serious[d]	n/a			



^, unable to meta-analyze because data on variance was not available

[a]High risk of bias in two studies that showed positive effects of electrotherapy techniques (Conforti 2013 PEDRO 4/10; Hendriks 1996 PEDRO 3/10).

[b]Point estimate and variance data were not presented in all studies, and therefore, meta-analysis was not possible for 3 studies (Foley-Nolan 1992, Hendriks 1996, Provinciali 1996). Two studies showed significant benefit of electrotherapy techniques, two studies showed no significant difference and one study showed significant negative effects of electrotherapy techniques. Studies that showed positive effects were high risk of bias, and therefore, inconsistency was only downgraded to serious, rather than very serious (inconclusive finding overall).

[c]Elements of study interventions and comparators were not consistent with usual care in an Australian context. For example, immobilisation with neck collar, and manual and passive therapy techniques.

[d]SMD confidence intervals in the meta-analysis crossed zero and the clinically significant thresholds of positive and negative effect.

Long-term outcomes (acute WAD)

Included studies: Provinciali 1996

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Inclusion of Provinciali (1996): (N=60) Median pain scores (VAS 0-10) of intervention group (usual care – multimodal physical therapy)) was lower compared to control group (electrotherapy) at 6 months post intervention (intervention 1.81, control 4.56) and this difference was statistically significant (P <0.001).	⊕◯◯◯ Very low	CRITICAL
1	Not serious	Serious[a]	Not serious	Very serious[b]	n/a			

[a]Findings based on a single trial with small sample size.

[b]Sample size significantly below the threshold for precision and no confidence intervals were reported.

Table 32: Evidence to decision framework (electrotherapy techniques for acute and chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
● Trivial (acute) ○ Small ○ Moderate ○ Large ○ Varies ● Don't know (chronic)	Acute: There were five clinical trials evaluating the effect of electrotherapy techniques for the management of people with acute WAD. Electrotherapy techniques may result in little to no effect on short-term neck pain in people with acute WAD, but the evidence is very uncertain. Electrotherapy techniques compared with usual care may result in increases in long-term neck pain in people with acute WAD, but the evidence is very uncertain. Chronic: No clinical trials in chronic WAD.	Mixed electrotherapy techniques included: Ultra-reiz, transcutaneous electrical nerve stimulation (TENS), low-energy high frequency pulsed electromagnetic therapy (PEMT), high powered laser therapy, ultrasound techniques. Elements of study interventions and comparators were not consistent with usual care in an Australian context. For example, immobilisation with neck collar, and manual and passive therapy techniques.
Undesirable Effects **How substantial are the undesirable anticipated effects?**		
Judgement	Research evidence	Additional considerations
○ Large ○ Moderate ○ Small ● Trivial (acute and chronic) ○ Varies ○ Don't know	Conforti 2013: Not reported. Foley-Nolan 1992: Not reported. Hendriks 1996: Not reported. Provinciali 1996: Not reported. Ruiz-Molinero 2014: Not reported.	Trivial adverse effects (e.g., discomfort) at low prevalence.
Certainty of evidence **What is the overall certainty of the evidence of effects?**		
Judgement	Research evidence	Additional considerations

● Very low (acute) ○ Low ○ Moderate ○ High ● No included studies (chronic)	Acute: High heterogeneity in short-term neck pain outcomes with two studies showing benefit of electrotherapy, two studies showing no effect and one study showing negative effects. Studies presented with serious risk of bias and serious indirectness was noted with study designs (interventions/comparators), that may not be consistent with an Australian context.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ● Does not favour either the intervention or the comparison (acute) ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● Don't know (chronic)	Acute: Overall there were no significant benefits on short-term neck pain in acute WAD trials. Long-term follow-up evaluated in one study which showed clinically significant negative effects when comparing electrotherapy to multimodal physical therapy in people with acute WAD. Serious indirectness noted with study designs (interventions/comparators), that may not be consistent with an Australian context. Trivial adverse effects expected. Chronic: No clinical trials for chronic WAD.	Contraindications for electrotherapy techniques: on an open wound if the skin is irritated near sensitive areas such as your eyes in or around water during pregnancy on people with a pacemaker or a cochlear implant on people with epilepsy
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations

○ Large costs ○ Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ● Don't know	No included evidence.	Some primary HCPs have electrotherapy machines in their practice. However, there are differences in electrotherapy types and their associated purchase and operating costs.
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations

○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	Application of these interventions does require healthcare professional time for setup which can reduce time spent prescribing recommended treatments.
Equity What would be the impact on health equity?		
Judgement	Research evidence	Additional considerations
○ Reduced ● Probably reduced ○ Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Some primary healthcare professionals have electrotherapy machines in their practice. However, there are differences in electrotherapy types. Access to professionals with this equipment needs to be considered (e.g., rural/remote areas).
Acceptability Is the intervention acceptable to key stakeholders?		
Judgement	Research evidence	Additional considerations

○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	No evidence for significant drop out rates in acute WAD trials with electrotherapy.	No clinical trials were carried out in an Australian context. Injured person and PHCP beliefs will influence acceptability.
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	No included evidence.	Primary healthcare professionals have electrotherapy machines in their practice. However, there are differences in electrotherapy types. Application of these interventions does require healthcare professional time for setup which can reduce time for recommended treatments. It is not standard practice to teach electrotherapy techniques to primary healthcare professionals in tertiary education settings in Australia.

T.12.3. Conclusions (electrotherapy techniques for acute WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Neither for or against the intervention	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	●	○	○	○

Recommendations
The guideline panel suggest that healthcare professionals do not use electrotherapy techniques in addition to usual care for the management of people with acute WAD. *(Panel vote summary: 9/11 82% conditional against; 2/11 strong against)*

Justification

- There were five clinical trials evaluating the effect of electrotherapy techniques for the management of people with acute WAD. Electrotherapy techniques may result in little to no effect on short-term neck pain in people with acute WAD in two of the five trials, two trials showed benefit of electrotherapy techniques, however, they were of high risk of bias and interventions/comparators were not consistent with usual care in an Australian context.
- One trial showed a clinically significant difference in short- and long-term neck pain in favour of multimodal physical therapy compared with electrotherapy.
- Electrotherapy techniques are passive therapies that differ to recommendations of active modalities and could increase a person's reliance on passive therapy for pain management.
- Serious indirectness noted with study designs (interventions/comparators), that may not be consistent with an Australian context. No clinical trials performed in an Australian context, and it is not standard practice to teach electrotherapy techniques in tertiary education settings in Australia.

T.12.4. Conclusions (electrotherapy techniques for chronic WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Neither for or against the intervention	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	●	○	○	○

Recommendations

The guideline panel suggest that healthcare professionals do not use electrotherapy techniques in addition to usual care for the management of people with chronic WAD.

(Panel vote summary: 9/11 82% conditional against; 2/11 strong against)

Justification

- No clinical trials for chronic WAD.
- Not consistent with recommended active biopsychosocial approach to chronic WAD.
- See justification for electrotherapy techniques for people with acute WAD.

T.13. Passive: Acupuncture

Are acupuncture techniques in addition to usual care effective for the treatment of acute or chronic WAD?

T.13.1. Executive summary

There were three studies included to determine the effect of acupuncture techniques compared other interventions for people with acute or chronic WAD (Table 33). Table 34 outlines the GRADE Evidence to Decision Framework decisions for the management of people with acute and chronic WAD.

Study populations and intervention characteristics were applicable to an Australian context for the two chronic WAD studies. However, the findings from one study (Kim et al 2020) in acute WAD were not applicable to an Australian context.

A trial by Aigner et al. (2006) evaluated the effect of laser acupuncture in the treatment of acute whiplash injuries and was included in the NSW acute WAD guidelines (2014 edition). However, we excluded this study from these guidelines as neck pain outcomes were collected retrospectively with high risk of recall bias; a questionnaire was completed by participants 8-12mo post-injury asking them to recall the number of days that they experienced neck pain following injury.

The evidence suggests that acupuncture techniques may moderately reduce short-term neck pain in chronic WAD in addition to usual care, however, similar magnitude effects on long-term neck pain are very uncertain. Acupuncture techniques may have trivial effects on neck disability in chronic WAD, which are significantly below the clinical importance threshold. Acupuncture techniques in addition to usual care may result in little to no difference in short-term psychological outcomes.

Effect on neck pain (see T.13.2 for details)

Acute WAD short-term (2 weeks to 3 months) (very low certainty in the evidence):

N=1 trial (Kim 2020). Compared Motion Style Acupuncture technique in addition to integrative Korean Medicine. Acupuncture techniques may result in little to no difference in short-term neck pain in people with acute WAD, but the evidence in very uncertain.

Chronic WAD short-term (2 weeks to 3 months) (moderate certainty in the evidence):

N=2 trials (Cameron 2011; Kwak 2012). Compared electroacupuncture to sham acupuncture (Cameron 2011) and acupuncture in addition to usual care (Kwak 2012). The evidence suggests that acupuncture techniques in addition to usual care likely results in moderate reductions in short-term neck pain in people with chronic WAD.

Chronic WAD short-term (>3 months to 12 months) (low certainty in the evidence):

N=1 trial (Cameron 2011). The evidence suggests that electro acupuncture compared with sham treatment may result in moderate reductions in long-term neck pain in people with chronic WAD.

Effect on neck disability (see T.13.3 for details)

Acute WAD short-term (2 weeks to 3 months) (very low certainty in the evidence):

N=1 trial (Kim 2020). Acupuncture techniques may result in little to no difference in short-term neck disability in people with acute WAD, but the evidence in very uncertain.

Chronic WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=1 trial (Cameron 2011). The evidence suggests that acupuncture techniques in addition to usual care may result in little to no difference in short-term neck disability.

Chronic WAD long-term (>3 months to 12 months) (low certainty in the evidence):

N=1 trial. The evidence suggests that acupuncture techniques in addition to usual care may result in little to no difference in long-term neck disability.

Effect on psychological functioning (see T.13.4 for details)

Chronic WAD short-term (2 weeks to 3 months) (moderate certainty in the evidence):

N=2 trials (Cameron 2011; Kwak 2012). The evidence suggests that acupuncture techniques in addition to usual care likely results in little to no difference in short-term psychological functioning.

Chronic WAD long-term (>3 months to 12 months) (low certainty in the evidence):

N=1 trial (Cameron 2011). The evidence suggests that acupuncture techniques in addition to usual care may result in little to no difference in long-term psychological functioning.

Table 33: Summary of included studies (acupuncture techniques for acute and chronic WAD)

Author Year	Participants and setting (country)	Intervention (acupuncture techniques)	Control	Outcomes included	Neck pain outcomes	Neck disability outcomes	Psych functioning outcomes	Summary (risk of bias PEDRO score)
(Kim et al., 2020) (acute)	97 participants with acute WAD in primary care (South Korea)	Integrative Korean Medicine (IKM) Treatment and Motion Style Acupuncture of the trapezius muscles with movement of the neck 3x10min over days 2-4 in hospital. IKM: 2x15min/d	IKM: acupuncture, pharmacopuncture, manual therapy, and herbal medicine.	Neck pain and neck disability at 3mo	NRS (0-10)	NDI (0-100)	x	No significant short-term differences in neck pain and neck disability were found with using motion style acupuncture in addition to Integrative Korean Medicine in acute WAD. (8)
(Cameron et al., 2011) (chronic)	124 participants with chronic WAD in primary care (Australia)	8 acupuncture needle points with electroacupuncture machine (2-5Hz, 1.5volts). 30min, 2x/wk, 6wk	Sham electroacupuncture: needles positioned 2-3cm from treatment points, electroacupuncture machine connected without electrical output. 30min, 2x/wk, 6 wk	Neck pain and neck disability at 3 and 6mo.	VAS (0-10)	NDI (0-100)	SF-36 mental component	Electroacupuncture was associated with a moderate reduction in neck pain after 3 and 6 mo compared with sham acupuncture in chronic WAD. Trivial differences in neck disability were found between groups. (9)
(Kwak et al., 2012) (chronic)	40 participants with chronic WAD in primary care	Usual care + acupuncture to 10 points 3x/wk for 2 wks and usual care	Waiting list for acupuncture treatment + usual care for 2 wk.	Neck pain and psych functioning at 2wk	VAS (0-10)	x	Self-rating Depression Scale	Acupuncture in addition to usual care was associated with a moderate reduction

	(South Korea)	(physiotherapy and exercise)					(SDS) (25-100)	in short-term neck pain but no effect on psychological functioning in chronic WAD. (9)

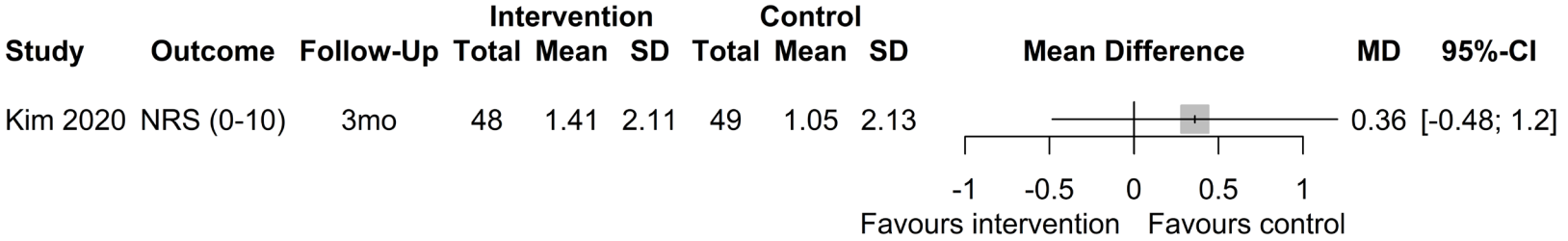
T.13.2. Effect on neck pain

Short-term outcomes (acute WAD)

Included studies: Kim 2020

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Motion style acupuncture + IKM (n=48) vs IKM (n=49). MD NRS (0-10): 0.36 (-0.48, 1.2)	⊕◯◯◯ Very low	CRITICAL
1	Not serious[a]	Serious[b]	Very serious[c]	Serious[d]	None			

Acute WAD – short-term neck pain (follow-up: 3mo; assessed with NRS: 0-10 scale)



IKM: Integrative Korean Medicine

[a]Low risk of bias (PEDRO 8/10).

[b]Findings are based on a single trial.

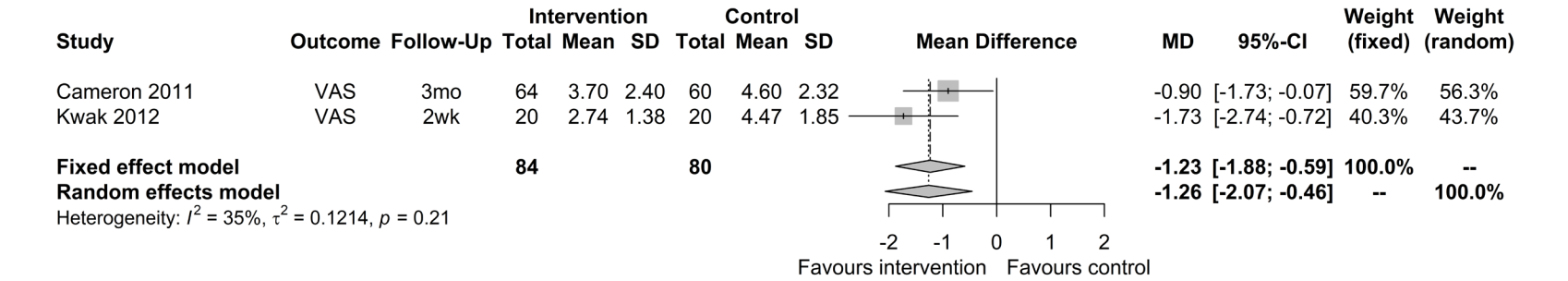
[c]Intervention and comparators are not consistent with acupuncture techniques and usual care within an Australian context.

[d]Sample size is below the adequate threshold for precision.

Short-term outcomes (chronic WAD)

Included studies: Cameron 2011; Kwak 2012

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Total N=164 MD 1.26 VAS lower (2.07 lower to 0.46 lower)	⊕⊕⊕◯ Moderate	CRITICAL
2	Not serious[a]	Not serious[b]	Not serious[c]	Serious[d]	None			
Meta-analysis: 2/2 trials chronic WAD - short-term neck pain (follow-up: range 2 weeks to 3 months; assessed with VAS: 0-10 scale)								

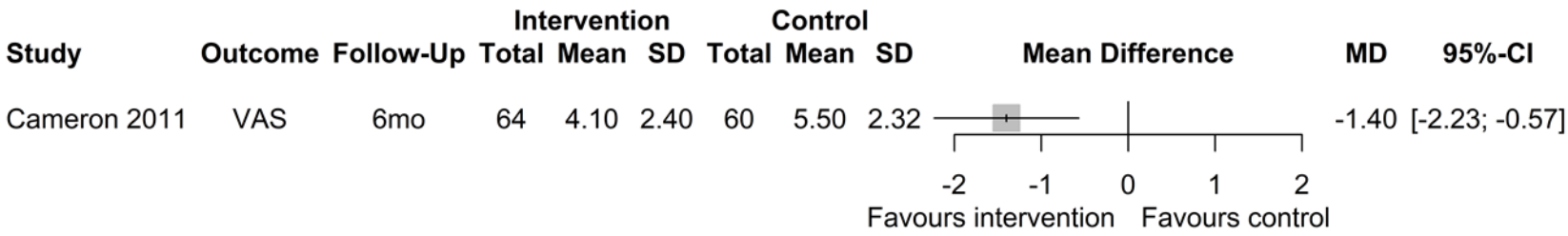


[a]Risk of bias was assessed as low in both studies (PEDRO 9/10).
[b]Non important heterogeneity between studies.
[c]The people, intervention and comparators in the studies are consistent with an Australian context. Usual care in the study by Kwak (2012) was physiotherapy and exercise, whilst the study by Cameron (2011) was carried out in Australia.
[d]Sample size is below the adequate threshold for precision, however, confidence intervals remained below zero.

Long-term outcomes (chronic WAD)

Included studies: Cameron 2011

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Electroacupuncture (n=64) vs sham electroacupuncture (n=60). MD 1.4 VAS lower (2.38 lower to 0.42 lower)	⊕⊕◯◯ Low	CRITICAL
1	not serious	Serious[a]	not serious	Serious[b]	None			
Mean follow-up 6 months; assessed with VAS: 0-10 scale								



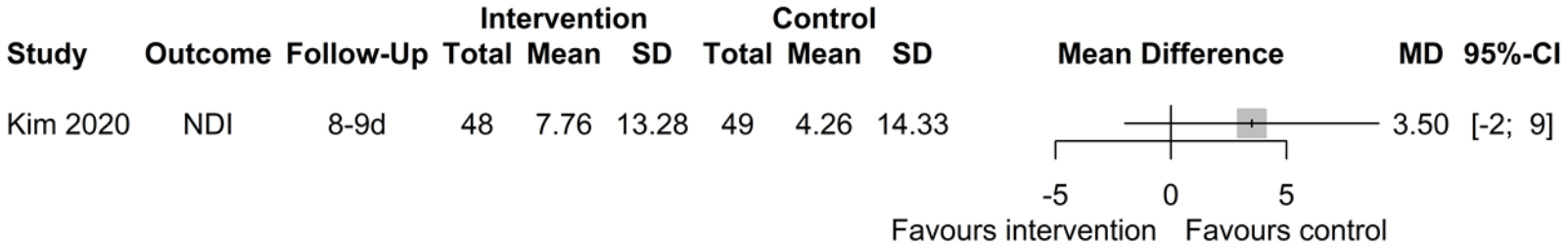
[a]Findings based on a single study.
[b]Sample size (N=124) is below the adequate threshold for precision.

T.13.3. Effect on neck disability

Short-term outcomes (acute WAD)

Included studies: Kim 2020

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Motion style acupuncture + IKM (n=48) vs IKM (n=49). MD NDI 3.50 (−2.0, 9.0)	⊕◯◯◯ Very low	CRITICAL
1	Not serious[a]	serious[b]	Very serious[c]	Serious[d]	None			
Acute WAD – short-term neck disability (follow-up: ~8-9 days*; assessed with NDI: 0-100 scale)								



IKM: Integrative Korean Medicine. *Note that this follow-up time is not consistent with inclusion criteria for short-term effects (2 weeks to 3 months), however, the research team decided to include this study as no other studies were found for acute WAD.
[a]Low risk of bias (PEDRO 8/10).
[b]Findings are based on a single trial.

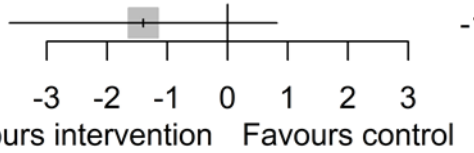
[c]Intervention and comparators are not consistent with acupuncture techniques and usual care within an Australian context.
[d]Sample size is below the adequate threshold for precision and CIs crossed the clinically significant threshold in neck disability.

Short-term outcomes (chronic WAD)

Included studies: Cameron 2011

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Electroacupuncture (n=64) vs sham electroacupuncture (n=60). MD 1.4 NDI lower (1.69 lower to 1.12 lower)	⊕⊕◯◯ Low	CRITICAL
1	not serious	Serious[a]	not serious	Serious[b]	None			
Short-term neck disability (follow-up: range 2 weeks to 3 months; assessed with NDI: 0-100 scale)								

Study	Outcome	Follow-Up	Intervention Total	Intervention Mean	Intervention SD	Control Total	Control Mean	Control SD	Mean Difference	MD	95%-CI
Cameron 2011	NDI	3mo	64	13.30	6.40	60	14.70	6.20		-1.40	[-3.62; 0.82]

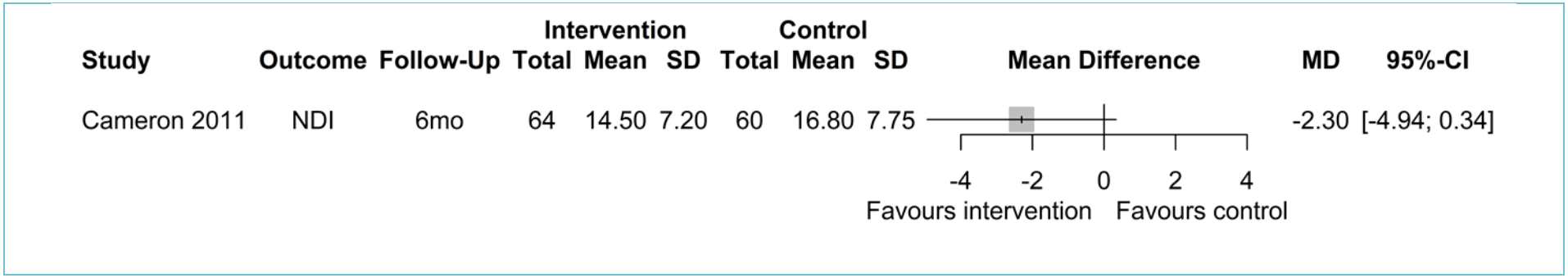


a. Findings are based on a single trial.
b. Sample size is below the adequate threshold for precision, but results were within the threshold of clinically important difference and zero.

Long-term outcomes (chronic WAD)

Included studies: Cameron 2011

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Electroacupuncture (n=64) vs sham electroacupuncture (n=60). MD 2.3 NDI lower (2.64 lower to 1.96 lower)	⊕⊕◯◯ Low	CRITICAL
1	Not serious	Serious[a]	Not serious	Serious[b]	None			
Long-term neck disability (mean follow-up 6 months; assessed with NDI: 0-100 scale)								



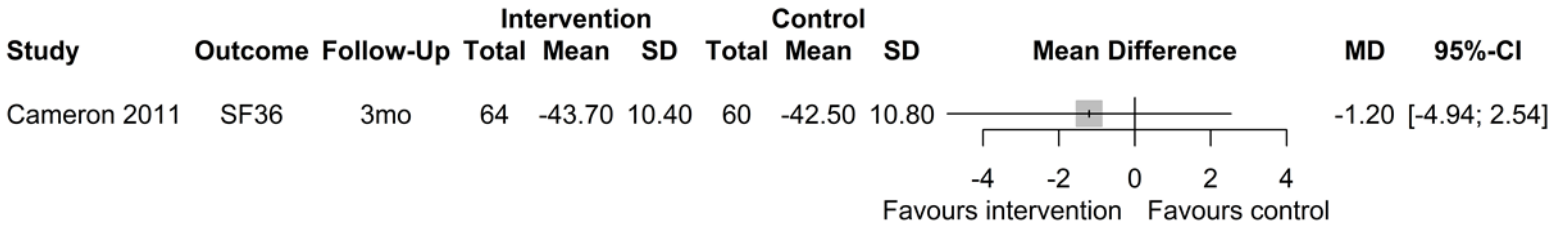
a. Findings are based on a single trial.
b. Sample size is below the adequate threshold for precision, but results were within the threshold of clinically important difference and zero.

T.13.4. Effect on psychological functioning

Short-term outcomes (chronic WAD)

Included studies: Cameron 2011; Kwak 2012

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Kwak 2012: Acupuncture +usual care (n=20) vs usual care (n=20). Mean change difference: SDS 1.57 lower (9.71 lower to 6.57 higher).	⊕⊕⊕◯ Moderate	CRITICAL
2	Not serious[a]	Not serious[b]	not serious	Serious[c]	None			
Short-term psychological functioning (follow-up: range 2 weeks to 3 months; assessed with Self-rating Depression Scale: 25-100)								



[a]Risk of bias was assessed as low in both studies (PEDRO 9/10).
[b]Non-important heterogeneity between studies, non-significant findings in both studies.
[c]The people, intervention and comparators in the studies are consistent with an Australian context. Usual care in the study by Kwak (2012) was physiotherapy and exercise, whilst the study by Cameron (2011) was carried out in Australia.
[d]Pooled sample size was below the adequate threshold for precision, however, confidence intervals were within the clinically significant thresholds.

Long-term outcomes (chronic WAD)

Included studies: Cameron 2011

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	(I: n=64, C: n=52) Effect size I-C (6mo): 0.3 (-2.1 to 2.9)	⨁⨁◯◯ Low	CRITICAL
1	Not serious	Serious[a]	Not serious	Serious[b]	None			
Long-term psychological functioning (follow-up: 6 months; assessed with SF-36 mental component score)								

[a]Findings based on a single study.

[b]Pooled sample size was below the adequate threshold for precision, however, confidence intervals were within the clinically significant thresholds.

Table 34: Evidence to decision framework (acupuncture techniques for acute and chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
Acute ○ Trivial ○ Small ○ Moderate ○ Large ○ Varies ● Don't know Chronic ○Trivial ● Small ○ Moderate ○ Large ○ Varies ○ Don't know	Acute: no significant short-term differences with motion style acupuncture in addition to integrative Korean medicine. The findings from this study (Kim et al 2020) in acute WAD were not applicable to an Australian context and follow-up timepoint is not greater than 2 weeks (~8-9 days). Unknown effects of acupuncture techniques in addition to usual care in an Australian context for acute WAD. Chronic: Moderate short- and long-term reductions in neck pain, and little to no differences in neck disability and psychological functioning. Treatment effects were not clinically significant.	Differences in intervention and comparators in chronic WAD trials: Cameron (2011): electroacupuncture vs sham Kwak (2012): acupuncture in addition to usual care (physiotherapy and exercise)
Undesirable Effects How substantial are the undesirable anticipated effects?		

Judgement	Research evidence	Additional considerations
○ Large ○ Moderate ● Small ○ Trivial ○ Varies ○ Don't know	Small in acute and chronic trials. Acute: Greater prevalence of minor adverse events were found in intervention group compared with control (Kim et al., 2020). Chronic: Minor adverse effects are recorded: Bruising (n=2), fatigue (n=1) (Kwak et al., 2012); minor pain and somatic reactions, e.g., sweating/low BP (n=4) (Cameron et al., 2011).	There are undesirable effects associated with acupuncture techniques reported at low prevalence (e.g., localised bruising). Low risk of significant harm (e.g., pneumothorax). Can create reliance on passive treatment in the chronic phase of the condition which is not conducive to promoting self-efficacy.
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations
● Very low ○ Low ○ Moderate ○ High ○ No included studies	Acute: There is no evidence on which to base a recommendation for acute WAD primarily due to the population and intervention characteristics of the single acute WAD acupuncture study (Kim et al., 2020). Chronic: Varies from very low to moderate certainty for critical outcomes.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations

○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ● Probably favours the intervention ○ Favours the intervention ○ Varies ○ Don't know	Acute: don't know. Chronic: Acupuncture techniques resulted in moderate reductions in neck pain compared with other interventions, and little to no differences in neck disability and psychological functioning.	There are undesirable effects associated with acupuncture techniques reported at low prevalence (e.g., localised bruising). Low risk of significant harm (e.g., pneumothorax). Can create reliance on passive treatment in the chronic phase of the condition which is not conducive to promoting self-efficacy.
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Large costs ● Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	In Australia, acupuncture is generally provided by a health professional on a fee for service basis. The cost might vary between AUD50-100 per treatment. Between 6 and 12 sessions may be required in addition to usual care.	Acupuncture can be performed as part of a multimodal therapy session by a healthcare professional. Cost of equipment needs to be considered. Acupuncture needles are covered by the cost of the treatment, however, electroacupuncture machine purchase does require additional costs.
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations

○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	Cost of equipment needs to be considered. Acupuncture needles are covered by the cost of the treatment, however, electroacupuncture machine purchase does require additional costs.
Equity What would be the impact on health equity?		
Judgement	Research evidence	Additional considerations
○ Reduced ● Probably reduced ○ Probably no impact ○ Probably increased	No included evidence.	Access may be reduced to acupuncture trained healthcare professionals and electroacupuncture equipment across Australia.

○ Increased ○ Varies ○ Don't know		
Acceptability Is the intervention acceptable to key stakeholders?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	Greater rate of dropout from the sham electroacupuncture group compared with the real electroacupuncture group (Cameron 2011).	Access may be reduced to acupuncture trained healthcare professionals across Australia (e.g., regional/rural).
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ○ Probably yes ○ Yes ● Varies ○ Don't know	No included evidence.	HCPs would need to be willing to seek out additional training and equipment to implement acupuncture techniques.

T.13.5. Conclusions (acupuncture techniques for acute WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Neither for or against the intervention	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	●	○	○

Recommendations
The guideline panel are unable to recommend for or against acupuncture techniques in addition to usual care for the management of people with acute WAD. *(Panel vote summary: 10/11 91% neutral; 1/11 9% conditional against)* **Justification** • No significant short-term differences with motion style acupuncture in addition to integrative Korean medicine. The findings from this study (Kim et al 2020) in acute WAD were not applicable to an Australian context. Unknown effects of acupuncture techniques in addition to usual care in an Australian context. • There are undesirable effects associated with acupuncture techniques reported at low prevalence (e.g., localised bruising). • Low risk of significant harm (pneumothorax). **Subgroup considerations** • High pain sensitivity (hot/cold hyperalgesia, pressure hyperalgesia, allodynia) could be a contraindication to acupuncture techniques. **Implementation considerations** *Indications:* • Not recommended as the primary treatment, but could be provided in conjunction with recommended treatments, provided there is clinical benefit. *Dose:* • Acupuncture techniques should only be used in the short-term (e.g., 6-12 sessions). *Considerations:* • Preference of the person with WAD. • HCPs should communicate risks: localised bruising and the low risk of significant harm (pneumothorax).

T.13.6. Conclusions (acupuncture techniques for chronic WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Neither for or against the intervention	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	●	○	○

Recommendations
The guideline panel are unable to recommend for or against acupuncture techniques in addition to usual care for the management of people with chronic WAD. *(Panel vote summary: 12/12 100% neutral)* **Justification** • Acupuncture techniques resulted in non-clinically (moderate) significant reductions in neck pain compared with other interventions, trivial effects on neck disability, and no differences in psychological functioning. • There are undesirable effects associated with acupuncture techniques reported at low prevalence (e.g., localised bruising). • Low risk of significant harm (e.g., pneumothorax). • Can create reliance on passive treatment in the chronic phase of the condition which is not conducive to promoting self-efficacy. • Passive treatment in the chronic phase of the condition differs from recommendations of an active and biopsychosocial approach to management of whiplash injury in this phase. **Subgroup considerations** • High pain sensitivity (hot/cold hyperalgesia, pressure hyperalgesia, allodynia) could be a contraindication to acupuncture techniques. **Implementation considerations** *Indications:* • Providing passive treatment in the chronic phase of WAD differs from recommendations of an active and bio-psychosocial approach to management in this phase. • Not recommended as the primary treatment, but could be provided in conjunction with recommended treatments, provided there is clinical benefit. *Dose:* • Acupuncture techniques should only be used in the short-term (e.g., 6-12 sessions). *Considerations:* • Preference of the person with WAD. • PHCPs should communicate risks: localised bruising and the low risk of significant harm (pneumothorax).

T.14. Passive: Trigger point needling

Are trigger point needling techniques in addition to usual care effective for the treatment of acute or chronic WAD?

T.14.1. Executive summary

There were 3 studies included to determine the effect of needling techniques in addition to usual for people with acute or chronic WAD (acute WAD: Garcia Naranjo 2017; Tough 2010; chronic WAD: Sterling 2015). Trigger point needling techniques differs from acupuncture techniques as the sites of treatment are targeted at myofascial trigger points. A summary of the included studies is detailed in Table 35. Study populations and intervention characteristics were applicable to an Australian context for two of the studies (Tough, 2010; Sterling, 2015). Trigger point needling techniques in addition to usual care may have little to no effect on neck pain, neck disability, and psychological functioning in acute or chronic WAD. Table 36 outlines the GRADE Evidence to Decision Framework decisions for the management of people with acute and chronic WAD.

Effect on neck pain (see T.14.2 for details)

Acute WAD short-term (2weeks 3months) (very low certainty in the evidence):

N=2 trials (Garcia Naranjo 2017; Tough 2010). Compared percutaneous electrolysis needling to multimodal care (Garcia Naranjo 2017) and compared trigger point needling in addition to usual care with sham needling in addition to usual care (Tough, 2010). Trigger point needling techniques in addition to usual care may result in little to no difference in short-term neck pain in people with acute WAD, but the evidence is very uncertain.

Chronic WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=1 trial (Sterling 2015). Compared trigger point needling in addition to usual care with sham needling in addition to usual care (Sterling, 2015). Trigger point needling techniques in addition to usual care results in little to no difference in short-term neck pain in people with chronic WAD.

Chronic WAD long-term (>3 months to 12 months) (low certainty in the evidence):

N=1 trial (Sterling 2015). Trigger point needling techniques in addition to usual care results in little to no difference in long-term neck pain in people with chronic WAD.

Effect on neck disability (see T.14.3 for details)

Acute WAD short-term (2 weeks to 3 months) (very low certainty in the evidence):

N=1 trial (Tough 2010). Trigger point needling techniques in addition to usual care may result in little to no difference in short-term neck disability in people with acute WAD, but the evidence is very uncertain.

Chronic WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=1 trial (Sterling 2015). Trigger point needling techniques in addition to usual care results in little to no difference in short-term neck disability in people with chronic WAD.

Chronic WAD long-term (>3 months to 12 months) (very low certainty in the evidence):

N=1 trial (Sterling 2015). Trigger point needling techniques in addition to usual care may result in small reductions in long-term neck disability in people with chronic WAD, but the evidence is very uncertain.

Effect on psychological functioning (see T.14.4 for details)

Acute WAD short-term (2 weeks to 3 months) (very low certainty in the evidence):

N=1 trial (Tough 2010). Trigger point needling techniques in addition to usual care may result in little to no difference in short-term neck disability in people with acute WAD, but the evidence is very uncertain.

Chronic WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=1 trial (Sterling 2015). Trigger point needling techniques in addition to usual care results in little to no difference in short-term psychological functioning in people with chronic WAD.

Chronic WAD long-term (>3 months to 12 months) (very low certainty in the evidence):

N=1 trial (Sterling 2015). Trigger point needling techniques in addition to usual care may result in little to no difference in long-term psychological functioning in people with chronic WAD, but the evidence is very uncertain.

Table 35: Summary of included studies (trigger point needling for acute and chronic WAD)

Author Year	Participants and setting (country)	Intervention (trigger point needling techniques)	Control	Outcomes included	Neck pain outcomes	Neck disability outcomes	Psych functioning outcomes	Summary (risk of bias PEDRO score)
(Naranjo et al., 2017)	100 participants with acute WAD in primary care (Spain)	Percutaneous electrolysis needling 3xwk/3wk to levator scapula muscle (scapula insertion).	20 physiotherapy sessions over 4/52 consisting of microwave thermotherapy, therapeutic TENS, massage, therapeutic ultrasound, and exercise and stretching of scapulothoracic muscles.	Neck pain at 5wk.	VAS (0-10)	X	X	No significant differences in short-term neck pain between percutaneous electrolysis needling and standard physiotherapy. (5)
(Tough et al., 2010)	34 participants with acute WAD in primary care (UK)	2-6 sessions/1xsession per wk of needling to muscular trigger points around the neck + standard physiotherapy consisting of education, postural assessment, neck-specific exercises.	2-6 sessions/1xsession per wk of sham needling with superficial tapping of the needle on the skin + standard physiotherapy.	Neck pain, neck disability, and psych functioning at 6wk.	VAS (0-10)	NDI (0-100)	Hospital Anxiety and Depression Scale Anxiety sub-scale (0-21)	No significance differences in short-term neck pain, neck disability, and psychological functioning with trigger point needling and usual care compared with sham needling and usual care in acute WAD. (8)
(Sterling et al., 2015)	80 participants with chronic WAD in primary care	6 dry-needling (DN) and exercise sessions for 3wk then 4 DN	As per intervention but sham needles were used.	Neck pain, neck disability, and psych functionin	VAS (0-10) over 1wk.	NDI (0-100)	SF-36 Mental component score (-	In people with chronic WAD, dry-needling and exercise has no clinically

	(Australia)	and exercise sessions over the next 3wk. Neck-specific exercises and postural training. Education guide to WAD.		g at 12wk and 12mo.			5.6 to 91.8)	worthwhile effects over sham dry-needling and exercise. (7)

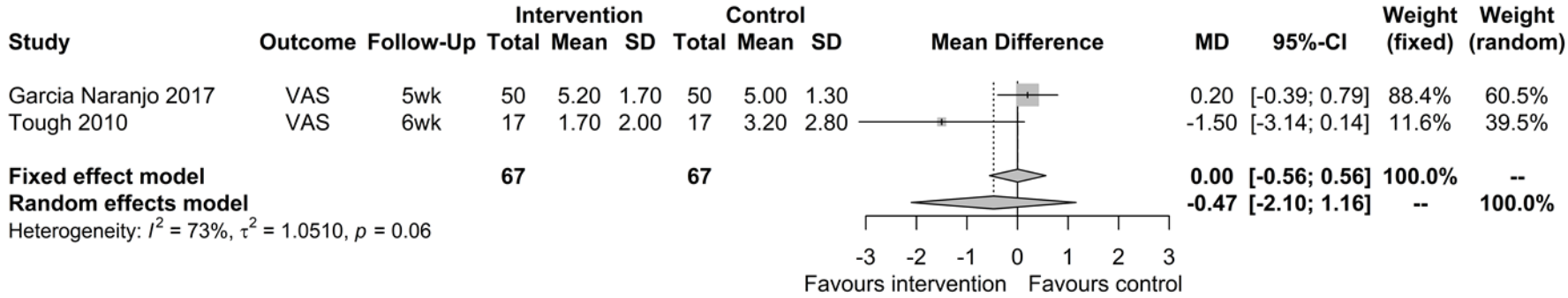
T.14.2. Effect on neck pain

Short-term outcomes (acute WAD)

Included studies: Garcia Naranjo 2017; Tough 2010

GRADE Certainty Assessment						Effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	MD 0.47 VAS lower (2.10 lower to 1.16 higher)	⊕◯◯◯ Very low	CRITICAL
2	Not serious[a]	Serious[b]	Serious[c]	Very serious[d]	None			

Meta-analysis 2/2 trials: (Acute WAD) short-term neck pain (follow-up: range 2 weeks to 3 months; assessed with: VAS)



MD: mean difference

[a]Moderate (Garcia Naranjo 2017) to low risk of bias (Tough 2010).

[b]Moderate heterogeneity in outcomes between studies.

[c]Population and treatment interventions are consistent with an Australian context for the study carried out by Tough (2010). However, the comparator group in the study by Garcia Naranjo (2017) included several electrotherapy techniques and manual therapy which is not consistent with usual active care in an Australian context.

[d]Sample size below the adequate threshold for precision and CIs cross the clinically important threshold and zero.

Short-term outcomes (chronic WAD)

Included studies: Sterling 2015

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention (n=40) and control (n=40). MD (I-C) 0.4 VAS lower (1.7 lower to 0.6 higher)	⊕⊕◯◯ Low	CRITICAL
1	Not serious[a]	Serious[b]	Not serious[c]	Serious[d]	None			
(Chronic WAD) short-term neck pain (follow-up: mean 12 weeks; assessed with: VAS (pain over previous week); Scale from: 0 to 10)								

a. Low risk of bias ('good' PEDRO score 7/10).
b. Findings based on a single study.
c. Population and treatment interventions are consistent with an Australian context.
d. Sample size significantly below the adequate threshold for precision, however, precision was not rated to very serious as the study was a placebo-controlled trial (sham treatment).

Long-term outcomes (chronic WAD)

Included studies: Sterling 2015

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention (n=40) and control (n=40). MD 0.4 VAS higher (0.8 lower to 1.4 higher)	⊕⊕◯◯ Low	CRITICAL
1	Not serious[a]	Serious[b]	Not serious[c]	Serious[d]	None			
(Chronic WAD) long-term neck pain (follow-up: mean 12 months; assessed with: VAS (pain over previous week); Scale from: 0 to 10)								

a. Low risk of bias (PEDRO 7/10).
b. Findings based on a single study.
c. Population and treatment interventions are consistent with an Australian context.
d. Sample size significantly below the adequate threshold for precision, however, precision was not rated to very serious as the study was a placebo-controlled trial (sham treatment).

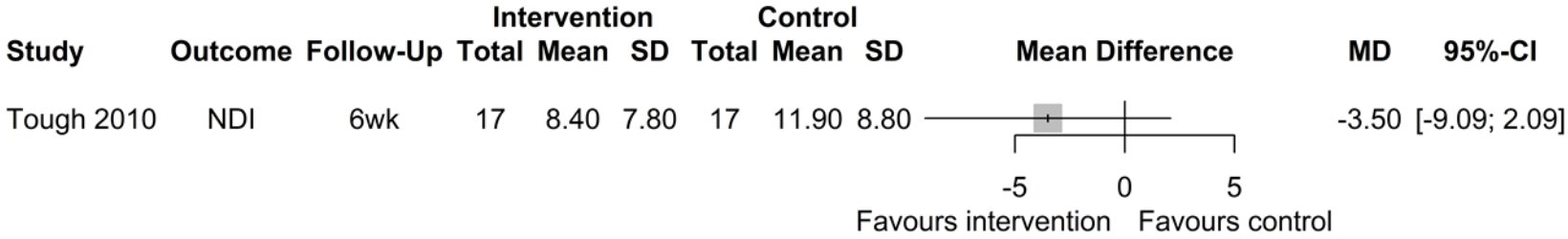
T.14.3. Effect on neck disability

Short-term outcomes (acute WAD)

Included studies: Tough 2010

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention (n=17) and control (n=17). MD 3.50 NDI lower (9.09 lower to 2.09 higher)	⊕◯◯◯ Very low	CRITICAL
1	Not serious	Serious[a]	Not serious[b]	Very serious[c]	None			

(Acute WAD) short-term neck disability (follow-up: mean 6 weeks; assessed with: NDI; Scale from: 0 to 100)



a. Findings based on a single low sample size study.
b. Population and treatment interventions are consistent with an Australian context.
c. Sample size below the adequate threshold for precision and CIs cross the clinically important threshold and zero.

Short-term outcomes (chronic WAD)

Included studies: Sterling 2015

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention (n=40) and control (n=40). MD 0.3 NDI (%) lower (5.2 lower to 4.9 higher)	⊕⊕◯◯ Low	CRITICAL
1	Not serious[a]	Serious[b]	Not serious[c]	Serious[d]	None			

(Chronic WAD) short-term neck disability (follow-up: mean 12 weeks; assessed with: NDI (%); Scale from: 0 to 100)

a. Low risk of bias (PEDRO 7/10).
b. Findings based on a single study.
c. Population and treatment interventions are consistent with an Australian context.
d. Sample size significantly below the adequate threshold for precision, however, precision was not rated to very serious as the study was a placebo-controlled trial (sham treatment). Confidence intervals within bound of clinically significant thresholds.

Long-term outcomes (chronic WAD)

Included studies: Sterling 2015

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention (n=40) and control (n=40). MD 3.8 NDI (%) lower (9.1 lower to 0.5 lower)	⊕◯◯◯ Very low	CRITICAL
1	Not serious[a]	Serious[b]	Not serious[c]	Very serious[d]	None			
(Chronic WAD) long-term neck disability (follow-up: mean 12 months; assessed with: NDI (%); Scale from: 0 to 100)								

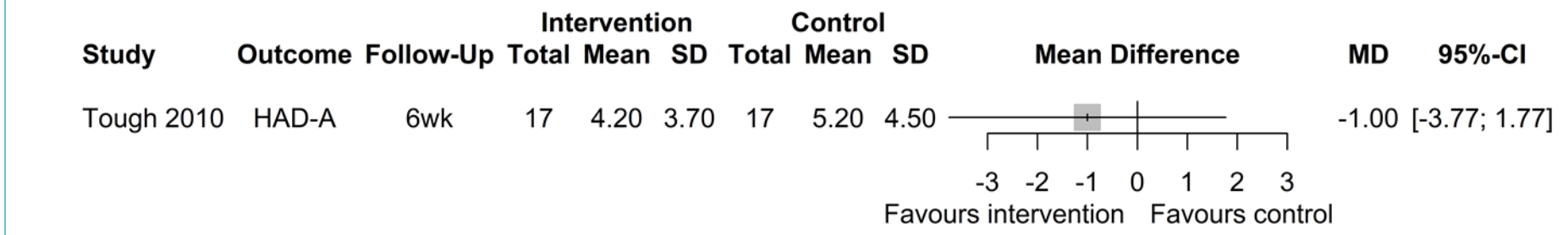
a. Low risk of bias (PEDRO 7/10).
b. Findings based on a single study.
c. Population and treatment interventions are consistent with an Australian context.
d. Sample size significantly below the adequate threshold for precision, and wide confidence intervals approaching zero for the upper bound.

T.14.4. Effect on psychological functioning

Short-term outcomes (acute WAD)

Included studies: Tough 2010

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention (n=17) and control (n=17). MD 1.00 HADS Anxiety score lower (3.77 lower to 1.77 higher)	⊕◯◯◯ Very low	CRITICAL
1	Not serious	Serious[a]	Not serious[b]	Very serious[c]	None			
(Acute WAD) short-term psychological functioning (follow-up: mean 6 weeks; assessed with: Hospital Anxiety and Depression Scale Anxiety sub-scale (HADS-A); Scale from: 0 to 21)								



a. Findings based on a single study.
b. Population and treatment interventions are consistent with an Australian context.
c. Sample size significantly below the adequate threshold for precision.

Short-term outcomes (chronic WAD)

Included studies: Sterling 2015

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention (n=40) and control (n=40). MD 1 SF-36 Mental Score lower (4.4 lower to 2.7 higher)	⊕⊕◯◯ Low	CRITICAL
1	Not serious[a]	Serious[b]	Not serious[c]	Serious[d]	None			
(Chronic WAD) short-term psychological functioning (follow-up: mean 12 weeks; assessed with: SF-36 Mental component score; Scale from: -5.6 to 91.8)								

[a]Low risk of bias (PEDRO 7/10).
[b]Findings based on a single study.
[c]Population and treatment interventions are consistent with an Australian context.
[d]Sample size significantly below the adequate threshold for precision, however, precision was not rated to very serious as the study was a placebo-controlled trial (sham treatment).

Long-term outcomes (chronic WAD)

Included studies: Sterling 2015

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention (n=40) and control (n=40). MD -3.3 SF-36 Mental Score (7.8 lower to 1.3 higher)	⊕◯◯◯ Very low	CRITICAL
1	Not serious[a]	serious[b]	Not serious[c]	very serious[d]	None			
(Chronic WAD) short-term psychological functioning (follow-up: mean 12 months; assessed with: SF-36 Mental component score; Scale from: -5.6 to 91.8)								

[a]Low risk of bias (PEDRO 7/10).
[b]Findings based on a single study.
[c]Population and treatment interventions are consistent with an Australian context.
[d]Sample size significantly below the adequate threshold for precision, and the confidence interval crossed the clinically significant threshold and zero.

Table 36: Evidence to decision framework (trigger point needling techniques for acute and chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations

● Trivial (acute and chronic) ○ Small ○ Moderate ○ Large ○ Varies ○ Don't know	Acute: Trigger point needling techniques results in little to no difference in short-term neck pain, neck disability, and psychological functioning in people with acute WAD. Chronic: Trigger point needling techniques result in small non-clinically significant reductions in long-term neck disability and little to no difference in remaining short- and long-term critical outcomes (neck pain, neck disability, and psychological functioning).	Intervention designs in acute (Tough, 2010) and chronic (Sterling, 2015) WAD were placebo-controlled trials (sham treatment).
Undesirable Effects How substantial are the undesirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Large ○ Moderate ● Small (acute) ● Trivial (chronic) ○ Varies ○ Don't know	Acute: Tough 2010: A temporary increase in pain (lasting no longer than the day of treatment) was reported by 16/20 (80%) people who received the genuine needling and by 9/20 (43%) people who received the sham needling. Chronic: Sterling 2015: Mild adverse effects defined as an exacerbation of a pre-existing symptoms such as pain or disability were recorded at low prevalence in both the intervention and control groups. Reported for 2 people from the dry-needling and exercise group and 2 people from the sham dry-needling and exercise group.	There are undesirable effects associated with trigger point needling techniques reported at low prevalence (e.g., localised bruising). Rare adverse effects: e.g., infection, pneumothorax. Can create reliance on passive treatment in the chronic phase of the condition which is not conducive to promoting self-efficacy.
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations

● Very low (acute and chronic) ○ Low ○ Moderate ○ High ○ No included studies	Overall, very low certainty in the evidence for trigger point needling techniques in addition to usual care have little to no difference on neck pain, neck disability, and psychological functioning in acute or chronic WAD.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ● Probably favours the comparison (no treatment) ○ Does not favour either the intervention or the comparison (acute and chronic) ○ Probably favours the intervention ○ Favours the intervention ○ Varies ○ Don't know	No clinically significant benefits to short- and long-term critical outcomes when comparing needling techniques to sham treatment and small adverse effects. Harms may outweigh benefits.	Intervention designs in acute (Tough, 2010) and chronic (Sterling, 2015) WAD trials included sham treatment as a comparator. High pain sensitivity (hot/cold hyperalgesia, pressure hyperalgesia, allodynia) could be a contraindication to trigger point needling techniques as they may exacerbate pain.
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations

○ Large costs ○ Moderate costs ● Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	No included evidence.	Needling interventions can be delivered by trained healthcare professionals as part of regular consultations in Australia. Cost per needle unit is low.
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ● Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ○ No included studies	García Naranjo (2017), the cost for the needling intervention or a standard physiotherapy session is the same for acute whiplash: 30 € (Spain) on average (small variations depending on the covering insurer). Based on the number of treatment sessions in each group in this study, it was reported that the total cost of physiotherapy was 6.6 times higher than the needling technique (not including the purchase of the needling technique equipment). There is insufficient evidence to recommend for or against this treatment, and the cost effectiveness in an Australian context for purchase and use of percutaneous electrolysis needling equipment is unknown.	The comparator group in the study by Garcia Naranjo (2017) included several electrotherapy techniques and manual therapy which is not consistent with usual active care in an Australian context.

Equity What would be the impact on health equity?		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ● Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Needling techniques (e.g., dry needling) are widely available in an Australian context.
Acceptability Is the intervention acceptable to key stakeholders?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	Garcia Naranjo (2017): no loss to follow-up in either group. Sterling (2015): low dropout rate (9% at 12 months) Tough (2010): no difference in dropout rates between groups (3/20 for intervention, 4/21 for control)	Needling techniques (e.g., dry needling) are widely available in an Australian context. The injured person's preference needs to be considered as some people may not accept needling as a form of treatment.
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	No included evidence.	Needling treatments are implemented as part of regular consultations by some healthcare professionals.

T.14.5. Conclusions (trigger point needling for acute WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Neither for or against the intervention	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	●	○	○	○

Recommendations
The guideline panel suggests that healthcare professionals do not use trigger point needling techniques in addition to usual care for the management of people with acute WAD. (Panel vote summary: 8/11 73% conditional against; 3/11 27% neutral) **Justification** • Trigger point needling techniques in addition to usual care compared with sham needling compared with usual care result in little to no difference in short-term neck pain, neck disability, and psychological functioning in people with acute WAD. • There are undesirable effects associated with trigger point needling techniques reported at low prevalence (e.g., localised bruising). • There are rare adverse effects: e.g., infection, pneumothorax. • In people with high pain sensitivity (hot/cold hyperalgesia, pressure hyperalgesia, allodynia) trigger point needling techniques may exacerbate pain.

T.14.6. Conclusions (trigger point needling for acute WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Neither for or against the intervention	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	●	○	○	○

Recommendations
The guideline panel suggests that healthcare professionals do not use trigger point needling techniques in addition to usual care for the management of people with chronic WAD. *(Panel vote summary: 8/11 73% conditional against; 3/11 27% neutral)*

Justification

- Trigger point needling techniques compared with sham needling results in small non-clinically significant reductions in long-term neck disability and little to no difference in remaining short- and long-term critical outcomes (neck pain, neck disability, and psychological functioning).
- There are undesirable effects associated with trigger point needling techniques reported at low prevalence (e.g., localised bruising).
- Rare adverse effects: e.g., infection, pneumothorax
- In people with high pain sensitivity (hot/cold hyperalgesia, pressure hyperalgesia, allodynia) trigger point needling techniques may exacerbate pain.
- Passive treatment in the chronic phase of the condition differs from recommendations of an active and biopsychosocial approach to management of whiplash injury in this phase.

13. Pharmacological treatment recommendations

T.15. Pharmacological (injection): Botulinum toxin-A injection

Are botulinum toxin-A injections compared with placebo injections effective for the management of acute or chronic WAD?

T.15.1. Executive summary

There were four studies (acute N=1; chronic N=3) included that compared botulinum toxin-A injections with placebo injections for the management of acute or chronic WAD (Table 37).

Effect on neck pain (see T.15.2 for details)

Acute WAD short term (2 weeks to 3 months) (very low certainty in the evidence):

N= 1 trial (Carroll 2008). The evidence suggests that botulinum toxin-A injections compared with placebo injections may result in little to no difference in short term neck pain in people with acute WAD, but the evidence is very uncertain.

Chronic WAD short term (2 weeks to 3 months) (low certainty in the evidence):

N= 3 trials (Braker 2008; Freund 2002; Padberg 2007). The evidence suggests that botulinum toxin-A injections compared with placebo injections results in little to no difference in short term neck pain in people with chronic WAD.

Effect on neck disability (see T.15.3 for details)

Acute WAD short term (2 weeks to 3 months) (very low certainty in the evidence):

N= 1 trial (Carroll 2008). The evidence suggests that botulinum toxin-A injections compared with placebo injections may result in little to no difference in short term neck disability in people with acute WAD, but the evidence is very uncertain.

Chronic WAD short term (2 weeks to 3 months) (very low certainty in the evidence):

N= 1 trials (Freund 2002). The evidence suggests that botulinum toxin-A injections compared with placebo injections may result in little to no difference in short term neck disability in people with chronic WAD, but the evidence is very uncertain.

Effect on psychological functioning (see T.15.4 for details)

Acute WAD short term (2 weeks to 3 months) (very low certainty in the evidence):

N= 1 trial (Carroll 2008). The evidence suggests that botulinum toxin-A injections compared with placebo injections may result in little to no difference in short term psychological functioning in people with acute WAD, but the evidence is very uncertain.

Additional considerations: Adverse effects

Carroll 2008 (acute WAD): Botox injection: Pain (n=7), weakness (n=1). Placebo injection: Pain (n=6), lump (n=1), weight gain (n=1), flu-like illness (n=1)

Braker 2008 (chronic WAD): Pain at the injection site botox injections (60%) and placebo injections (33%). Significantly greater systemic adverse effects in botox injections (40%) vs placebo injections (0%), e.g., weakness, vertigo, fever, shivering.

Freund 2002 (chronic WAD): Adverse effects were minor and consisted primarily of dry mouth (25%) and injection-site pain.

Padberg 2007 (chronic WAD): No adverse effects.

Table 37: Summary of included studies (botulinum toxin-A injections for acute and chronic WAD)

Author Year	Participants and setting (country)	Intervention (botulinum toxin-A)	Control (placebo)	Outcomes included	Neck pain outcomes	Neck disability outcomes	Psych functioning outcomes	Summary (risk of bias PEDRO score)
(Carroll et al., 2008)	37 participants in primary care with acute WAD (Ireland)	250U of botulinum toxin-A (Dysport) in 2.5mL of saline injected into four tender sites (cervical/trapezius muscles).	As per intervention, however, with injection of saline solution.	Neck pain, neck disability, and psych functioning at 3mo.	VAS (0-10)	Vernon-Mior Neck Pain and Disability Index	Beck Depression Inventory (BDI)	No significant difference between botulinum toxin-A and placebo injections on short term neck pain, neck disability, and psychological functioning. (9)
(Braker et al., 2008)	19 participants in primary care with chronic WAD (Israel)	200U of botulinum toxin-A equally divided between 4 most tender points (50U dissolved in 1mL of normal saline). Double blind procedure.	Saline injections into 4 most tender points. Double blind procedure.	Neck pain at 12wk.	VAS (0-10)*	x	x	No significant difference between botulinum toxin-A and placebo injections on short- and long-term neck pain. (9)
(Freund & Schwartz, 2002)	28 participants in primary care with chronic WAD (Canada)	5 injections of 0.2ml of type A 100U each into one or more tender sites: splenius capitis, rectus capitis, semispinalis capitis, and trapezius, bilaterally.	0.2ml of saline as per intervention protocol.	Neck pain and neck disability at 4wk.	VAS (0-30)	Vernon-Mior Neck Pain and Disability Index (0-50)	x	No treatment effect found for short-term neck pain, and placebo injections resulted in trivial reductions in short-term neck disability compared with botulinum toxin-A injections. (8)
(Padberg et al., 2007)	40 participants in primary care with	100 units botulinum toxin in 2 cc syringes at individualised	100 units of saline in 2 cc syringes as per intervention protocol.	Neck pain at 12wk.	VAS (0-100)	x	x	No significant differences in short term neck pain between botulinum

	chronic WAD (Netherlands)	sites according to clinically increased muscle tone or tenderness						toxin injections and placebo injections. (8)

*data presented in graph only (no point estimates provided).

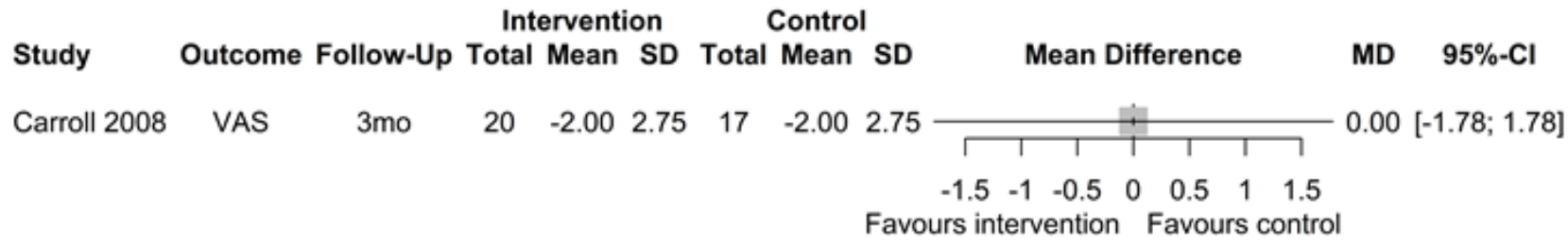
T.15.2. Effect on neck pain

Short-term outcomes (acute WAD)

Included studies: Carroll 2008

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention (n=20) Control (n=17) I-C VAS mean change difference from baseline: 0.00 (-1.78, 1.78)	⊕◯◯◯ Very low	CRITICAL
1	Not serious[a]	Serious[b]	Not serious[c]	Very serious[d]	None			

(Acute WAD) Short term neck pain (follow-up: mean 1 months; assessed with: VAS; Scale from: 0 to 10)



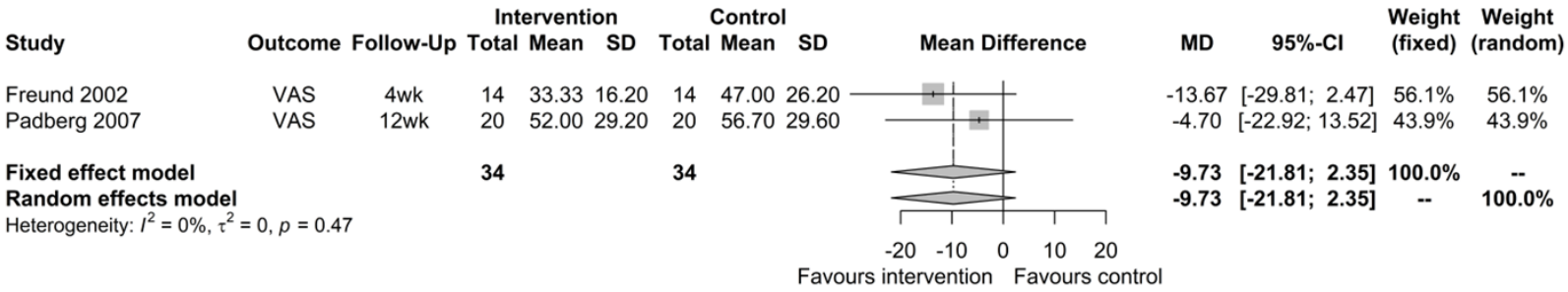
[a]Low risk of bias ('excellent' PEDRO score 9/10).
[b]Findings were from a single study with small sample size.
[c]Intervention and control were consistent with the clinical question.
[d]Number of total observations were significantly below the threshold, data were converted from median (range) change difference to mean change difference.

Short-term outcomes (chronic WAD)

Included studies: Braker 2008; Freund 2002; Padberg 2007

GRADE Certainty Assessment						Total No of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Botulinum toxin injections (n=44), placebo injections (n=43) Meta-analysis -9.73 VAS (0-100) lower (-21.81, 2.35)* Braker 2008: no statistically significant differences in short term neck pain (VAS 0-10)	⊕⊕◯◯ Low	CRITICAL
3	Not serious[a]	Not serious[b]	Not serious[c]	Very serious[d]	None			

(Chronic WAD) Short term neck pain meta-analysis (follow-up: mean 2wk-3mo; assessed with: VAS; Scale from: 0 to 100)



*0-30-point VAS (Freund 2002) scaled to 0-100 to allow for meta-analysis.
[a]Low risk of bias (PEDRO scores range from 8-9/10).
[b]Findings across studies were homogenous.
[c]Intervention and control were consistent with the clinical question.
[d]Number of total observations were significantly below the threshold for precision and confidence intervals cross the threshold of clinical significance and zero.

T.15.3. Effect on neck disability

Short-term outcomes (acute WAD)

Included studies: Carroll 2008

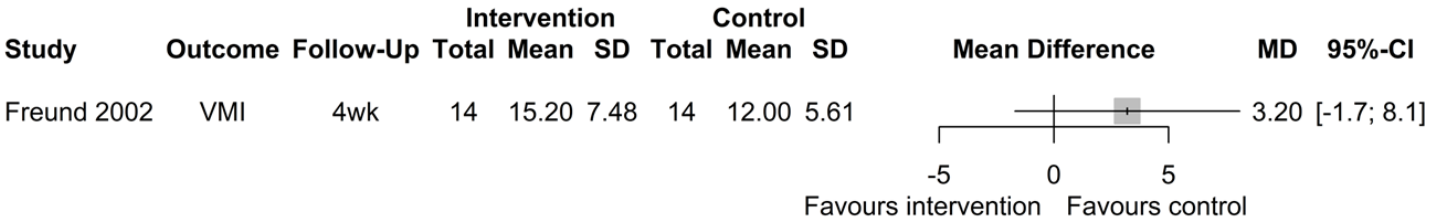
GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention (n=20) Control (n=17) I-C mean change difference from baseline: -9.04 (-21.48, 3.40) Vernon-Mior Neck Pain and Disability Index score	⊕◯◯◯ Very low	CRITICAL
1	Not serious[a]	Not serious[b]	Not serious	Extremely serious[b]	None			
(Acute WAD) Short term neck disability (follow-up: mean 3mo; assessed with: Vernon-Mior Neck Pain and Disability Index Score; Scale from: 0 to 50)								

[a]Low risk of bias (PEDRO 9/10).
[b]Findings were from a single study with small sample size.
[c]Number of total observations were significantly below the threshold and data were converted from median (range) change difference.

Short-term outcomes (chronic WAD)

Included studies: Freund 2002

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention (n=14) Control (n=14) I-C mean difference: 3.2 (-1.70, 8.10) Vernon-Mior Neck Pain and Disability Index score	⊕◯◯◯ Very low	CRITICAL
1	Not serious[a]	not serious	not serious	Extremely serious[b]	None			
(Acute WAD) Short term neck disability (follow-up: mean 4wk; assessed with: Vernon-Mior Neck Pain and Disability Index Score; Scale from: 0 to 50)								



[a]Low risk of bias (PEDRO 8/10).
[b]Number of total observations were significantly below the threshold for precision and confidence intervals crossed the clinically significant threshold and zero.

T.15.4. Effect on psychological functioning

Short-term outcomes (acute WAD)

Included studies: Carroll 2008

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention (n=20) Control (n=17) Estimated I-C mean change difference from baseline BDI: -9.77 (-14.75, -4.79)*	⨁◯◯◯ Very low	CRITICAL
1	Not serious[a]	not serious	not serious	Extremely serious[b]	None			
(Acute WAD) Short term neck disability (follow-up: mean 3mo; assessed with: Beck Depression Inventory (BDI); Scale from: 0 to 63)								

a. Low risk of bias (PEDRO 9/10).
b. Number of total observations were significantly below the threshold and data were converted from median (range) change difference.
* estimated from median and range (reported by authors as clinically, but not statistically significant).

Table 38: Evidence to decision framework (botulinum toxin-A injection for acute WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
● Trivial ○ Small ○ Moderate ○ Large ○ Varies ○ Don't know	(N=1 trial) The evidence suggests that botulinum toxin-A injections compared with placebo injections may result in little to no difference in short term neck pain, neck disability, and psychological functioning in people with acute WAD.	General effects of botulinum toxin-A injections for other conditions (e.g., neurological) are short term only.
Undesirable Effects How substantial are the undesirable anticipated effects?		
Judgement	Research evidence	Additional considerations

○ Large ● Moderate ○ Small ○ Trivial ○ Varies ○ Don't know	Carroll 2008 (acute WAD): Botox injection: Pain (n=7), weakness (n=1). Placebo injection: Pain (n=6), lump (n=1), weight gain (n=1), flu-like illness (n=1)	There are significant undesirable effects (e.g., weakness, vertigo, fever, infection) associated with botulinum toxin-A injections. Blocks neuromuscular conduction which reduces muscular strength and may impact some tasks.
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations
● Very low ○ Low ○ Moderate ○ High ○ No included studies	Very low certainty in the evidence as findings were from a single study and mean differences were estimated from median (range), which influenced the precision of these data.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
● Favours the comparison (no treatment) ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● Don't know	Absence of benefit with the intervention compared with placebo and potentially significant side effects.	

Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Large costs ● Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	Moderate cost (PBS lists cost for botulinum toxin ~$350 per dose) and requires specialised skills.	Costs associated with possible side effects. Multiple doses may occur over time.
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations

○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	Likely to not be cost-effective in addition to usual care, as there is no evidence of benefit and there are moderate costs associated with the injections.
Equity What would be the impact on health equity?		
Judgement	Research evidence	Additional considerations
○ Reduced ● Probably reduced ○ Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Only a select population would have access to treatment (e.g., in settings where additional funding is available).
Acceptability Is the intervention acceptable to key stakeholders?		
Judgement	Research evidence	Additional considerations
○ No ● Probably no ○ Probably yes ○ Yes ○ Varies ○ Don't know	No evidence included. Study dropout rates may not be appropriate as an indicator of a treatment acceptability as the treatment was administered at a single timepoint.	Absence of benefit with the intervention compared with placebo and potentially significant side effects.
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations

○ No ● Probably no ○ Probably yes ○ Yes ○ Varies ○ Don't know	No included evidence.	It is unclear whether botulinum toxin-A would be approved for the management acute WAD before assessing the effect of usual care. There is not an approved indication for using botulinum toxin-A for management of neck pain but there is an indication (subject to strong eligibility criteria) for “chronic migraine”. Intervention requires specialised care which may not be widely accessible.

T.15.5. Conclusions (botulinum toxin-A injection for acute WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Neither for or against the intervention	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	●	○	○	○

Recommendations
The guideline panel suggest that healthcare professionals do not use botulinum toxin-A injections for the management of people with acute WAD. *(Panel vote summary: 13/15 87% conditional against; 1/15 strong against; 1/15 neutral)* **Justification** • The evidence suggests that botulinum toxin-A injections compared with placebo injections may result in little to no difference in short term neck pain, neck disability, and psychological functioning. Findings were based on a single study with small sample size. • General effects of botulinum toxin-A injections for other conditions (e.g., neurological) are short term only. • Significant side effects (e.g., weakness, vertigo, fever, infection risk). • May result in dependency on botulinum toxin-A injections as ongoing treatment. • Moderate costs associated with treatment. • Only a select population would have access to treatment (e.g., in settings where professionals with specialised skills for these injections and where additional funding is available).

Table 39: Evidence to decision framework (botulinum toxin-A injection for chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
● Trivial ○ Small ○ Moderate ○ Large ○ Varies ○ Don't know	(N=3 trials). The evidence suggests that botulinum toxin-A injections compared with placebo injections may result in little to no difference in short term neck pain, neck disability, and psychological functioning in people with chronic WAD.	General effects of botulinum toxin-A injections for other conditions (e.g., neurological) are short term only.
Undesirable Effects **How substantial are the undesirable anticipated effects?**		
Judgement	Research evidence	Additional considerations
○ Large ● Moderate ○ Small ○ Trivial ○ Varies ○ Don't know	Braker 2008 (chronic WAD): Pain at the injection site botox injections (60%) and placebo injections (33%). Significantly greater systemic adverse effects in botox injections (40%) vs placebo injections (0%), e.g., weakness, vertigo, fever, shivering. Freund 2002 (chronic WAD): Adverse effects were minor and consisted primarily of dry mouth (25%) and injection-site pain. Padberg 2007 (chronic WAD): No adverse effects.	There are significant undesirable effects (e.g., weakness, vertigo, fever, infection) associated with botulinum toxin-A injections. Blocks neuromuscular conduction which reduces muscular strength and may impact some tasks.
Certainty of evidence **What is the overall certainty of the evidence of effects?**		
Judgement	Research evidence	Additional considerations

● Very low ○ Low ○ Moderate ○ High ○ No included studies	Overall, very low certainty. However, the evidence suggests that botulinum toxin-A injections compared with placebo injections results in little to no difference in short term neck pain in people with chronic WAD (low certainty in the evidence).	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
● Favours the comparison (no treatment) ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● Don't know	Absence of benefit with the intervention compared with placebo and potentially significant side effects.	We want to “activate not deactivate” (panel member comment) muscles around the neck in the chronic phase, which have been shown to have function and performance impairments in chronic WAD (see Assessment section in these guidelines).
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Large costs ● Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	Moderate cost (PBS lists cost for botulinum toxin ~$350 per dose) and requires specialised skills.	Costs associated with possible side effects. Multiple doses may occur over time.

Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness **Does the cost-effectiveness of the intervention favour the intervention or the comparison?**		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	Likely to not be cost-effective in addition to usual care, as there is no evidence of benefit and there are moderate costs associated with the injections.
Equity **What would be the impact on health equity?**		
Judgement	Research evidence	Additional considerations
○ Reduced ● Probably reduced ○ Probably no impact ○ Probably increased ○ Increased	No included evidence.	Only a select population would have access to treatment (e.g., in settings where additional funding is available).

○ Varies ○ Don't know		
Acceptability Is the intervention acceptable to key stakeholders?		
Judgement	Research evidence	Additional considerations
○ No ● Probably no ○ Probably yes ○ Yes ○ Varies ○ Don't know	No evidence included. Study dropout rates may not be appropriate as an indicator of a treatment acceptability as the treatment was administered at a single timepoint.	Absence of benefit with the intervention compared with placebo and potentially significant side effects.
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations
○ No ● Probably no ○ Probably yes ○ Yes ○ Varies ○ Don't know	No included evidence.	It is unclear whether botulinum toxin-A would be approved for the management chronic WAD before assessing the effect of usual care. There is not an approved indication for using botulinum toxin-A for management of neck pain but there is an indication (subject to strong eligibility criteria) for “chronic migraine”. Intervention requires specialised care which may not be widely accessible.

T.15.6. Conclusions (botulinum toxin-A injection for chronic WAD)

Type of recommendation

Strong recommendation against the intervention ●	Conditional recommendation against the intervention ○	Neither for or against the intervention ○	Conditional recommendation for the intervention ○	Strong recommendation for the intervention ○

Recommendations
The guideline panel strongly recommend that healthcare professionals do not use botulinum toxin-A injections for the management of people with chronic WAD. *(Panel vote summary: 10/14 71% strong against; 4/14 29% conditional against)* **Justification** • The evidence suggests that botulinum toxin-A injections compared with placebo injections results in little to no difference in short term neck pain, neck disability, and psychological functioning. • General effects of botulinum toxin-A injections for other conditions (e.g., neurological) are short term only. • Significant side effects (e.g., weakness, vertigo, fever, infection risk). • May result in dependency on botulinum toxin-A injections as ongoing treatment. • Moderate costs associated with treatment. • Only a select population would have access to treatment (e.g., in settings where professionals with specialised skills for these injections and where additional funding is available). • Differs from recommendations of an active and biopsychosocial approach to management of whiplash injury in this phase.

T.16. Pharmacological (injection): Corticosteroid injection

Are facet joint corticosteroid injections compared with placebo injections effective for the management of acute or chronic WAD?

T.16.1. Executive summary

There was one included study that evaluated the effect of facet joint corticosteroid injection compared with local anaesthetic injection in people with chronic WAD (Table 40). No included studies for people with acute WAD.

Effect on neck pain (see T.16.2 for details)

Chronic WAD short-term (2 weeks to 3 months) (very low certainty in the evidence):

N=1 trial (Barnsley 1994). Compared corticosteroid injection and local anaesthetic injection into a cervical facet joint. Corticosteroid injections compared with placebo injections may result in little to no difference on short-term neck pain, but the evidence is very uncertain.

Table 40: Summary of included studies (corticosteroid injections for acute and chronic WAD)

Author Year	Participants and setting (country)	Intervention (corticosteroid injection)	Control (placebo)	Outcomes included	Neck pain outcomes	Neck disability outcomes	Psych functioning outcomes	Summary (risk of bias PEDRO score)
(Barnsley et al., 1994)	41 participants with chronic WAD in primary care (Australia)	Injection of betamethasone (5.7 mg) into a single cervical zygapophyseal joint diagnosed as a source of pain using on a nerve block protocol.	Injection of bupivacaine (0.5 percent) into a single cervical zygapophyseal joint diagnosed as a source of pain using on a nerve block protocol.	Neck pain at 12wk.	Time (days) to 50% of pre-intervention pain VAS (0-100)	x	x	Intraarticular injection of corticosteroid in the cervical Z-joint was not effective in reducing pain compared with an anesthetic injection in people with chronic WAD. (7)

T.16.2. Effect on neck pain

Short-term outcomes (chronic WAD)

Included studies: Barnsley 1994

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention (n=21), Control (n=20) I-C: -0.5 days, p=0.41. The median time to a return to 50 percent of the pre-injection level of pain was 3 days in the corticosteroid group and 3.5 days in the local anesthetic group.	⊕◯◯◯ Very low	CRITICAL
1	Not serious[a]	Not serious	Serious[b]	Very serious[c]	None			
(Chronic WAD) Short-term neck pain (follow-up: mean 12 weeks; assessed with: time to 50% of pre-intervention neck pain VAS; Scale from: 0 to 100)								

[a]Low risk of bias ('good' PEDRO score 7/10).
[b]Control intervention is a local anesthetic and not a true placebo.
[c]Number of total observations were significantly below the threshold for precision (n=41).

Table 41: Evidence to decision framework (corticosteroid injections for acute WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
● Trivial ○ Small ○ Moderate ○ Large ○ Varies ○ Don't know	No clinical trials for acute WAD. Chronic WAD: Facet joint corticosteroid injections compared with a local anesthetic injection may have no effect on short-term neck pain in chronic WAD (Barnsley, 1994). The median time to a return to 50 percent of the pre-injection level of pain was 3 days in the corticosteroid group and 3.5 days in the local anesthetic group (p = 0.42). Following an initial reduction in pain, pain increased in a short period of time.	General effects for corticosteroid injections are short term.
Undesirable Effects **How substantial are the undesirable anticipated effects?**		
Judgement	Research evidence	Additional considerations
○ Large ○ Moderate ○ Small ○ Trivial ● Varies ○ Don't know	Not reported.	Low risk of known severe adverse effects (e.g., vascular complications, spinal cord compression, infection). Radiation associated with CT guided injections.
Certainty of evidence **What is the overall certainty of the evidence of effects?**		
Judgement	Research evidence	Additional considerations

○ Very low ○ Low ○ Moderate ○ High ● No included studies	No clinical trials for acute WAD.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ● Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ○ Don't know	No clinical trials in acute WAD. No significant effects were found between corticosteroid and local anesthetic injections in chronic WAD (Barnsley, 1994). Low risk of possible significant undesirable effects.	
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations

● Large costs ○ Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	Considerable costs involved as the intervention requires specialised skills (e.g., CT assistance for the injections).	
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No research evidence.	Comparison is an anesthetic injection.
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention	No research evidence.	Comparison is an anesthetic injection. In the absence of benefit, cost-effectiveness likely favours not using this treatment.

○ Favours the intervention ○ Varies ● No included studies		
Equity **What would be the impact on health equity?**		
Judgement	Research evidence	Additional considerations
○ Reduced ●Probably reduced ○ Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Only a select population would have access to treatment (e.g., in settings where additional funding is available). Access to CT equipment.
Acceptability **Is the intervention acceptable to key stakeholders?**		
Judgement	Research evidence	Additional considerations
○ No ● Probably no ○ Probably yes ○ Yes ○ Varies ○ Don't know	No included evidence.	Probably not acceptable given the low risk of harm and absence of benefit.
Feasibility **Is the intervention feasible to implement?**		

Judgement	Research evidence	Additional considerations
○ No ● Probably no ○ Probably yes ○ Yes ○ Varies ○ Don't know	No included evidence.	It is unclear whether corticosteroid injections would be approved for the management acute WAD before assessing the effect of usual care. Requires specialised skills (e.g., CT assistance for the injections). Access to CT equipment.

T.16.3. Conclusions (corticosteroid injections for acute WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
●	○	○	○	○

Recommendations
The guideline panel strongly recommend that healthcare professionals do not use facet joint corticosteroid injections for the management of people with acute WAD. *(Panel vote summary: 13/14 93% strong against; 1/14 7% conditional against)* Justification • The effectiveness of corticosteroid injections for the management of acute WAD is unknown. • No benefit shown in chronic WAD when compared with local anaesthetic injections. • Low risk of severe adverse effects (e.g., vascular complications, spinal cord compression, infection). • Costly treatment. • Requires specialised skills (e.g., CT assistance for the injections). • Effects are seen in the short-term only (weeks). • Corticosteroid injections are only considered after people have not shown significant improvement with usual care.

Table 42: Evidence to decision framework (corticosteroid injections for chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
● Trivial ○ Small ○ Moderate ○ Large ○ Varies ○ Don't know	Chronic WAD: Facet joint corticosteroid injections compared with a local anesthetic injection may have no effect on short-term neck pain in chronic WAD (Barnsley, 1994). The median time to a return to 50 percent of the pre-injection level of pain was 3 days in the corticosteroid group and 3.5 days in the local anesthetic group (p = 0.42). Following an initial reduction in pain, pain increased in a short period of time.	General effects for corticosteroid injections are short term. Corticosteroid injections are only considered after people have not shown significant improvement with usual care.
Undesirable Effects **How substantial are the undesirable anticipated effects?**		
Judgement	Research evidence	Additional considerations
● Large ○ Moderate ○ Small ○ Trivial ○ Varies ○ Don't know	Not reported in the included study.	Low risk of known severe adverse effects (e.g., vascular complications, spinal cord compression, infection).
Certainty of evidence **What is the overall certainty of the evidence of effects?**		
Judgement	Research evidence	Additional considerations

● Very low ○ Low ○ Moderate ○ High ○ No included studies	Corticosteroid injections compared with local anesthetic injections may have no effect on short-term neck pain in chronic WAD (Barnsley, 1994). Very low certainty in the evidence, as findings were from a single study with small sample size and the control intervention differed compared with the clinical question (not a true placebo injection).	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ● Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ○ Don't know	No significant effects were found between corticosteroid and local anesthetic injections in chronic WAD. Low risk of possible significant undesirable effects.	Comparison is a local anesthetic injection.
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations

● Large costs ○ Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	Considerable costs involved as the intervention requires specialised skills (e.g., CT assistance for the injections).	
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	Comparison is a local anesthetic injection.
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations

○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No research evidence.	Comparison is a local anesthetic injection. In the absence of benefit, cost-effectiveness likely favours not using this treatment.
Equity What would be the impact on health equity?		
Judgement	Research evidence	Additional considerations
○ Reduced ●Probably reduced ○ Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Only a select population would have access to treatment (e.g., in settings where additional funding is available). Access to CT equipment.
Acceptability Is the intervention acceptable to key stakeholders?		
Judgement	Research evidence	Additional considerations
○ No ● Probably no ○ Probably yes ○ Yes	No included evidence.	Probably not acceptable given the low risk of harm and absence of benefit.

○ Varies ○ Don't know		
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations
○ No ● Probably no ○ Probably yes ○ Yes ○ Varies ○ Don't know		It is unclear whether insurance companies would approve corticosteroid injections for the management of chronic WAD as it costly and requires specialised skills (e.g., CT assistance for the injections).

T.16.4. Conclusions (corticosteroid injections for chronic WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
●	○	○	○	○

Recommendations
The guideline panel strongly recommend that healthcare professionals do not use facet joint corticosteroid injections for the management of people with chronic WAD. *(Panel vote summary: 10/15 67% strong against; 5/15 33% conditional against)* Justification • No benefit shown in chronic WAD when compared with local anaesthetic injections, where pain increased in a short period of time (days) after an initial reduction in pain levels. • Effects are seen in the short-term only (weeks). • Low risk of severe adverse effects (e.g., vascular complications, spinal cord compression, infection). • Costly treatment.

- Requires specialised skills (e.g., CT assistance for the injections).
- Corticosteroid injections are only considered after people have not shown significant improvement with usual care.

T.17. Pharmacological (injection): Intravenous steroid injection

Are intravenous steroid injections compared with placebo injections effective for the management of acute or chronic WAD?

T.17.1. Executive summary

Intravenous (IV) steroid injections (e.g., hydrocortisone) are systemic, compared with the localised corticosteroid injection into a facet joint (as detailed in T.16). One study was included that evaluated the effect of IV steroid injections compared with placebo injection for the management of acute WAD (Table 43). No clinical trials for chronic WAD.

Effect on neck pain (see T.17.2 for details)

Acute WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=1 trial (Shaked 2021). Compared steroid intravenous injections compared with placebo injections. The evidence suggests that steroid IV injection compared with placebo injection results in little to no difference in short-term neck pain in people acute WAD.

Effect on neck disability (see T.17.3 for details)

Acute WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=1 trial (Shaked 2021). Compared steroid intravenous injections compared with placebo injections. The evidence suggests that steroid IV injection compared with placebo injection results in little to no difference in short-term neck disability in people acute WAD.

Effect on psychological functioning (see T.17.4 for details)

Acute WAD short-term (2 weeks to 3 months) (very low certainty in the evidence):

N=1 trial (Shaked 2021). Compared steroid intravenous injections compared with placebo injections. The evidence suggests that steroid IV injection compared with placebo injection may result in little to no difference in short-term psychological functioning in people acute WAD, but the evidence is very uncertain.

Table 43: Summary of included studies (intravenous steroid injection)

Author Year	Participants and setting (country)	Intervention (steroid IV injection)	Control (placebo IV injection)	Outcomes included	Neck pain outcomes	Neck disability outcomes	Psych functioning outcomes	Summary (risk of bias PEDRO score)
(Shaked et al., 2021)	77 participants with acute WAD in primary care (Israel)	Hydrocortisone 100mg in a volume of 5ml given intravenously.	Saline 0.9% in a volume of 5ml given intravenously.	Neck pain, neck disability, and psych functioning at 1mo.	NRS (0-10)	NDI (0-100)	Post-Traumatic Stress Diagnostic Scale (PDS) (0-51)	No significant differences were found in short-term neck pain, neck disability and psychological functioning. (8)

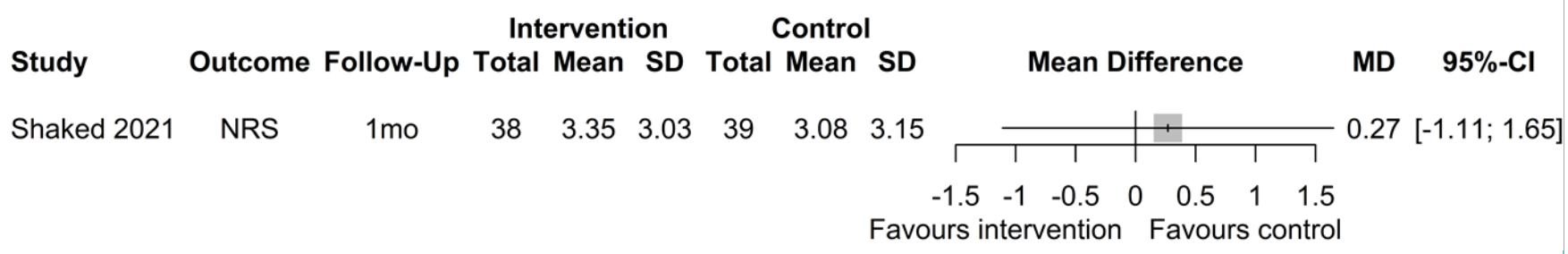
T.17.2. Effect on neck pain

Short-term outcomes (acute WAD)

Included studies: Shaked 2021

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Steroid injection (n=38), Placebo injection (n=39) Mean difference I-C NRS: 0.27 (-1.11, 1.65)	⨁⨁◯◯ Low	CRITICAL
1	Not serious[a]	Not serious	Not serious	Very serious[b]	None			

(Acute WAD) Short-term neck pain (follow-up: 1mo; assessed with: NRS; Scale from: 0 to 10)



a. Low risk of bias (PEDRO 8/10).

b. Number of total observations were significantly below the threshold for precision (n=77) and based on a single study, however, confidence intervals were within clinically significant thresholds.

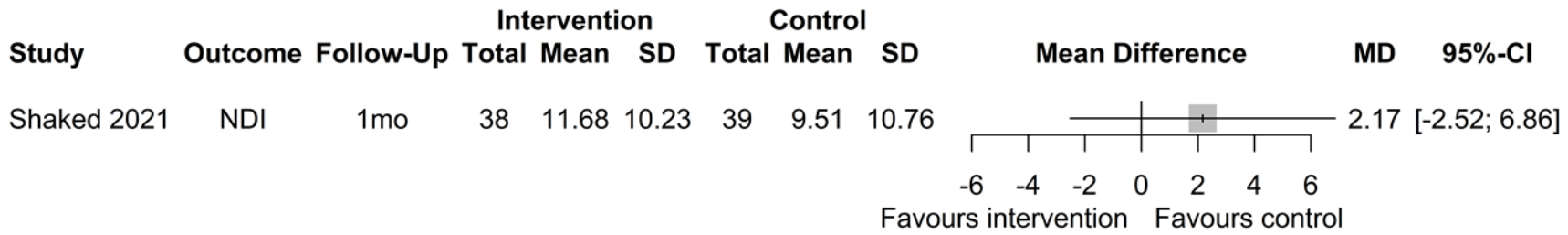
T.17.3. Effect on neck disability

Short-term outcomes (acute WAD)

Included studies: Shaked 2021

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Steroid injection (n=38), Placebo injection (n=39)	⊕⊕◯◯ Low	CRITICAL
1	not serious[a]	not serious	not serious	Very serious[b]	None	Mean difference I-C NDI: 2.17 (-2.52, 6.86)		

(Acute WAD) Short-term neck pain (follow-up: 1mo; assessed with: NDI; Scale from: 0 to 100)



a. Low risk of bias (PEDRO 8/10).
b. b. Number of total observations were significantly below the threshold for precision (n=77) and based on a single study, however, confidence intervals were within clinically significant thresholds.

T.17.4. Effect on psychological functioning

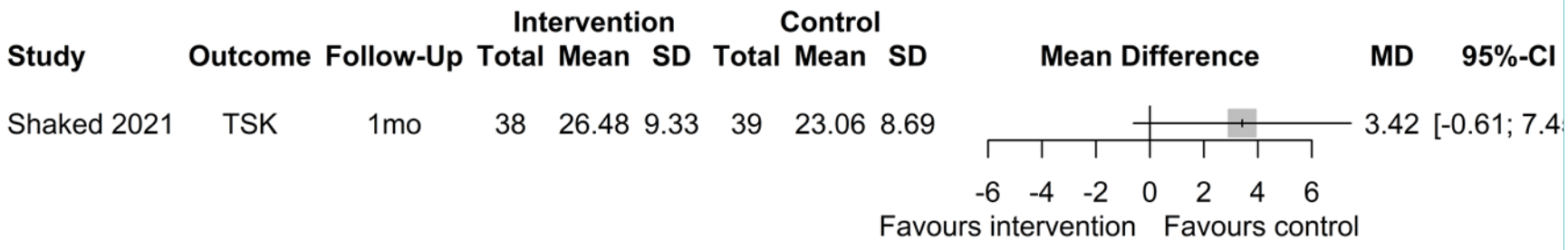
Short-term outcomes (acute WAD)

Included studies: Shaked 2021

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Steroid injection (n=38), Placebo injection (n=39)	⊕⊕◯◯ Low	CRITICAL

1	Not serious[a]	not serious	not serious	Extremely serious[b]	None	Mean difference I-C PDS: 3.42 (-0.61, 7.45)		

(Acute WAD) Short-term psychological functioning (follow-up: 1mo; assessed with: PDS; Scale from: 0 to 51)



[a]Low risk of bias (PEDRO 8/10).
[b]Number of total observations were significantly below the threshold for precision (n=77) and based on a single study. Confidence intervals crossed the clinically significant threshold in favour of the control and zero.

Table 44: Evidence to decision framework (intravenous steroid injection for acute WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
● Trivial ○ Small ○ Moderate ○ Large ○ Varies ○ Don't know	The evidence suggests that steroid IV injection compared with placebo injection results in little to no difference in short-term neck pain, neck disability, and psychological functioning in people acute WAD (Shaked 2021).	Anticipated effects are in the short-term only. Intravenously delivered steroids are systemic and therefore are dispersed throughout the body rather than in a localised area.
Undesirable Effects How substantial are the undesirable anticipated effects?		
Judgement	Research evidence	Additional considerations

○ Large ● Moderate ○ Small ○ Trivial ○ Varies ○ Don't know	Not reported in included trial.	Known side effects for steroids. Infection risk with IV injection. Slows tissue healing process by reducing inflammatory processes.
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations
○ Very low ● Low ○ Moderate ○ High ○ No included studies	The evidence suggests that steroid intravenous injections do not reduce short-term neck pain (low certainty), neck disability (low certainty), and psychological functioning (very low certainty) compared with placebo injections in people with acute WAD.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ● Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention	Absence of benefit with the intervention compared with placebo and potentially significant side effects (Shaked, 2021).	Comparison is a placebo injection.

○ Varies ○ Don't know		
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Large costs ● Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	Requires specialised expertise in a tertiary care setting (e.g., hospital).	
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies		
Cost effectiveness		

Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	Comparison is a placebo injection. In the absence of benefit, cost-effectiveness likely favours not using this treatment.
Equity What would be the impact on health equity?		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ○ Probably no impact ○ Probably increased ○ Increased ○ Varies ● Don't know	No included evidence.	
Acceptability Is the intervention acceptable to key stakeholders?		
Judgement	Research evidence	Additional considerations
○ No ● Probably no ○ Probably yes	No included evidence.	If the person is already within an emergency department in a hospital, then it may be acceptable for health professionals, however, this would depend on the person's preference.

○ Yes ○ Varies ○ Don't know		Probably not acceptable given the low risk of harm and absence of benefit.
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations
○ No ● Probably no ○ Probably yes ○ Yes ○ Varies ○ Don't know	No included evidence.	If the person is already within an emergency department in a hospital, then it may be feasible. However, not feasible for referral to tertiary care for IV injection if seen initially in primary care.

T.17.5. Conclusions (IV steroid injections for acute WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
●	○	○	○	○

Recommendations
The guideline panel strongly recommend that healthcare professionals do not use intravenous steroid injections for the management of people with acute WAD. *(Panel vote summary: 12/15 80% strong against; 3/15 20% conditional against)* **Justification** • The evidence suggests that steroid intravenous injections do not reduce short-term neck pain, neck disability, and psychological functioning compared with placebo injections in people with acute WAD. • Steroid injections slow healing responses. • Known side effects for steroids. • Infection risk with IV injection.

- Requires specialised expertise.
- Consideration for other medications for pain management before IV steroid injections.

Table 45: Evidence to decision framework (intravenous steroid injections for chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Trivial ○ Small ○ Moderate ○ Large ○ Varies ● Don't know	No clinical trials for chronic WAD. No anticipated effect as there are no significant differences compared with placebo injections in acute WAD (Shaked 2021).	Anticipated effects are in the short-term only. Intravenously delivered steroids are systemic and therefore dispersed throughout the body, rather than in a localised area.
Undesirable Effects How substantial are the undesirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Large ● Moderate ○ Small ○ Trivial ○ Varies ○ Don't know	Known side effects for steroids. Infection risk with IV injection. Slows tissue healing process by reducing inflammatory responses.	Could result in reliance on steroid injections for ongoing pain management.
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations

○ Very low ○ Low ○ Moderate ○ High ● No included studies	No clinical trials in chronic WAD.	
Balance of effects **Does the balance between desirable and undesirable effects favour the intervention or the comparison?**		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ● Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ○ Don't know	Absence of trials demonstrating the effectiveness of the intervention in acute WAD and potentially significant side effects. No clinical trials in chronic WAD.	Control intervention was a placebo injection.
Resources required **How large are the resource requirements (costs)?**		
Judgement	Research evidence	Additional considerations

○ Large costs ● Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	Requires specialised expertise in a tertiary care setting (e.g., hospital).	
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	Comparison is a placebo injection. In the absence of benefit in acute WAD and no trials in chronic WAD, cost-effectiveness likely favours not using this treatment.
Equity What would be the impact on health equity?		

Judgement	Research evidence	Additional considerations
○ Reduced ● Probably reduced ○ Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Only a select population would have access to treatment (e.g., in settings where additional funding is available).
Acceptability Is the intervention acceptable to key stakeholders?		
Judgement	Research evidence	Additional considerations
○ No ● Probably no ○ Probably yes ○ Yes ○ Varies ○ Don't know	No included evidence.	Not acceptable for referral to tertiary care for IV injection.
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations
○ No ● Probably no ○ Probably yes ○ Yes ○ Varies ○ Don't know	No included evidence.	Not feasible for referral to tertiary care for IV injection. Requires specialised expertise to administer.

T.17.6. Conclusions (IV steroid injections for chronic WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
●	○	○	○	○

Recommendations
The guideline panel strongly recommend that healthcare professionals do not use intravenous steroid injections for the management of people with chronic WAD. *(Panel vote summary: 9/15 60% strong against; 6/15 40% conditional against)* **Justification** • The evidence suggests that steroid intravenous injections do not reduce short-term neck pain, neck disability, and psychological functioning compared with placebo injections in people with acute WAD. • Known side effects for steroids. • Infection risk with IV injection. • Requires specialised expertise, where referral to a tertiary care setting for IV injection is not feasible. • Consideration for other medications for pain management before IV steroid injections. • Can develop a person's reliance on steroid injections for pain management.

T.18. Pharmacological (oral): Simple analgesics

Are simple analgesics (e.g., paracetamol) compared with placebo effective for the management of acute or chronic WAD?

T.18.1. Executive summary

No clinical trials on the effectiveness of simple analgesics (e.g., paracetamol) compared with placebo in acute or chronic WAD were included in these guidelines. See 'Absence of evidence procedures' (4.1.9) for further details. The following guidelines were used to inform recommendations on simple analgesics for managing acute and chronic WAD:

1) Acute WAD: Evidence relating to the use of simple analgesics for acute pain management was sourced from the Australian and New Zealand College of Anaesthetists and Faculty of Pain Medicine: Acute Pain Management Scientific Evidence (5th ed) (Schug et al., 2020).
2) Chronic WAD: Pain Australia provided input to the United Kingdom National Institute for Health and Care Excellence's consultation on the Chronic Pain Assessment and Management Guidelines (NICE, 2021).

Table 46: Evidence to decision framework (simple analgesics for acute WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Trivial ● Small (acute) ○ Moderate ○ Large ○ Varies ● Don't know (chronic)	No clinical trials on the effectiveness of simple analgesics compared with placebo in acute or chronic WAD were included in these guidelines. Acute: Paracetamol is an effective analgesic for acute pain when compared to placebo (Level I [Cochrane Review]) (Schug et al., 2020). Chronic: No evidence for the use of paracetamol for the management of chronic pain was included in the NICE guidelines.	
Undesirable Effects **How substantial are the undesirable anticipated effects?**		
Judgement	Research evidence	Additional considerations
○ Large ○ Moderate ○ Small ● Trivial ○ Varies ○ Don't know	Trivial side effects generally if safe dosages are followed. Side effects from paracetamol are rare but include: Allergic reactions, including a rash or swelling, rash, blood disorders, liver and kidney damage (when taken at higher than recommended doses) (Healthdirect, 2023). Side effects are dose related: paracetamol is known to be dangerous in overdose.	
Certainty of evidence **What is the overall certainty of the evidence of effects?**		
Judgement	Research evidence	Additional considerations

○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence for whiplash injury.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ● Probably favours the intervention **(acute)** ○ Favours the intervention ○ Varies ● Don't know **(chronic)**	ACUTE: Paracetamol is an effective analgesic for acute pain; the incidence of adverse effects is comparable to placebo (Level I [Cochrane Review]) (Schug et al., 2020).	Contraindications to paracetamol: • Person has an allergy to paracetamol. • Person takes other paracetamol containing medicines. • Person has already taken the recommended dose within a 24-hour period. Caution for taking paracetamol: • liver problems • kidney problems • problems with alcohol • very underweight Chronic: can create a reliance on simple analgesics for pain management, which differs to the recommended active and biopsychosocial approach to managing chronic WAD.
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations

○ Large costs ○ Moderate costs ● Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know		Available over the counter at low cost in multiple forms (e.g., tablet).
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	Not applicable.	
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies	No included evidence.	

● No included studies		
Equity **What would be the impact on health equity?**		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ● Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Easily accessible over the counter medication at low cost in multiple forms (e.g., tablet) and settings across Australia.
Acceptability **Is the intervention acceptable to key stakeholders?**		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know		Widely available and used in Australia, acceptable for people for pain management.
Feasibility **Is the intervention feasible to implement?**		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know		Easily accessible over the counter medication at low cost in multiple forms (e.g., tablet) and settings across Australia.

T.18.2. Conclusions (simple analgesics for acute WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	○	●	○

Recommendations
The guideline panel suggest that simple analgesics (e.g., paracetamol) could be used for the management of people with acute WAD. *(Panel vote summary: 9/9 100% conditional for)* **Justification** • No clinical trials for the use of simple analgesia compared with placebo in acute WAD. However, paracetamol is known to be an effective analgesic for acute pain and the incidence of adverse effects is comparable to placebo. • Can be implemented safely if dosage recommendations are followed, as there are known significant dose related adverse effects, and if not used by people with known contraindicated conditions. **Subgroup considerations** • Simple analgesics could be used to alleviate pain in the short-term for people with WAD grades II and III. **Implementation considerations** *Indications:* • Simple analgesics could be used to alleviate pain in the short-term. Use as a first line pharmacological treatment in conjunction with other recommended treatments if there are clinically significant reductions in neck pain and disability. *Dose:* • Calculate total paracetamol dosage that person is currently taking and ensure that it falls within guidelines (given known dose related side-effects) *Considerations:* Inform person about • known dose-related side-effects. • that paracetamol might be present in mixed oral medications (over the counter or prescribed). For example, cold and flu medication.

- outside Australia paracetamol has different brand names (e.g., acetaminophen).

Contraindications:

- People with allergy to paracetamol
- Have already taken the recommended dose within a 24-hour period.
- People with liver, kidney conditions, alcohol problems or if severely underweight.

T.18.3. Conclusions (simple analgesics for chronic WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	●	○	○

Recommendations
The guideline panel cannot recommend for or against the use of simple analgesics for the management of people of chronic WAD. *(Panel vote summary: 8/9 89% neutral; 1/9 11% conditional for)* **Justification** • No clinical trials in chronic WAD and no evidence identified within the NICE Guidelines for managing chronic pain (NICE, 2021). • Can be implemented safely if dosage recommendations are followed, as there are known significant dose related adverse effects, and if not used by people with known contraindicated conditions. **Implementation considerations** *Indications:* • Simple analgesics could be used in conjunction with an active biopsychosocial approach in the chronic phase of whiplash injury. *Dose:* • Calculate total paracetamol dosage that person is currently taking and ensure that it falls within guidelines (given known dose related side-effects). *Considerations:* • Inform person of known dose-related side-effects.

- Inform person that paracetamol might be present in mixed oral medications (over the counter or prescribed). For example, cold and flu medication.
- Outside Australia paracetamol has different names (e.g., acetaminophen).
- If a person with chronic WAD is already using simple analgesia (e.g., paracetamol) for pain management, HCPs should review the prescribing and consider the following actions:
    - Explain the lack of evidence for these medicines for managing chronic pain.
    - Develop a shared plan in conjunction with the injured person for usage of simple analgesia if there are clinically meaningful benefits at a safe dosage.
    - Explain the risks of continuing if they report little benefit or adverse effects and encourage and support them to reduce and stop the medicine if possible.

Contraindications:

- People with allergy to paracetamol.
- Have already taken the recommended dose within a 24-hour period.
- People with liver, kidney conditions, alcohol problems or if severely underweight.

T.19. Pharmacological (oral): Nonsteroidal anti-inflammatory drugs

Are non-steroidal anti-inflammatory drugs compared with placebo effective for the management of acute or chronic WAD?

T.19.1. Executive summary

No clinical trials on the effectiveness of non-steroidal anti-inflammatory drugs (NSAIDs) compared with placebo in acute or chronic WAD were included in these guidelines. It is noted that several acute WAD trials prescribed NSAIDs as part of conservative management, for example, in addition to soft collar use: Dehner 2006; Gennis 1996; Foley-Nolan 1992.

One RCT involving treatment of acute WAD with NSAIDs was reported in version 1 of the NSW acute WAD guidelines: Gunzburg R Efficacy of an NSAID (Tenoxicam) in the acute phase of whiplash. Proceedings – World Congress Whiplash Associated Disoders:116. This study was published only as a conference abstract without point estimate data for extraction, and therefore, was excluded from these guidelines.

A systematic review for noninvasive interventions for treating neck pain found no relevant studies for the use of NSAIDs for the management of WAD (Hurwitz et al., 2009). The authors concluded that a lack of scientifically acceptable evidence precludes summary statements on NSAIDs in the treatment of WAD. The risk of serious side effects from NSAIDs is negligible; however, minor side effects may be much more frequent.

One clinical trial (Khwaja et al., 2010) evaluated the effect of a muscle relaxant (cyclobenzaprine) in addition to ibuprofen (NSAID). The study was not eligible from these guidelines as NSAIDs were not compared against a placebo or in addition to usual care.

- Acute WAD: Evidence relating to the use of NSAIDs for acute pain management was sourced from the Australian and New Zealand College of Anaesthetists and Faculty of Pain Medicine: Acute Pain Management Scientific Evidence (5th ed) (Schug et al., 2020).
- Chronic WAD: Pain Australia provided input to the United Kingdom National Institute for Health and Care Excellence's consultation on the Chronic Pain Assessment and Management Guidelines. (NICE Chronic Pain Guidelines).

Table 47: Evidence to decision framework (NSAIDs for acute and chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
● Trivial (chronic) ● Small (acute) ○ Moderate ○ Large ○ Varies ○ Don't know	No clinical trials on the effectiveness of NSAIDs compared with placebo in acute or chronic WAD were included in these guidelines. It is noted that several acute WAD trials prescribed NSAIDs as part of conservative management, for example, in addition to soft collar use: Dehner 2006; Gennis 1996; Foley-Nolan 1992. Acute: Nonselective NSAIDs are effective in the treatment of acute muscle injury (Level I Prisma). Nonselective NSAIDs given in addition to paracetamol improve analgesia compared with either medicine given alone (Level I), in particular ibuprofen combined with paracetamol (Level I [Cochrane Review]) (Schug et al., 2020). Chronic: Evidence suggested that short-term use of NSAIDs made no difference to pain or psychological distress in people with chronic pain. (NICE, 2021).	
Undesirable Effects **How substantial are the undesirable anticipated effects?**		
Judgement	Research evidence	Additional considerations
○ Large ○ Moderate ● Small (acute and chronic) ○ Trivial ○ Varies ○ Don't know	Acute and chronic: • Common side effects after taking NSAIDs include nausea, heartburn and indigestion. • More serious but less common side effects include stomach bleeding or kidney problems. NSAIDs, including those bought over-the-counter, have also been linked to a small increase in the risk of stroke and heart attack. Side effects can be dose related (Healthdirect, 2023). Acute: Nonselective NSAIDS may cause bronchospasm in individuals known to have NSAID-exacerbated respiratory disease (Schug et al., 2020). Chronic: A small amount of evidence suggested that NSAIDs reduced physical function, compared with placebo in people with chronic pain (NICE, 2021).	

Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence for WAD.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● Don't know	Acute: NSAIDs can relieve symptoms associated with a range of conditions, including pain (e.g., muscle strains and sprains). Chronic: Risks of harm with NSAIDs (gastrointestinal bleeding) and the lack of evidence of short-term or long-term effectiveness, the committee decided to recommend against starting NSAIDs for chronic pain management.	Contraindications to NSAIDs: • are allergic or hypersensitive to NSAIDs. • are pregnant or planning a pregnancy. • have a kidney or liver condition. • have a gastrointestinal (gut) ulcer or bleeding. Care should be taken when prescribing NSAIDs to older adults with hypertension and/or heart disease.
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations

○ Large costs ○ Moderate costs ● Negligible costs and savings (acute and chronic) ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	Not applicable.	Available over the counter at low cost in multiple forms (e.g., tablet).
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the	No included evidence.	Likely varies based on dosage and whether there are benefits.

intervention ○ Varies ● No included studies		
Equity What would be the impact on health equity?		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ● Probably no impact (acute and chronic) ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Easily accessible over the counter medication at low cost in multiple forms (e.g., tablet) and settings across Australia.
Acceptability Is the intervention acceptable to key stakeholders?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know	No included evidence for WAD.	Widely available and used in Australia, acceptable for people for pain management.
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations

○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know		Easily accessible over the counter medication at low cost in multiple forms (e.g., tablet) and settings across Australia.

Type of recommendation (NSAIDs for acute WAD)

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	○	●	○

T.19.2. Conclusions (NSAIDs for acute WAD)

Recommendations
The guideline panel suggest that non-steroidal anti-inflammatory drugs could be used for the management of people with acute WAD. *(Panel vote summary: 9/9 100% conditional for)* Justification • NSAIDs can be used to alleviate pain in the short-term. • Used as part of a conservative treatment in whiplash clinical trials, without significant side effects reported. • Nonselective NSAIDs are effective in the treatment of acute muscle injury. • Nonselective NSAIDs given in addition to paracetamol improve analgesia compared with either medicine given alone for acute pain management. • Can be implemented safely if dosage recommendations are followed, as there are known dose related adverse effects, and if not used by people with known contraindicated conditions. Subgroup considerations • NSAIDs could be used to alleviate pain in the short-term for people with WAD grades II and III. Implementation considerations

Indications:

- If simple analgesics are ineffective, short-term use of NSAIDs may be used if there are clinically significant reductions in neck pain.

Considerations:

- Inform person of known side-effects (which appear to be dose related).
- NSAIDs being present in different medications and under different names.

Contraindications:

- People allergic or hypersensitive to NSAIDs
- Pregnancy or planning a pregnancy.
- People with kidney or liver conditions
- People with have a gastrointestinal (gut) ulcer or bleeding.
- People who have a NSAID-exacerbated respiratory disease.
- Care should be taken when prescribing NSAIDs to older adults with hypertension and/or heart disease.

Type of recommendation (NSAIDs for chronic WAD)

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	●	○	○

T.19.3. Conclusions (NSAIDs for chronic WAD)

Recommendations
The guideline panel cannot recommend for or against the use of non-steroidal anti-inflammatory drugs for the management of chronic WAD. *(Panel vote summary: 8/9 89% neutral; 1/9 11% conditional for)* **Justification** • No clinical trials in chronic WAD. • Consideration of evidence and recommendations developed in the NICE Guidelines for managing chronic pain. • Evidence suggested that short-term use of NSAIDs made no difference to pain or psychological distress in people with chronic pain. • A small amount of evidence suggested that NSAIDs reduced physical function, compared with placebo in people with chronic pain. • Known dose-related adverse effects associated with NSAIDs and lack of evidence of short-term or long-term effectiveness for chronic pain management.

Implementation considerations

Indications:

- HCPs should avoid initiating the use of NSAIDs for the management of chronic WAD if the person is not currently using NSAIDs. If a person with chronic WAD has had no benefit with simple analgesics or is already taking NSAIDs, healthcare professionals should review the prescribing of NSAIDs and consider the following actions:
- explain the lack of evidence for these medicines for chronic pain management.
- develop a shared plan in conjunction with the injured person for usage of NSAIDs, if there are clinically meaningful benefits at a safe dosage.
- explain the risks of continuing if they report little benefit or adverse effects and encourage and support them to reduce and stop the medicine, if possible, in conjunction with an active and biopsychosocial treatment approach.
- In the event of a flare up NSAIDs could be prescribed for a short period of time only.

Contraindications:

- People allergic or hypersensitive to NSAIDs
- Pregnancy or planning a pregnancy.
- People with kidney or liver conditions
- People with have a gastrointestinal (gut) ulcer or bleeding.
- People with a NSAID-exacerbated respiratory disease.
- Care should be taken when prescribing NSAIDs to older adults with hypertension and/or heart disease.

T.20. Pharmacological (oral): Amitriptyline

Is amitriptyline compared with placebo effective for the management of acute or chronic WAD?

T.20.1. Executive summary

Amitriptyline is a tricyclic antidepressant used in low doses for the treatment of neuropathic pain. No clinical trials evaluating amitriptyline compared with placebo for the management of acute or chronic WAD. Information was sourced from the following acute and chronic pain management guidelines:

- Acute: Evidence relating to the use of amitriptyline for acute pain management was sourced from the Australian and New Zealand College of Anaesthetists and Faculty of Pain Medicine: Acute Pain Management Scientific Evidence (5th ed) (Schug et al., 2020).
- Chronic: Evidence relating to the use of amitriptyline for chronic pain management was sourced from the United Kingdom National Institute for Health and Care Excellence's Chronic Pain Assessment and Management Guidelines (NICE, 2021).

Table 48: Evidence to decision framework (amitriptyline for acute and chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Trivial ○ Small ○ Moderate ○ Large ○ Varies ● Don't know	No clinical trials on the effectiveness of amitriptyline for the management of acute or chronic WAD but has been demonstrated to be effective for the management of acute and chronic pain in other conditions. For example: Tricyclic antidepressants are effective in the treatment of chronic headaches (Level I [PRISMA]). Tricyclic antidepressants (e.g., amitriptyline) are effective in the treatment of neuropathic pain following spinal cord injury but only in those with co-morbid depression (Level I) (Schug et al., 2020). Evidence indicated that antidepressants (including amitriptyline) improved quality of life, pain, sleep and psychological distress compared with placebo (NICE, 2021). For treatment of fibromyalgia, amitriptyline is one of the most effective medications for pain management, with moderate improvements in pain and sleep, and small improvements in fatigue and health-related QOL (Häuser et al., 2012) (Level I, 35 RCTs, n=6,766).	
Undesirable Effects **How substantial are the undesirable anticipated effects?**		
Judgement	Research evidence	Additional considerations
○ Large ○ Moderate ○ Small ○ Trivial ● Varies (acute and chronic) ○ Don't know	Adverse effects of amitriptyline vary based on potency. Trivial adverse effects from amitriptyline can include: dry mouth, altered sense of taste, nausea (feeling sick), vomiting, diarrhoea, constipation, blurred vision, difficulty in focusing, drowsiness, tiredness, headache, dizziness, light-headedness, increased sweating, weight gain or loss, changes in sex drive (TGA, Consumer Medicine Information https://www.tga.gov.au/products/australian-register-therapeutic-goods-artg/consumer-medicines-information-cmi). ACUTE: • Adverse events are increased with amitriptyline (RR 1.5; 95%CI 1.3 to 1.8) (Schug et al., 2020).	

	• Tricyclic antidepressants for fibromyalgia, no significant difference in adverse effects compared with placebo for dizziness/somnolence (studies/participants) 24/255 RR 1.73 (0.49, 6.14) and weight gain 2/124 RR 2.14 (0.23, 20.17), however, increased dry mouth 16/132 RR 4.43 (1.18, 16.68) (Häuser et al., 2012). CHRONIC: • Risk of withdrawal symptoms when deprescribing antidepressants (NICE, 2021).	
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ● Probably favours the intervention (acute/chronic) ○ Favours the	Effective for the management of pain conditions (e.g., fibromyalgia, chronic headache, neuropathic pain). Antidepressants (including amitriptyline) improved quality of life, pain, sleep, and psychological distress compared with placebo.	Comparison intervention is placebo treatment and would not be recommended. No trials in people with acute or chronic WAD. People with high levels of pain, sleep disturbances and psychological distress may benefit from the use of amitriptyline.

intervention ○ Varies ○ Don't know		
Resources required **How large are the resource requirements (costs)?**		
Judgement	Research evidence	Additional considerations
○ Large costs ○ Moderate costs ● Negligible costs and savings (acute and chronic) ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	No included evidence.	Negligible costs, however, a prescription is required in an Australian context.
Certainty of evidence of required resources **What is the certainty of the evidence of resource requirements (costs)?**		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	

Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	
Equity What would be the impact on health equity?		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ● Probably no impact (acute and chronic) ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Prescription required but used in an Australian context for pain and depression.
Acceptability Is the intervention acceptable to key stakeholders?		

Judgement	Research evidence	Additional considerations
○ No ○ Probably no ○ Probably yes ● Yes (acute and chronic) ○ Varies ○ Don't know	Example fibromyalgia: The RR of dropouts due to adverse events was 0.84 (95% CI 0.46, 1.52; I2= 0%), showing no significant difference compared with placebo (Häuser et al., 2012).	Widely available and used in an Australian context. Effectiveness and acceptability (low dropout) demonstrated in other pain states e.g., fibromyalgia.
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ○ Probably yes ● Yes (acute and chronic) ○ Varies ○ Don't know	No included evidence.	Widely available and used in Australian. Available on the PBS.

Type of recommendation (amitriptyline for acute and chronic WAD)*

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	●	○	○

*The guidelines panel agreed on a single recommendation for the use of amitriptyline for acute and chronic WAD.

T.20.2.Conclusions (amitriptyline for acute and chronic WAD)

Recommendations
The guideline panel cannot recommend for or against the use of amitriptyline for the management of people with acute or chronic whiplash associated disorders.

(Vote summary: 6/9 67% neutral; 3/9 33% conditional for)

Justification

- No clinical trials in acute or chronic WAD.
- Tricyclic antidepressants such as amitriptyline have been shown to be effective at reducing pain, improving sleep and QOL in pain conditions such as fibromyalgia, neuropathic pain, and chronic headaches.
- Effectiveness and acceptability (low dropout) demonstrated in other pain states e.g., fibromyalgia.
- Widely available and used in an Australian context.

Subgroup considerations

- People with suspected neuropathic/nociplastic pain and/or psychological distress who have not shown benefit with simple analgesics and NSAIDs.

Implementation considerations

Indications:

- If simple analgesics and NSAIDs are ineffective and the injured person is presenting with neuropathic/nociplastic pain and/or psychological distress, use of amitriptyline could be considered provided there is clinical benefit.

Dose:

- To minimise adverse effects, it is advisable to commence treatment with amitriptyline at the lowest dose possible (e.g., amitriptyline 5 to 10 mg at night) and titrate up to no more than 100 mg per day.

Considerations:

- In conjunction with recommended treatments, not as the primary treatment, and only prescribed for short periods of time (e.g., 4-6 weeks).
- Inform person of known side-effects, including the risk of withdrawal symptoms.

Contraindications:

- Prior hypersensitization, concomitant use of monoamine oxidase inhibitors, acute recovery phase following myocardial infarction) and potential precautions (suicidality, anxiety and insomnia, activation of mania/hypomania and schizophrenia, cardiovascular disorders, people with hyperthyroid, or those receiving thyroid medication, elective surgery, elevated or lowered blood sugar, impaired liver function).

T.21. Pharmacological (oral): Pregabalin

Is pregabalin compared with placebo effective for the management of acute or chronic WAD?

T.21.1. Executive summary

There was one trial that evaluated the effect of pregabalin compared with placebo for the management of acute WAD (Table 49). No clinical trials for chronic WAD were identified.

Effect on neck pain (see T.21.2 for details)

Acute WAD short-term (2 weeks to 3 months) (very low certainty in the evidence):

N=1 trial (Nikles 2021, Appendix A). Compared pregabalin oral medication with placebo with clinically significant treatment effects found favouring the intervention. Pregabalin may result in clinically significant reductions in short-term neck pain compared with placebo, but the evidence is very uncertain.

Acute WAD long-term (>3 months to 12 months) (very low certainty in the evidence):

N=1 trial (Nikles 2021, Appendix A). Compared pregabalin oral medication with placebo with no effects found. Pregabalin may result in little to no difference in long-term neck pain compared with placebo, but the evidence is very uncertain.

Additional considerations: Adverse effects

There were no serious adverse events. Minor adverse events were more common in the pregabalin group (dizziness [7/10, 70% vs 2/14, 14%], headache [3/10, 30% vs 1/14, 7%], drowsiness [2/10, 20% vs 1/14, 7%], blurred vision [2/10, 20% vs 0/14, 0%], nausea/vomiting (1/10, 10% vs 1/14, 7%), and dry mouth (1/10, 10% vs 1/14, 7%)). Some had more than one adverse event. In the pregabalin group, all 6 (100%) participants who returned data for this question reported a minor adverse event.

Table 49: Summary of included studies (pregabalin for acute and chronic WAD)

Author Year	Participants and setting (country)	Intervention (pregabalin)	Control (placebo)	Outcomes included	Neck pain outcomes	Neck disability outcomes	Psych functioning outcomes	Summary (risk of bias PEDRO score)
(Nikles et al., 2021)	24 participants with acute WAD in ED, primary care (Australia) with higher initial pain levels (NRS Recruited within 48 hours.	Advice as per WAD guidelines and 4wk oral medication treatment: pregabalin (75mg) orally 2x daily. Dose modification regimen as per standard clinical practice, e.g., could incrementally increase up to 300mg bd. Paracetamol or oxycodone was considered if high levels of pain occurred after 7d of treatment.	Advice as per WAD guidelines and placebo capsule 2x daily. Paracetamol and oxycodone if high levels of pain.	Neck pain at 3mo and 12mo.	NRS (0-10)	NDI (0-100)*	SF-12 Mental component*	Pregabalin resulted in clinically significant reductions in short-term neck pain compared with placebo. (8)

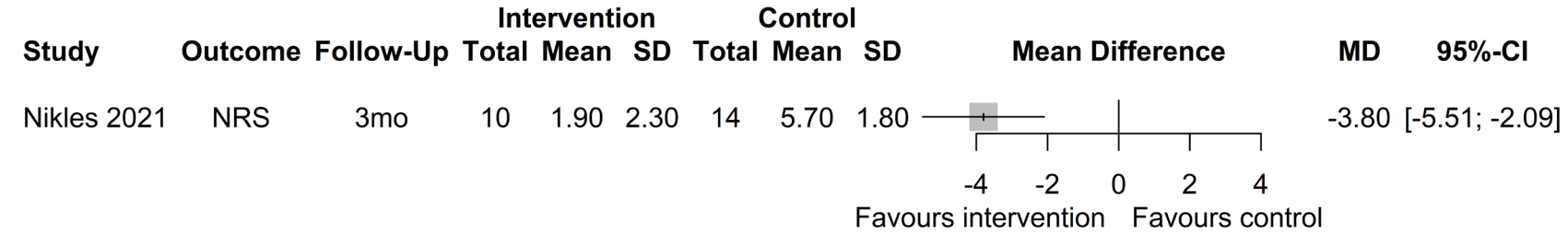
*****Secondary outcomes, including NDI and SF-12 scores were excluded from these guidelines due to poor follow-up rates (e.g., pregabalin n=7 vs placebo n=2 at 3mo)

T.21.2. Effect on neck pain

Short-term outcomes (acute WAD)

Included studies: Nikles 2021

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Baseline: Pregabalin (n=10), placebo (n=14) 3mo: Pregabalin (n=9), placebo (n=9) I-C mean difference NRS: −3.80 (−5.51 to −2.09), p =0.001	⊕◯◯◯ Very low	CRITICAL
1	Not serious[a]	not serious	not serious	Extremely serious[b]	None			
(Acute WAD) Short-term neck pain (follow-up: 3mo; assessed with: NRS; Scale from: 0 to 10)								

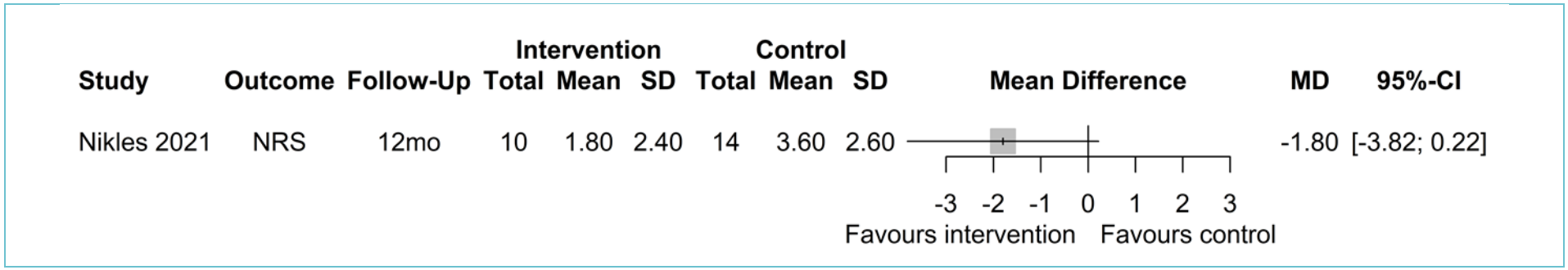


a. Low risk of bias (PEDRO 8/10).
b. Pilot study with low number of participants and loss to follow-up.

Long-term outcomes (acute WAD)

Included studies: Nikles 2021

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Baseline: Pregabalin (n=10), placebo (n=14) 3mo: Pregabalin (n=9), placebo (n=9) I-C mean difference NRS: −1.80 (−3.82, 0.22), p =0.14	⊕◯◯◯ Very low	CRITICAL
1	Not serious[a]	not serious	not serious	Extremely serious[b]	None			
(Acute WAD) Long-term neck pain (follow-up: 12mo; assessed with: NRS; Scale from: 0 to 10)								



a. Low risk of bias (PEDRO 8/10).
b. Pilot study with low number of participants and loss to follow-up, and confidence intervals cross the clinically significant threshold and zero.

Table 50: Evidence to decision framework (pregabalin for acute and chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Trivial ○ Small ● Moderate (acute) ○ Large ○ Varies ● Don't know (chronic)	Acute: Clinically significant effects in short-term neck pain (3mo) and little to no difference in long-term neck pain.	Small, possibly underpowered study to evaluate long-term effects of pregabalin on neck pain. People were recruited with significant initial pain intensity (NRS greater than or equal to 5); desirable effects only applicable to this subgroup.
Undesirable Effects How substantial are the undesirable anticipated effects?		
Judgement	Research evidence	Additional considerations

○ Large ○ Moderate ● Small ○ Trivial ○ Varies ○ Don't know	There were no serious adverse events. High prevalence of dizziness as a minor adverse effect in the pregabalin group compared with placebo group. [7/10, 70% vs 2/14, 14%].	Known side effects associated with pregabalin.
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations
● Very low (acute) ○ Low ○ Moderate ○ High ● No included studies (chronic)	Acute: Pregabalin may result in clinically significant reductions in short-term (3mo) neck pain in people with acute WAD with significant pain (NRS greater than or equal to 5) compared with placebo, but the evidence is very uncertain as the findings were from a single study with low sample size (pilot trial).	Short-term effects were 3mo, study may have been underpowered for evaluation of long-term effects (12mo).
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations

○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ● Probably favours the intervention (acute) ○ Favours the intervention ○ Varies ● Don't know (chronic)	Acute: Clinically significant reductions in neck pain with small adverse effects.	Small pilot trial with loss to follow up. People were recruited with significant initial pain intensity (NRS greater than or equal to 5).
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Large costs ○ Moderate costs ● Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	No included evidence.	~50c per capsule (PBS). Requires prescription (GP consult).
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations

○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	Cost-effectiveness is likely dependent upon whether an individual responds to the medication.
Equity What would be the impact on health equity?		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ● Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Available in an Australian context for neuropathic pain.
Acceptability Is the intervention acceptable to key stakeholders?		

Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	Pregabalin group's adherence with medication was much higher than placebo group (73.6% vs 38.3%).	Medication in widespread use in an Australian context.
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	Prescribed by trial GP (not community GP) in primary care.	Use of pregabalin in WAD is not an accepted indication for the PBS (neuropathic pain and not responding to other medication). Commonly prescribed medication for neuropathic pain.

Type of recommendation (pregabalin for acute WAD)

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	●	○	○

T.21.3. Conclusions (pregabalin for acute WAD)

Recommendations
The guideline panel cannot recommend for or against the use of pregabalin for the management of people with acute WAD. *(Panel vote summary: 8/8 100% neutral)* **Justification**

- Pregabalin may result in clinically significant reductions in short-term neck pain in people with acute WAD and high pain intensity compared with placebo, but the evidence is based on a small pilot trial with high loss to follow-up (unable to evaluate long-term outcomes).
- Justification for the trial (Nikles, 2021) as an alternative to more commonly prescribed opioids that have been used in people with WAD.
- Known side effects associated with pregabalin use, including high prevalence of dizziness as a minor adverse effect in the pregabalin group compared with placebo group (Nikles 2021).

Subgroup considerations

- People with acute WAD who have high initial pain intensity (NRS≥5) early after whiplash injury (e.g., 48 hours post), and are suspected to have neuropathic pain.

Implementation considerations

Indications:

- People who have high initial pain intensity (NRS≥5) early after whiplash injury (e.g., 48 hours post) and are suspected to have neuropathic pain.

Considerations:

HCPs should

- Prescribe for a short period of time only (5wks).
- Screen people for a history of drug misuse before prescribing and ongoing observation of people for development of signs of misuse and dependence should be carried out.
- Use in conjunction with recommended treatments and only if the injured person is showing clinically meaningful benefit in critical outcomes.
- Inform person of known side-effects.

Contraindications:

- People with history of depression were not included in the study due to the risk of suicidal ideation (Nikles, 2021).

Type of recommendation (pregabalin for chronic WAD)

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	●	○	○

T.21.4. Conclusions (pregabalin for chronic WAD)

Recommendations
The guideline panel cannot recommend for or against the use of pregabalin for the management of people with chronic WAD. *(Panel vote summary: 9/9 100% neutral)* **Justification** • No clinical trials for the use of pregabalin in chronic WAD. • Known side effects associated with pregabalin use. **Implementation considerations** Indications: If a person with chronic WAD has had no benefit with simple analgesics or NSAIDs, and are suspected to have neuropathic pain, pregabalin could be considered. Considerations: HCPs should • Explain the lack of evidence for these medicines chronic non-neuropathic pain management. • Prescribe for a short period of time only (5 wks). • Explain the risks of continuing if they report little benefit or adverse effects and encourage and support them to reduce and stop the medicine if possible. • Used in conjunction with an active and biopsychosocial treatment approach. • Prescribe according to principles described in Clinical Framework for Delivery of Health Services. • Evaluate outcomes.

T.22. Pharmacological (oral): Opioid analgesics

Are opioid analgesics compared with placebo effective for the management of acute or chronic WAD?

T.22.1. Executive summary

No clinical trials evaluating opioid analgesics compared with placebo for the management of acute or chronic WAD. Information was sourced from the following acute and chronic pain management guidelines:

ACUTE: Evidence relating to the use of opioids for acute pain management was sourced from the Australian and New Zealand College of Anaesthetists and Faculty of Pain Medicine: Acute Pain Management Scientific Evidence (5th ed) (Schug et al., 2020).

CHRONIC: Evidence relating to the use of opioids for chronic pain management was sourced from the United Kingdom National Institute for Health and Care Excellence's Chronic Pain Assessment and Management Guidelines (NICE, 2021).

Common types of opioids in an Australian context:

fentanyl, morphine, oxycodone, methadone, tramadol, buprenorphine, tapentadol, hydromorphone, codeine.

Table 51: Evidence to decision framework (opioid analgesics for acute and chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
● Trivial (chronic) ○ Small ○ Moderate (acute) ○ Large ● Varies (acute) ○ Don't know	No clinical trials on the effectiveness of opioids for the management of acute or chronic WAD. Acute: In the management of acute pain, one opioid is not superior to others but some opioids are better in some people (Schug et al., 2020). Tramadol is an effective treatment for neuropathic pain (Schug et al., 2020). Chronic: No evidence on the effectiveness of opioids for chronic pain (NICE, 2021).	
Undesirable Effects How substantial are the undesirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Large ○ Moderate ○ Small ○ Trivial ● Varies (acute and chronic) ○ Don't know	Adverse effects of opioids vary based on type and potency. Adverse effects from opioids can include sleepiness, constipation, sweating, fatigue, headache, dry mouth, vomiting. Acute: The incidence of clinically meaningful adverse effects (nausea, vomiting) of opioids is dose-related) (Schug et al., 2020). Opioids in high doses, can induce hyperalgesia and/or acute tolerance (Schug et al., 2020) Tramadol has a lower risk of respiratory depression and impairs gastrointestinal motor function less than other opioids at equianalgesic doses (Schug et al., 2020). Chronic Increased risk of dependence and addiction with long-term use >6mo (NICE, 2021).	

	A range of other adverse effects (NICE, 2021).	
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ● Probably favours the comparison – no treatment (**chronic**) ○ Does not favour either the intervention or the comparison ○ Probably favours	**ACUTE:** One opioid is not superior to others but some opioids are better in some people. Tramadol is an effective treatment for neuropathic pain. Known adverse effects associated with opioids that are type and dose dependent. Other medications such as NSAIDs or pregabalin are opioid-sparing medications which can reduce opioid-related adverse effects. **CHRONIC:** Nice Guideline Committee recommended against starting opioid treatment for people with chronic pain due to the evidence of long-term harm and lack of evidence on effectiveness of opioids.	Comparison intervention is placebo treatment and would not be recommended.

the intervention ○ Favours the intervention ● Varies (**acute**) ○ Don't know		
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Large costs ○ Moderate costs ● Negligible costs and savings (acute and chronic) ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	No included evidence.	Negligible costs, however, a prescription is required and opioids are tightly controlled in an Australian context (limited dosage per prescription).
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations

○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	
Equity What would be the impact on health equity?		
Judgement	Research evidence	Additional considerations

○ Reduced ○ Probably reduced ● Probably no impact (acute and chronic) ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Prescription required and tightly controlled, but used widely in multiple forms (e.g., oral tablet) and settings across Australia.
Acceptability Is the intervention acceptable to key stakeholders?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ○ Probably yes ● Yes (acute and chronic) ○ Varies ○ Don't know	No included evidence.	Widely available and used in Australia for pain management.
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ○ Probably yes ● Yes (acute and chronic) ○ Varies ○ Don't know	No included evidence.	Widely available and used in Australia for pain management.

Type of recommendation (opioid analgesics for acute WAD)

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	●	○	○	○

T.22.2.Conclusions (opioid analgesics for acute WAD)

Recommendations
The guideline panel suggests that healthcare professionals do not use opioid analgesics for the management of people with acute WAD. *(Panel vote summary: 8/10 80% conditional against; 2/10 20% neutral)* **Justification** • No clinical trials in the context of acute or chronic WAD. • Some opioids have been shown to be effective for acute pain management: e.g., tramadol is an effective treatment for neuropathic pain. • Variable effectiveness as one opioid is not superior to others, but some opioids are better in some people. • Clinically meaningful adverse effects (nausea, vomiting) of opioids are dose-related and in high doses opioids can induce hyperalgesia and/or acute tolerance. **Subgroup considerations** • People with very severe pain who have not shown benefit with simple analgesics, NSAIDs, or other medication (e.g., pregabalin). **Implementation considerations** *Indications:* • If simple analgesics and NSAIDs are ineffective and pain is very severe, cautious use of low-potency opioids (e.g., tramadol) could be considered provided that there is clinical benefit. *Dose:* • If used, opioids should be only prescribed for short periods of time for severe pain that either is not responsive to other analgesics, or when other analgesics are contraindicated. *Considerations:* • Opioid types and potency need to be considered individually. • Communicate known side-effects, which appear to be dose related, to the injured person.

Contraindications:

- People with impaired liver or kidney function, or alcohol dependence, mild traumatic brain injury and other co-morbidities.

T.22.3. Conclusions (opioid analgesics for chronic WAD)

Type of recommendation (opioid analgesics for chronic WAD)

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	●	○	○	○

Recommendations
The guideline panel suggests that healthcare professionals do not use opioid analgesics for the management of people with chronic WAD. *(Panel vote summary: 7/10 70% conditional against; 2/10 20% neutral; 1/10 10% strong against)*

Justification

- No clinical trials in chronic WAD.
- Consideration of evidence and recommendations developed in the NICE Guidelines for managing chronic pain.
- The evidence of long-term harm, along with lack of evidence on effectiveness of opioids, persuaded the committee to recommend against starting opioid treatment for people with chronic pain (NICE, 2021).

Implementation considerations

Indications:

- If simple analgesics and NSAIDs are ineffective and pain is very severe, cautious use of low-potency opioids (e.g., tramadol) could be considered provided that there is clinical benefit.

Dose:

- If used, opioids should be only prescribed for short periods of time for severe pain that either is not responsive to other analgesics, or when other analgesics are contraindicated.

Considerations:

- Opioid types and potency need to be considered individually.
- Communicate known side-effects, which appear to be dose related, to the injured person.

Contraindications:

- People with impaired liver or kidney function, or alcohol dependence, TBI/other comorbidities/injury.

14. Multidisciplinary care treatment recommendation

T.23. Multidisciplinary care

Are multidisciplinary one-to-one interventions compared with usual care effective for the management of people with acute or chronic whiplash associated disorders?*

*The panel agreed to comment on multidisciplinary pain clinics in the implementation considerations of this clinical question, given that no evidence was identified for multidisciplinary pain clinics for the management of WAD

T.23.1. Executive summary

There was one acute and one chronic study included that evaluated the effect of multidisciplinary care on people with WAD (Table 52). Commentary of multidisciplinary pain clinics is presented in the chronic WAD conclusions (see T.23.6 for details).

Effect on neck pain (see T.23.2 for details)

Acute WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=1 trial (Jull 2013). The evidence suggests that multidisciplinary care compared with usual care may result in little to no difference in short-term neck pain in people with acute WAD.

Acute WAD long-term (>3 months to 12 months) (low certainty in the evidence):

N=1 trial (Jull 2013). The evidence suggests that multidisciplinary care compared with usual care may result in little to no difference in long-term neck pain in people with acute WAD.

Chronic WAD short-term (2 weeks to 3 months) (very low certainty in the evidence):

N=1 trial (Wicksell 2008). Multidisciplinary care compared with usual care may result in little to no difference in short-term neck pain in people with chronic WAD, but the evidence is very uncertain.

Chronic WAD long-term (>3 months to 12 months) (very low certainty in the evidence):

N=1 trial (Wicksell 2008). Multidisciplinary care compared with usual care may result in little to no difference in long-term neck pain in people with chronic WAD, but the evidence is very uncertain.

Effect on neck disability (see T.23.3 for details)

Acute WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=1 trial (Jull 2013). The evidence suggests that multidisciplinary care compared with usual care may result in little to no difference in short-term neck disability in people with acute WAD.

Acute WAD long-term (>3 months to 12 months) (low certainty in the evidence):

N=1 trial (Jull 2013). The evidence suggests that multidisciplinary care compared with usual care may result in little to no difference in long-term neck disability in people with acute WAD.

Chronic WAD short-term (2 weeks to 3 months) (very low certainty in the evidence):

N=1 trial (Wicksell 2008). Multidisciplinary care compared with usual care results in clinically significant reductions in short-term neck disability in people with chronic WAD, but the evidence is very uncertain.

Chronic WAD long-term (>3 months to 12 months) (very low certainty in the evidence):

N=1 trial (Wicksell 2008). Multidisciplinary care compared with usual care results in little to no difference in long-term neck disability in people with chronic WAD, but the evidence is very uncertain.

Effect on psychological functioning (see T.23.4 for details)

Acute WAD short-term (2 weeks to 3 months) (low certainty in the evidence):

N=1 trial (Jull 2013). The evidence suggests that multidisciplinary care compared with usual care may result in little to no difference in short-term psychological functioning in people with acute WAD.

Acute WAD long-term (>3 months to 12 months) (low certainty in the evidence):

N=1 trial (Jull 2013). The evidence suggests that multidisciplinary care compared with usual care may result in little to no difference in long-term psychological functioning in people with acute WAD.

Chronic WAD short-term (2 weeks to 3 months) (very low certainty in the evidence):

N=1 trial (Wicksell 2008). Multidisciplinary care compared with usual care may result in clinically significant reductions in short-term depression in people with chronic WAD, but the evidence is very uncertain.

Chronic WAD long-term (>3 months to 12 months) (very low certainty in the evidence):

N=1 trial (Wicksell 2008). Multidisciplinary care compared with usual care may result in clinically significant reductions in long-term depression in people with chronic WAD, but the evidence is very uncertain.

Additional considerations: Adverse effects

Jull 2013 (acute): No adverse events were reported concerning physiotherapy or psychological interventions.

Wicksell 2008 (chronic): Not reported.

Table 52: Summary of included studies (multidisciplinary care for acute and chronic WAD)

Author Year	Participants and setting (country)	Intervention (multidisciplinary)	Control (usual care)	Outcomes included	Neck pain outcomes	Neck disability outcomes	Psych functioning outcomes	Summary (risk of bias PEDRO score)
(Jull et al., 2013) Acute WAD	101 participants recruited from hospital accident and emergency departments and advertising in the popular press with acute WAD (Australia)	Combined individualised care from general practitioner (GP), physiotherapist, psychologist for 10 wks. GP provided Pharmacotherapeutic care (e.g., analgesic agents, opioids) monitored wkly. Physiotherapist provided multimodal rehabilitation (e.g., advice, exercise, manual therapy, whiplash booklet). Psychologist provided cognitive behavioural therapy for those with IES≥26, with option to extend initial 6wk intervention period by 4 wks for psychological distress.	Participants pursued usual care from healthcare professionals of their choice or as monitored by insurer (e.g., GP, physio, chiro).	Neck pain, neck disability, and psychological functioning at 3mo	VAS (0-100)	NDI (0-50)	IES, PFActS-C	No advantage of early multiprofessional intervention compared with usual care. (6)

(Wicksell et al., 2008) Chronic WAD	21 participants recruited from the Swedish Association of Survivors of Traffic Accidents and Polio with chronic WAD (Sweden)	Psychologist and pain physician trained in CBT and acceptance and commitment therapy (ACT) delivered interventions including pain education, values assessment, shifting perspective, gradual values-based exposure, acceptance and diffusion over 10 sessions across 8 weeks. Continued with treatment as usual (medication, acupuncture, physiotherapy, naprapathy, osteopathy)	Participants were placed on a waitlist and received treatment as usual (medication, acupuncture, physiotherapy, naprapathy, osteopathy)	Neck pain, neck disability, and psychological functioning at 4mo and 7mo	VAS (0-100)	PDI	TSK, IES, HADS, PIPS	After treatment, significant differences in favour of the treatment group were seen in pain disability, life satisfaction, fear of movements, depression, and psychological inflexibility. No change for any of the groups was seen in pain intensity. (8)

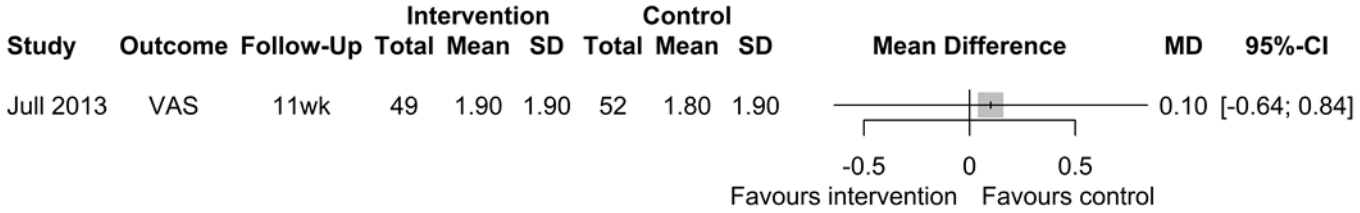
SES, Self-Efficacy Scale; TSK, Tampa Scale of Kinesiophobia; NDI, Neck Disability Index; PDI, Pain Disability Index; SF12, Short Form 12; EQ-5D; CSQ, Coping Strategies Questionnaire; SF-36, Short Form 36; PDS, Post-traumatic Stress Diagnostic Scale; DASS, Depression Anxiety Stress Scale; PCS, Pain Catastrophizing Scale; PCI, Pain Coping Inventory; HADS, Hospital Anxiety and Depression Scale; PIPS, Psychological Inflexibility in Pain Scale; CES-D, Centre for Epidemiological Studies – Depression Scale; WDQ, Whiplash Disability Questionnaire; PFActS-C, Pictorial Fear of Activity Scale-Cervical; Pain Self-Efficacy Questionnaire

T.23.2. Effect on neck pain

Short-term outcomes (acute WAD)

Included studies: Jull 2013

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Jull 2013: See figure below.	⊕⊕◯◯ Low	CRITICAL
1	Not serious[a]	Not serious	Not serious[b]	Very serious[c]	n/a			

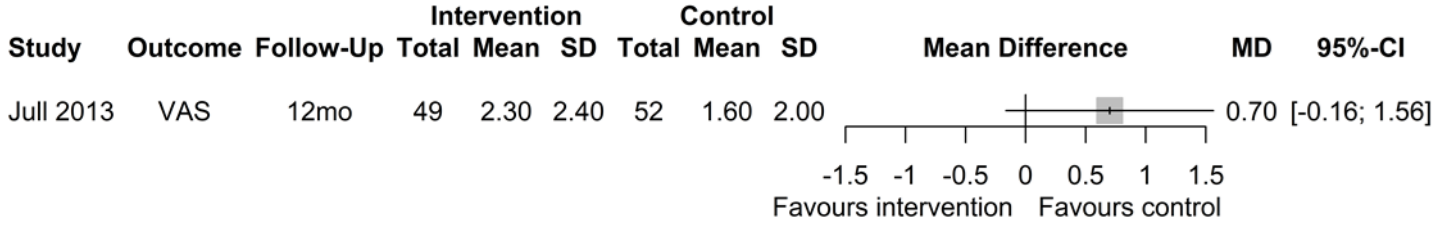


[a]'Good' PEDRO rating (6/10).
[b]Study carried out in Australian primary care settings.
[c]Sample size (n=101) significantly below the threshold for precision. Confidence intervals within clinically meaningful thresholds.

Long-term outcomes (acute WAD)

Included studies: Jull 2013

GRADE Certainty Assessment						No of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Jull 2013: See figure below.	⊕⊕◯◯ Low	CRITICAL
1	Not serious[a]	Not serious	Not serious[b]	Very serious[c]	n/a			



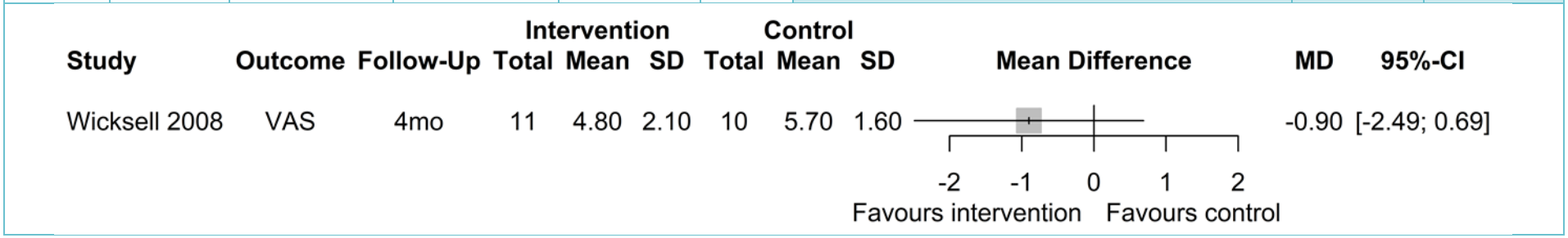
[a]'Good' PEDRO rating (6/10).
[b]Study carried out in Australian primary care settings.

[c]Sample size (n=101) significantly below the threshold for precision. Confidence intervals within clinical meaningful threshold.

Short-term outcomes (chronic WAD)

Included studies: Wicksell 2008

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	See figure below.	⊕◯◯◯ Very low	CRITICAL
1	Not serious[a]	Not serious	Not serious[b]	Extremely serious[c]				

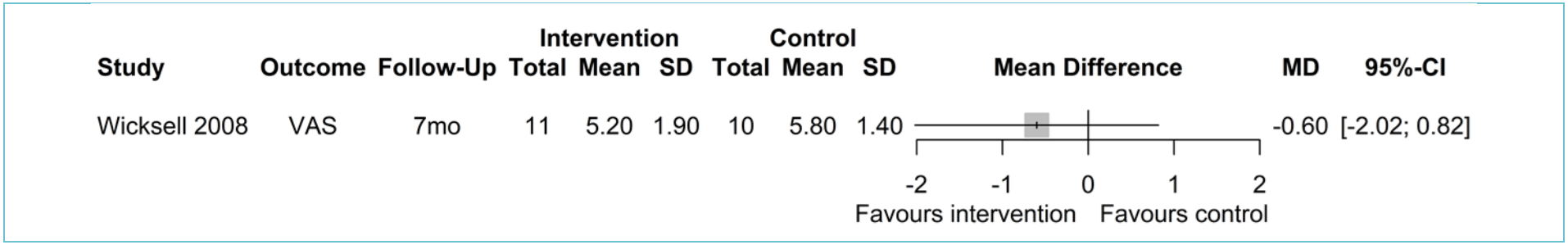


[a]'Good' PEDRO rating (8/10).
[b]Study included healthcare professionals and primary care settings that are consistent with an Australian setting.
[c]Small sample size from a single pilot trial (n=21) which is significantly below the threshold for precision. Confidence intervals within clinical meaningful threshold.

Long-term outcomes (chronic WAD)

Included studies: Wicksell 2008

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	See figure below.	⊕◯◯◯ Very low	CRITICAL
1	Not serious[a]	Not serious	Not serious[b]	Extremely serious[c]	n/a			



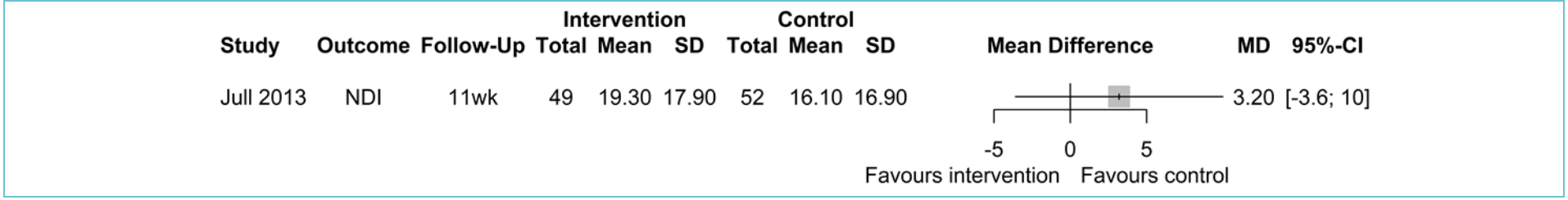
[a]'Good' PEDRO rating (8/10).
[b]Study carried out in primary care settings that are consistent with primary care in an Australian setting.
[c]Small sample size from a single pilot trial (n=21) which is significantly below the threshold for precision. Confidence intervals crossed the clinically significant threshold and zero.

T.23.3. Effect on neck disability

Short-term outcomes (acute WAD)

Included studies: Jull 2013

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	See figure below.	⊕⊕◯◯ Low	CRITICAL
1	Not serious[a]	Not serious	Not serious[b]	Very serious[c]	n/a			



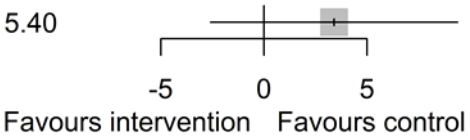
[a]'Good' PEDRO rating (6/10).
[b]Study carried out in Australian primary care settings.
[c]Sample size (n=101) significantly below the threshold for precision. Confidence intervals within clinical meaningful threshold.

Long-term outcomes (acute WAD)

Included studies: Jull 2013

GRADE Certainty Assessment						No of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	See figure below.	⊕⊕◯◯ Low	CRITICAL
1	Not serious[a]	Not serious	Not serious[b]	Very serious[c]	n/a			

Study	Outcome	Follow-Up	Intervention Total	Intervention Mean	Intervention SD	Control Total	Control Mean	Control SD	Mean Difference	MD	95%-CI
Jull 2013	NDI	12mo	49	16.90	15.30	52	13.50	15.40		3.40	[-2.59; 9.39]



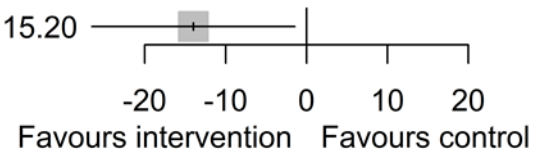
[a]'Good' PEDRO rating (6/10).
[b]Study carried out in Australian primary care settings.
[c]Sample size (n=101) significantly below the threshold for precision. Confidence intervals within clinical meaningful threshold.

Short-term outcomes (chronic WAD)

Included studies: Wicksell 2008

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	See figure below.	⊕◯◯◯ Very low	CRITICAL
1	Not serious[a]	Not serious	Not serious[b]	Extremely serious[c]	n/a			

Study	Outcome	Follow-Up	Intervention Total	Intervention Mean	Intervention SD	Control Total	Control Mean	Control SD	Mean Difference	MD	95%-CI
Wicksell 2008	PDI	4mo	11	24.30	14.00	10	38.30	15.20		-14.00	[-26.54; -1.46]



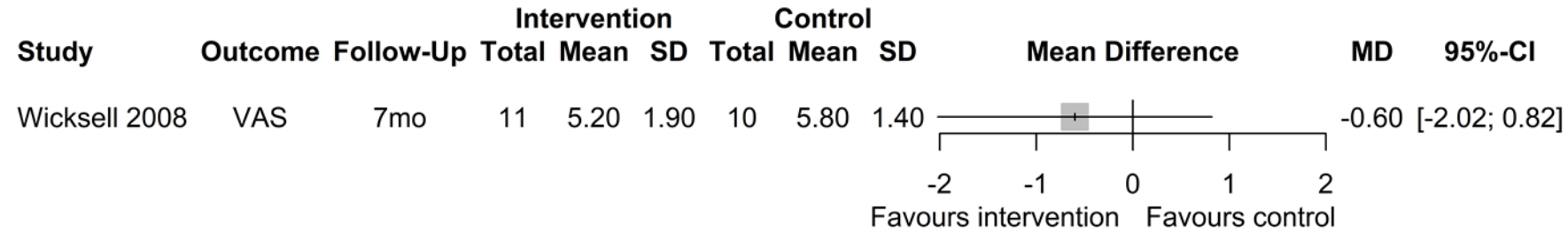
[a]'Good' PEDRO rating (8/10).

[b]Study carried out in primary care settings that are consistent with primary care in an Australian setting.
[c]Small sample size from a single pilot trial (n=21) which is significantly below the threshold for precision. Wide confidence intervals spanning from large magnitude differences between groups beyond the clinically significant threshold and approaching zero.

Long-term outcomes (chronic WAD)

Included studies: Wicksell 2008

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	See figure below.	⊕◯◯◯ Very low	CRITICAL
1	Not serious[a]	Not serious	Not serious[b]	Extremely serious[c]	n/a			



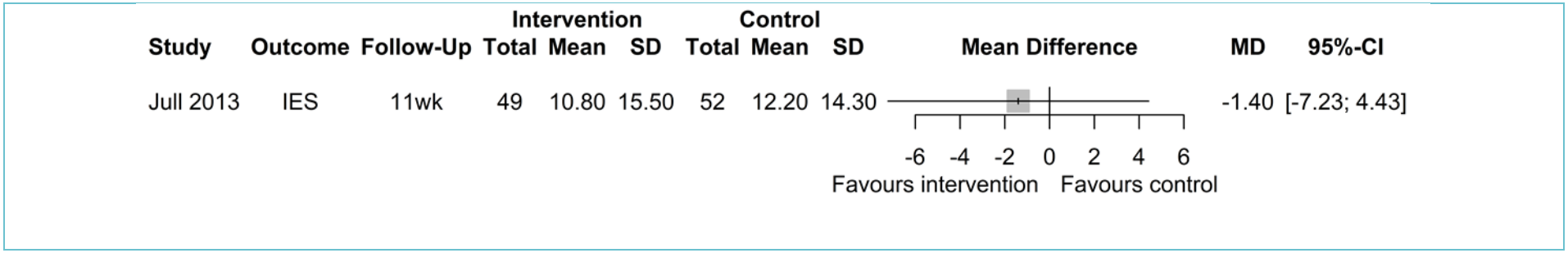
[a]'Good' PEDRO rating (8/10).
[b]Study carried out in primary care settings that are consistent with primary care in an Australian setting.
[c]Small sample size from a single pilot trial (n=21) which is significantly below the threshold for precision. Confidence intervals crossed the clinically significant threshold and zero.

T.23.4. Effect on psychological functioning

Short-term outcomes (acute WAD)

Included studies: Jull 2013

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	See figure below.	⊕⊕◯◯ Low	CRITICAL
1	Not serious[a]	Not serious	Not serious[b]	Very serious[c]	n/a			

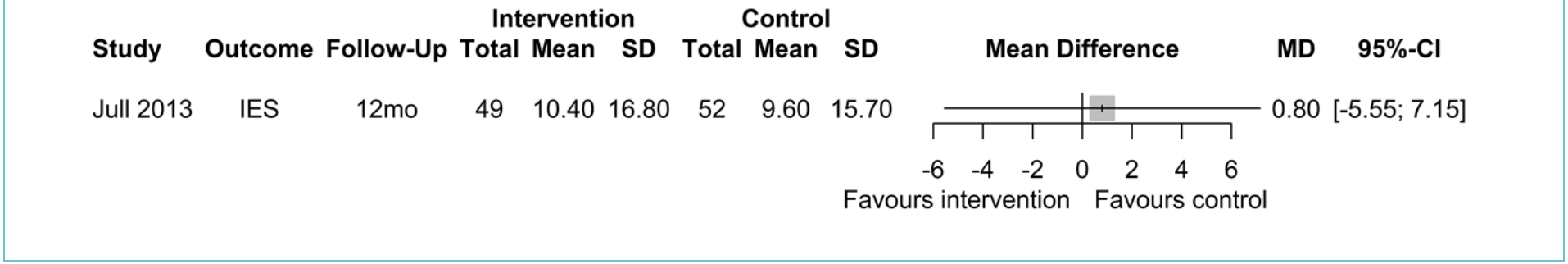


[a]'Good' PEDRO rating (6/10).
[b]Study carried out in Australian primary care settings.
[c]Sample size (n=101) significantly below the threshold for precision. Confidence intervals crossed the clinically meaningful threshold and zero.

Long-term outcomes (acute WAD)

Included studies: Jull 2013

GRADE Certainty Assessment						No of people and effects	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	See figure below.	⊕⊕◯◯ Low	CRITICAL
1	Not serious[a]	Not serious	Not serious[b]	Very serious[c]	n/a			

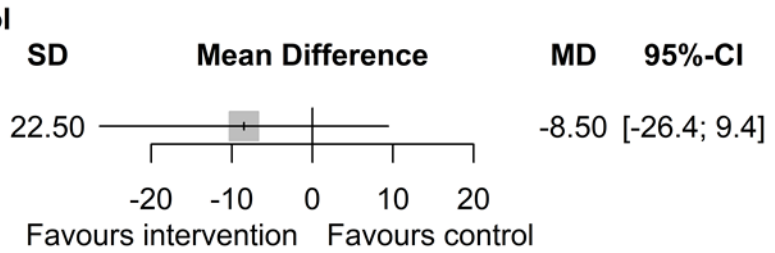


[a]'Good' PEDRO rating (6/10).
[b]Study carried out in Australian primary care settings.
[c]Sample size (n=101) significantly below the threshold for precision. Confidence intervals crossed the clinically meaningful threshold and zero.

Short-term outcomes (chronic WAD)

Included studies: Wicksell 2008

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Wicksell 2008 outcome: HADS Hospital Anxiety and Depression Scale (Depression subscale 0-21) (8wk) MD I-C: -4.3 (-7.77, -0.83)	⊕◯◯◯ Very low	CRITICAL
1	Not serious[a]	Not serious	Not serious[b]	Extremely serious[c]	n/a			

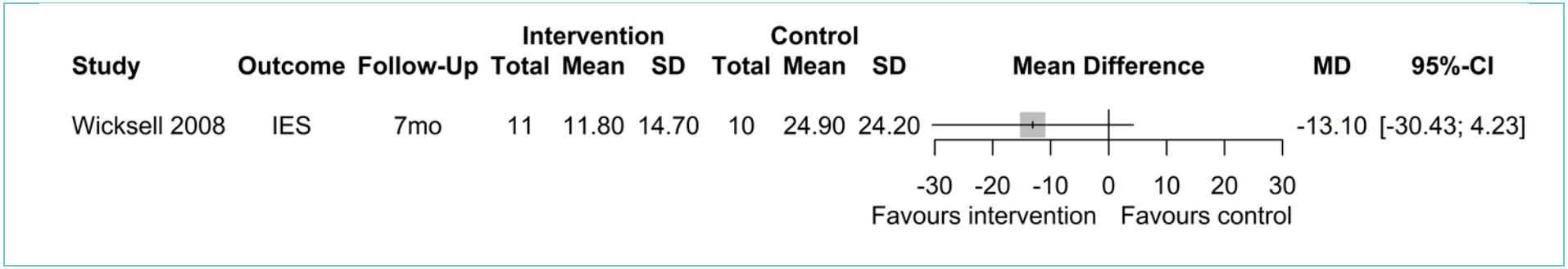


[a]'Good' PEDRO rating (8/10).
[b]Study carried out in primary care settings that are consistent with primary care in an Australian setting.
[c]Small sample size from a single pilot trial (n=21) which is significantly below the threshold for precision. Wide confidence intervals for HADS outcome presented in table above.

Long-term outcomes (chronic WAD)

Included studies: Wicksell 2008

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Wicksell 2008 outcome: HADS Hospital Anxiety and Depression Scale (Depression subscale 0-21) (4mo) MD I-C: -5.7 (-9.62, -1.78)	⊕◯◯◯ Very low	CRITICAL
1	Not serious[a]	Not serious	Not serious[b]	Extremely serious[c]	n/a			



[a]'Good' PEDRO rating (8/10).
[b]Study carried out in primary care settings that are consistent with primary care in an Australian setting.
[c]Small sample size from a single pilot trial (n=21) which is significantly below the threshold for precision. Wide confidence intervals for HADS outcome presented in table above.

Table 53: Evidence to decision framework (multidisciplinary care for acute and chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
● Trivial (acute) ○ Small ● Moderate (chronic) ○ Large ○ Varies ○ Don't know	Acute: The evidence suggests that multidisciplinary care compared with usual care results in little to no difference in short- and long-term neck pain, neck disability, and psychological functioning in people with acute WAD. Chronic: Multidisciplinary care compared with usual care results in clinically significant reductions in short-term neck disability and short- and long-term depression in people with chronic WAD, but the evidence is very uncertain as the findings were from a single trial with small sample size. No differences were found in neck pain.	
Undesirable Effects How substantial are the undesirable anticipated effects?		
Judgement	Research evidence	Additional considerations

○ Large ○ Moderate ○ Small ● Trivial ○ Varies ○ Don't know	Jull 2013 (acute): No adverse events were reported concerning physiotherapy or psychological interventions. Wicksell 2008 (chronic): Not reported.	
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations
● Very low (chronic) ● Low (acute) ○ Moderate ○ High ○ No included studies	Acute: Single study with sample size (n=101) significantly below the threshold for precision. Chronic: Small sample size from a single pilot trial (n=21) which is significantly below the threshold for precision and several outcomes were shown to have wide confidence intervals crossing the clinically significant threshold and zero.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ● Does not favour either the intervention or the comparison (acute) ● Probably favours the intervention (chronic) ○ Favours the	Acute: No benefit of multidisciplinary care compared with usual care for management of people with acute WAD. Chronic: Variable benefits that reached clinical significance for several critical outcomes and trivial adverse effects expected.	Acute/chronic: Usual care in this context was at the discretion of the participants and generally involved general medical professionals and physiotherapists. Medium to high-risk people: Subjects in the study by Jull (2013) were stratified according to psychophysical measures suggestive of poor prognoses (including NDI ≥30, Impact of Events Scale score >26, and sensory disturbances – cold and pressure thresholds). Subjects in the study by Wicksell (2008) are already 'medium to high-risk people' as they are in the chronic phase of whiplash injury.

intervention ○ Varies ○ Don't know		
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Large costs ● Moderate costs (acute/chronic) ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	Acute: Community clinic sites with multidisciplinary coordinated care (Jull 2013). Chronic: Multidisciplinary coordinated care, however, undefined clinic sites (Wicksell 2008).	
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	

Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	
Equity **What would be the impact on health equity?**		
Judgement	Research evidence	Additional considerations
○ Reduced ● Probably reduced (acute/chronic) ○ Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Not all areas in Australia can access multidisciplinary care for management of acute or chronic WAD. However, multidisciplinary care could be conducted remotely via video/telehealth approaches, but the effectiveness of this strategy for management of WAD is unknown. Greater difficulty with access to a multidisciplinary pain clinic compared with coordinated care across several community sites.
Acceptability		

Is the intervention acceptable to key stakeholders?		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes (acute/chronic) ○ Yes ○ Varies ○ Don't know	Acceptable interventions with low dropout rates: • Acute (Jull 2013): 3/49 intervention vs 1/52 control participants. • Chronic (Wicksell 2008): No participants in the intervention group dropped out.	Physical, psychological, and physician interventions are acceptable in an Australian context for management of whiplash injury.
Feasibility **Is the intervention feasible to implement?**		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ● Probably yes (acute/chronic) ○ Yes ○ Varies ○ Don't know	No included evidence.	Feasible to be treated by two or more healthcare professionals at the same time, however, adequate communication between professions is not always achieved in an Australia context. Communication needs to be a part of a collaborative care plan.

T.23.5. Conclusions (multidisciplinary care for acute WAD)

Type of recommendation (multidisciplinary care for acute WAD)

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	●	○	○

Recommendations
The guideline panel cannot recommend for or against multidisciplinary care for the management of people with acute WAD. *Panel vote summary: (8/9 89% neutral; 1/9 11% conditional for)* **Justification** • The evidence suggests that multidisciplinary care compared with usual care results in little to no difference in short- and long-term neck pain, neck disability, and psychological functioning (Jull 2013). Usual care in this context was at the discretion of the participants and generally involved general medical professionals and physiotherapists. • Recommended treatments for managing acute WAD in these guidelines are delivered by several healthcare professions, and people with acute WAD are likely to receive multi-profession care in practice. • Multidisciplinary care involving medical, physical, and psychological treatment had high acceptability among people and no adverse effects reported. **Subgroup considerations** • Medium to high-risk people. Subjects in the study by Jull (2013) were stratified according to psychophysical measures suggestive of poor prognoses including NDI ≥30, Impact of Events Scale score ≥26, and sensory disturbances such as cold and pressure thresholds. **Implementation considerations** Indications: • For people at medium/high risk of poor outcome and if there are clinically meaningful benefits in critical outcomes. Dose: • Provide for up to 3-months, where HCP's aim to develop self-efficacy in the injured person to self-manage their condition following treatment. Considerations: • Involve recommended treatment modalities outlined in these guidelines (education, physical therapy, psychological intervention). • Inter-professional communication is the core and critical component required to deliver effective multidisciplinary care. Following assessment, healthcare professionals should initiate contact with other treating healthcare professionals if no communication has previously been established. Support for case conferencing (funding available through Medicare/insurers) should be considered to facilitate communication between professionals.

T.23.6. Conclusions (multidisciplinary care for chronic WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	○	●	○

Recommendations
The guideline panel suggests that multidisciplinary care could be used for the management of people with chronic WAD. *(Panel vote summary: 9/9 100% conditional for)* **Justification** • The evidence (n=1 trial) suggests that multidisciplinary care compared with usual care results in clinically significant reductions in short-term neck disability, and short- and long-term depression, but the evidence is very uncertain as this it was from a single pilot trial (n=21). Usual care in this context was at the discretion of the participants and generally involved general medical professionals and physical therapy. • People with chronic WAD are already classified as medium-high risk and are likely presenting with pain, physical, and psychological issues. • Recommended treatments for managing chronic WAD in these guidelines are delivered by several healthcare professions, which is likely to involve physical, psychological, and medical interventions. • Multidisciplinary care involving physical, psychological, and medical treatment had high acceptability among a small cohort of people and no adverse effects reported. These treatment interventions are acceptable in an Australian context for chronic pain conditions including whiplash. **Implementation considerations** *Indications:* • Multidisciplinary care should be considered for the management of people with chronic WAD if they present with pain, physical, and psychological issues and have not responded to other recommended treatments. Multidisciplinary care should involve recommended treatment modalities outlined in these guidelines which are part of an active and biopsychosocial approach to chronic WAD management. *Dose:* • Multidisciplinary care should be provided for a period up to 3-6-months (providing there are treatment benefits around self-efficacy, including evidence of activity and participation).

- Treatment should be tapered (reduced dosage over time) as self-efficacy develops.

Considerations:

- Interprofessional communication is critical for effective multidisciplinary collaborative care. Following initial assessment, primary HCPs should initiate contact with other treating healthcare professionals if no prior communication has been established.

Outcomes:

- HCPs should aim to develop self-efficacy in people with chronic whiplash to enable self-management. Meaningful change in self-efficacy is likely to be achieved before clinically meaningful benefits in neck pain or disability.

Multidisciplinary chronic pain clinics

Multidisciplinary chronic pain clinics (one location) are effective interventions in other types of musculoskeletal pain (not including radicular pain), where there is a clear biopsychosocial approach with coordination between at least two treating health professionals providing physical, psychological, and medical therapies (not including interventional pain management techniques). Other inclusion factors to consider are the presence of significant pain and disability. As there is no clear recommendation for the duration and intensity of this treatment, it should be provided within the Clinical Framework for Delivery of Health Services when treating people injured in motor vehicle collisions (https://www.tac.vic.gov.au/providers/working-with-the-tac/clinical-framework).

15. Medical procedure treatment recommendations

T.24. Medical procedure: Radiofrequency neurotomy

Is a radiofrequency neurotomy compared with placebo treatment effective for the management of cervical facet joint pain in people with chronic WAD?

T.24.1. Executive summary

There is one clinical trial that has evaluated the effect of radiofrequency neurotomy (RFN) for the management of cervical z-joint pain in people with chronic whiplash associated disorders. Radiofrequency neurotomy treatment is only considered if usual care has failed and the injured person has persistent neck pain. People must have been assessed by a specialist and diagnosed with chronic facet joint pain using localised anesthetic. As a result, a recommendation for RFN treatment in acute WAD is not considered in these guidelines.

Effect on neck pain (see T.24.2 for details)

Chronic WAD long-term (>3 months to 12 months) (very low certainty in the evidence):

N=1 Trial (Lord 1996). Compared RFN with placebo (double-blind, placebo-controlled trial). RFN may have clinically relevant long-term reductions in neck pain compared with placebo treatment, but the evidence is very uncertain.

Additional considerations: Adverse effects

Pain associated with the procedure lasted a median of 3.5 days (interquartile range, 1 to 16) in the control group and 13.5 days (interquartile range, 6 to 15) in the active-treatment group (P = 0.26 by the Mann–Whitney U test). One injured person in the active-treatment group had a psoriatic rash starting at the skin incision (Köbner's phenomenon) one week after the operation. Six people in the control group and three in the active-treatment group had a return of their accustomed pain in the period immediately after the operation.

Table 54: Summary of included studies (radiofrequency neurotomy for chronic WAD)

Author Year	Participants and setting (country)	Intervention (RFN)	Control (Placebo)	Outcomes included	Neck pain outcomes	Neck disability outcomes	Psych functioning outcomes	Summary (risk of bias PEDRO score)
(Lord et al., 1996) (Chronic)	24 people with chronic WAD, cervical facet joint pain, in a tertiary referral centre in Australia.	Double-blind placebo-controlled study. Medial branch anesthetic block injections over three stages (double blind placebo approach) were used to diagnose facet joint pain in C3-C7 region. An electrode was introduced percutaneously under fluoroscopic control and several lesions were made with a 22-gauge electrode heated to 80deg for 90sec. Two insertions were made at different angles to the medial branch of the cervical dorsal ramus which supplies the facet joint.	Diagnostic procedure was performed in the same manner as the intervention except that the temperature of the electrode was maintained at 37deg. The surgeon was blinded to the temperature of the electrode.	Neck pain	Pain (VAS)	x	x	Chronic cervical zygapophyseal-joint pain confirmed with double-blind, placebo-controlled local anesthesia, percutaneous radiofrequency neurotomy with multiple lesions of target nerves can provide lasting relief. (9)

T.24.2.Effect on neck pain

Long-term outcomes (acute WAD)

Included studies: Lord 1996

GRADE Certainty Assessment						No of people and effect	Certainty	Importance
No studies	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	N=24 (I: 12, C: 12) Survival curve analysis of ongoing pain relief. Median time of pain relief (return to 50% previous pain) 263 days vs 8 days (placebo), p =0.04. 3/12 people in intervention group had no pain relief.	⊕◯◯◯ Very low	CRITICAL
1	Not serious[a]	Not serious	Not serious[b]	Extremely serious[c]	n/a			

[a]Low risk of bias: Double blind placebo controlled clinical trial (Pedro=9/10)
[b]Participants attended a tertiary referral centre in Australia.
[c]Small sample from a single pilot trial (N=24) and inadequate reporting of neck pain point estimates to evaluate short- and long-term effects of the intervention.

Table 55: Evidence to decision framework (radiofrequency neurotomy for chronic WAD)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Trivial ○ Small ● Moderate ○ Large ○ Varies ○ Don't know	RFN may have clinically relevant long-term reductions in neck pain compared with placebo treatment, but the evidence is very uncertain as the findings are from a single trial with small sample size and the findings are yet to be replicated.	Six people in the control group and three in the active-treatment group had a return of their accustomed pain in the period immediately after the procedure. Key outcome was median time (days) of pain relief (return to 50% previous pain), implying a return/increase in some magnitude of pain over time.
Undesirable Effects How substantial are the undesirable anticipated effects?		
Judgement	Research evidence	Additional considerations

○ Large ● Moderate ○ Small ○ Trivial ○ Varies ○ Don't know	Pain associated with the procedure lasted a median of 3.5 days (interquartile range, 1 to 16) in the control group and 13.5 days (interquartile range, 6 to 15) in the active-treatment group (P = 0.26 by the Mann–Whitney U test). One injured person in the active-treatment group had a psoriatic rash starting at the skin insertion site (Köbner's phenomenon) one week after the procedure. Six people in the control group and three in the active-treatment group had a return of their accustomed pain in the period immediately after the procedure.	CT guidance required. Low risk of significant harm, associated with insertion of probe near vascular and neural structures. Infection risk associated with procedure.
Certainty of evidence What is the overall certainty of the evidence of effects?		
Judgement	Research evidence	Additional considerations
● Very low ○ Low ○ Moderate ○ High ○ No included studies	Lord 1996: Double blind placebo-controlled trial, however, small sample from a single trial (N=24) and inadequate reporting of neck pain point estimates to evaluate short- and long-term effects of the intervention.	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the	Lord 1996: Clinically significant reductions in long-term pain in a proportion of the treatment cohort compared with placebo treatment. Six people in the control group and three in the active-treatment group had a return of their accustomed pain in the period immediately after the operation. Key outcome was median time (days) of pain relief (return to 50% previous pain), implying a return/increase in some magnitude of pain over time.	Inadequate reporting of neck pain point estimates to evaluate short- and long-term effects of the intervention. Note: comparator was a placebo procedure treatment and would not be recommended.

intervention ● Varies ○ Don't know		
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
● Large costs ○ Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	Lord 1996: Procedure performed in tertiary referral centre in Australia. Prior to RFN, participants are required to undergo medial branch anaesthetic block injections over three stages (double blind placebo approach) to diagnose facet joint pain in C3-C7 region.	Highly specialised procedure, requiring a guided injection. Public pain services and private centres perform the procedure.
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations

○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No included evidence.	
Equity What would be the impact on health equity?		
Judgement	Research evidence	Additional considerations

● Reduced ○ Probably reduced ○ Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Not routinely available, and only performed in specialised clinics which is likely to result in reduced health equity.
Acceptability Is the intervention acceptable to key stakeholders?		
Judgement	Research evidence	Additional considerations
○ No ● Probably no ○ Probably yes ○ Yes ○ Varies ○ Don't know	No included evidence.	Not routinely available, and only performed in specialised clinics. Large costs associated with the treatment. Treatment effects wear off. Not all people accept a procedure for treatment. Known risk associated with the procedure.
Feasibility Is the intervention feasible to implement?		
Judgement	Research evidence	Additional considerations
○ No ● Probably no ○ Probably yes ○ Yes ○ Varies ○ Don't know	Lord 1996: Conducted in a tertiary referral centre in Australia.	Not routinely available, and only performed in specialised clinics. Large costs associated with the treatment. Requires specific training for this procedure (medical specialist with additional training). Pain medicine specialists can perform this procedure (not in a tertiary referral centre).

T.24.3. Conclusions (radiofrequency neurotomy for chronic WAD)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	●	○	○	○

Recommendations
The guideline panel suggest that healthcare professionals not use radiofrequency neurotomy (RFN) for the management of people with chronic WAD. *(Panel vote summary: 9/11 82% conditional against; 2/11 18% strong against)* **Justification** • Small pilot trial that has not been replicated. • Proportion of participants had a return of their accustomed pain in the period immediately after the operation. • Large costs associated with the treatment. • Not all people accept a medical procedure for treatment. • Known risks associated with the procedure: Low risk of significant harm, associated with insertion of probe near vascular and neural structures. Infection risk associated with injection.

T.25. Medical procedure: Spinal surgery

Is spinal surgery compared with non-surgical treatment effective for the management of people with WAD with radiculopathy?

T.25.1. Executive summary

No clinical trials evaluating the effectiveness of spinal surgery compared with non-surgical treatment for the management of chronic WAD. Cervical surgery is generally only considered during the chronic phase of whiplash injury and in the presence of neurological symptoms.

Systematic review of surgery (plasma decompression/nucleoplasty or anterior cervical decompression with fusion, ADCF) versus conservative care for neck pain involving people with chronic neck pain and evidence of myelopathy or radiculopathy (van Middelkoop et al., 2013). Van Middelkoop et al. (2013) used the GRADE process to evaluate certainty of evidence for several outcomes, including short- and long-term pain (considers neck/arm) in people with radiculopathy. Six studies, four of which were CCTs, were identified which examined surgery versus non-surgical interventions in people with radiculopathy. Exclusion of developing spinal cord injury (myelopathy).

Decompression surgical technique

Short-term pain

Radiculopathy participants (n=1 trial): Low quality of evidence for the effectiveness of decompression compared to conservative care for short-term pain.

Long-term pain

Radiculopathy participants (n=1 trial): Low quality of evidence for the effectiveness of decompression compared to conservative care for long-term pain.

Anterior cervical decompression with fusion (ACDF) surgical technique

Short-term pain

People with radiculopathy (n=2 trials): Very low quality of evidence for the effectiveness of surgery compared to collar, and no difference compared to physiotherapy, for short-term pain.

Long-term pain

Radiculopathy participants (n=3 trials): Very low quality of evidence for little to no difference in long term pain compared with conservative management.

Table 56: Evidence to decision framework (surgical intervention for chronic WAD with radiculopathy)

Desirable Effects How substantial are the desirable anticipated effects?		
Judgement	Research evidence	Additional considerations
○ Trivial ○ Small ○ Moderate ○ Large ○ Varies ● Don't know	No clinical trials on the effectiveness of surgical intervention compared with non-surgical intervention for the management of people with chronic WAD and radiculopathy. Low quality evidence for the effectiveness of decompression compared to conservative care for management of short- and long-term pain in people with chronic neck pain with evidence of radiculopathy (van Middelkoop et al., 2013). Very low-quality evidence for no significant difference in short- and long-term pain following anterior cervical decompression with fusion compared with non-surgical intervention in people with chronic neck pain with evidence of radiculopathy (van Middelkoop et al., 2013).	Radiculopathy is suspected in a small subgroup of people with WAD (less than 5%), based on NSW SIRA data.
Undesirable Effects **How substantial are the undesirable anticipated effects?**		
Judgement	Research evidence	Additional considerations
○ Large ○ Moderate ○ Small ○ Trivial ● Varies ○ Don't know	No included evidence.	Known risks associated with cervical surgery include: • Infection • Exacerbation of pain • Vascular/neural damage (nerve root and/or spinal cord injury)
Certainty of evidence **What is the overall certainty of the evidence of effects?**		
Judgement	Research evidence	Additional considerations

○ Very low ○ Low ○ Moderate ○ High ● No included studies	Very low to low (van Middelkoop et al., 2013).	
Balance of effects Does the balance between desirable and undesirable effects favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ●Varies ○ Don't know	Surgery considered only in subgroup of people in the chronic phase with high pain intensity, and evidence of radiculopathy, and ineffective conservative care. For example: • Mean preoperative VAS 8.8 (Birnbaum, 2009). • Median average neck pain and arm pain 6-7 (Löfgren et al., 2003). • Mean (SD) pain intensity surgery group and control 7.0 (2.2) and 6.6 (2.1) (Mayer et al., 2002). • People (n = 115) had neck/arm pain >50 on the VAS pain scale and had failed at least 30 days of conservative care (Cesaroni & Nardi, 2010).	Known side effects and risks associated with cervical surgery.
Resources required How large are the resource requirements (costs)?		
Judgement	Research evidence	Additional considerations

● Large costs ○ Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	No included evidence.	Significant medical and hospital-related costs for surgery.
Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
Judgement	Research evidence	Additional considerations
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No included evidence.	
Cost effectiveness Does the cost-effectiveness of the intervention favour the intervention or the comparison?		
Judgement	Research evidence	Additional considerations
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the	No included evidence.	

intervention ○ Varies ● No included studies		
Equity **What would be the impact on health equity?**		
Judgement	Research evidence	Additional considerations
○ Reduced ○ Probably reduced ● Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know	No included evidence.	Could be covered under CTP insurance for a small subgroup of people with WAD and radiculopathy. Less availability to surgical intervention in regional/rural areas.
Acceptability **Is the intervention acceptable to key stakeholders?**		
Judgement	Research evidence	Additional considerations
○ No ○ Probably no ○ Probably yes ○ Yes ● Varies ○ Don't know	No included evidence.	Requests for surgery for radiculopathy following whiplash injury would be considered within existing frameworks for evaluating requests for spinal surgery.
Feasibility **Is the intervention feasible to implement?**		
Judgement	Research evidence	Additional considerations

○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	No included evidence.	Could be covered under CTP insurance for a small subgroup of people with WAD and radiculopathy.

T.25.2. Conclusions (spinal surgery for chronic WAD and radiculopathy)

Type of recommendation

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	○	●	○	○

Recommendations
The guideline panel cannot recommend for or against the use of surgery of the cervical spine for the management of people with chronic WAD and radiculopathy. *(Panel vote summary: 7/8 88% neutral; 1/8 12% conditional against)* **Justification** • Radiculopathy is suspected in a small subgroup of people with WAD (less than 5%). • No clinical trials evaluating the effect of spinal surgery compared with non-surgical interventions for the management of people with WAD and radiculopathy. • (Low quality evidence) Cervical decompression surgery compared with non-surgical intervention has been shown to be effective at reducing short- and long-term pain in people with chronic neck pain with radiculopathy. • (Very low-quality evidence) No differences between decompression with cervical fusion and non-surgical intervention (including physiotherapy) in short- and long-term pain in people with chronic neck pain with radiculopathy. • Known significant adverse risks with cervical surgery (e.g., infection, vascular/neural damage). **Subgroup considerations** • People with WAD grade III and in accordance with the *indications* listed below.

Implementation considerations

Indications:

- Spinal surgery (e.g., decompression) could be considered in rare cases of WAD III when a period of conservative treatment was found to be ineffective, and the person has persistent high intensity pain (e.g., mean pain ≥6/10, neck/arm) and evidence of radiculopathy (see screening for radiculopathy, WAD grade III, in the Diagnosis section) present for more than 1-month.
- Note: Radiculopathy is suspected in a small subgroup of people with WAD (less than 5%).

Considerations:

- Communicate known adverse effects/risk associated with cervical spinal surgery.
- Recommendations are applicable for radiculopathy, not radicular pain, meaning there is objective neurological abnormality.

T.26. Treatment for whiplash-associated headache

In our systematic review of whiplash RCTs, no trials specifically aimed to change headache symptoms as part of the intervention. Four studies evaluated headache intensity as a secondary outcome in response to multimodal physical therapy (Scholten Peeters 2006), immobilisation with soft collar (Borchgrevink 1998; Kongsted 2007), and specific education (Kongsted 2008) interventions. No significant differences in between group headache intensity found in these studies. The guideline committee note that as per the International Classification of Headache Disorders (3rd edition), the critical outcome measure for headache is the frequency of headache over the previous month. Frequency of headache was not measured in any of the included whiplash trials. Interventions that target headache after whiplash might be an area for future research.

Implementation considerations

- Healthcare professionals should review primary headache trials for evidence regarding headache management following traumatic injury.

16. References

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